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RCRA CLOSURE PLAN
FOR EKCO HOUSEWARES, INC.
MASSILLON, OHIO

VOLUME I

WESTON SM

MANAGERS DESIGNERS/CONSULTANTS

RCRA CLOSURE PLAN
FOR EKCO HOUSEWARES, INC.
MASSILLON, OHIO

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SECTION 1
INTRODUCTION

1.1 OBJECTIVES

The purpose of this Resource Conservation and Recovery Act (RCRA) Closure Plan is to provide a closure methodology for the lagoon/surface impoundment at the EKCO Housewares, Inc. (EKCO) facility in Massillon, Ohio. The lagoon had received characteristic hazardous waste (based on cadmium) in the past. This plan provides for the treatment and removal of sludges and oils in the lagoon to the water table. The intent of this plan is to provide for a clean closure of the lagoon.

1.2 BACKGROUND

An assessment of the nature and extent of releases from the lagoon was performed by Roy F. Weston, Inc. (WESTON) in late March and early April 1988. A Draft RCRA Closure Plan for the EKCO facility in Massillon, Ohio, was then submitted in August 1988. The Ohio Environmental Protection Agency (OEPA) disapproved the original closure plan in February 1989. In June 1990 a treatability study of stabilization options was performed. This closure plan is generated as a result of numerous discussions with and comments received from OEPA.

1.2.1 Scope

This RCRA Closure Plan presents a closure method based on an evaluation of pertinent site information obtained during the lagoon investigation and the RCRA Corrective Action investigation at the site during the past 2 years. A summary of financial assurance mechanisms that may be required will be forwarded separately by AHPC as an addendum to this submittal.

1.2.2 Applicable Regulations

This RCRA Closure Plan is written to fulfill the requirements of Ohio Hazardous Waste Management Regulations, Ohio Administrative Code (OAC) 3745-67-28. The plan, in accordance with the standards and requirements of these sections, contains information for interim status facilities have received a RCRA-defined hazardous waste, and have met the definition for surface impoundment.

Ohio Hazardous Waste Management Regulations, OAC contains the general closure requirements for all hazardous waste management facilities (OAC 3745-66-10 through 3745-66-15). The major provisions of closure and post-closure specify the following:

- Closure performance standard.
- Closure Plan.
- Time allowed for closure.
- Certification of closure.

Section OAC 3745-67-28 contains regulations specific to surface impoundments and addresses the applicable closure requirements.

1.3 GOALS

1.3.1 Regulatory Compliance

In accordance with OAC 3745-66-11, the methodology in this RCRA Closure Plan provides for closure of the lagoon/surface impoundment in a manner that minimizes the need for further maintenance, while controlling, minimizing, or eliminating, to the extent necessary to protect human health and the environment, the post-closure migration of hazardous waste, hazardous waste constituents, leachate, contaminated rainfall, or waste to the groundwater, surface waters, or atmosphere.

1.3.2 Applicable Standards

The applicable closure standards for the closure of this surface impoundment are defined in OAC 3745-56-28. This section of the regulation basically allows for two general standards of closure:

- "Clean Closure," as defined by OAC 3745-56-11 and 3745-66-11, is the removal or decontamination of all waste residues, contaminated containment system components (i.e., liners), contaminated subsoils, and structures contaminated with waste and leachate.
- "Landfill Closure," as defined by OAC 3745-67-28, requires the surface impoundment to be closed in accordance with the landfill closure and post-closure requirements (OAC 3745-68-10).

The "clean closure" of a surface impoundment is based on removal of the hazardous waste and contaminated liners, soil, appurtenances, and groundwater once contained in the facility. Therefore, it is very important to determine the constituents of concern and the spatial distribution of these constituents when deciding on the appropriate closure method.

In May 1991, OEPA developed a guidance document entitled *Closure Plan Review Guidance*, which defines a "clean closure" and addresses organic and inorganic constituents separately. For the organics (or those constituents that do not occur naturally), the level for "clean closure" is the analytical detection limit. The detection limit may be higher than stated in Appendix A. Also, the inorganic constituents (i.e., naturally occurring) of the hazardous waste must be reduced to a statistically calculated background concentration, as determined by several methods, or to the upper limit of the Rural Ohio Farm Soils (ROFS) concentrations.

1.4 APPROACH

The approach developed for the closure of the lagoon/surface impoundment at EKCO is as follows:

- Evaluate the information on the plant and lagoon operations.
- Evaluate the information available in previous investigations/studies and identify additional data requirements.
- Select an appropriate closure method based on available information.
- Prepare and submit for OEPA approval a new Closure Plan delineating the proposed closure method.

The background information of the plant and lagoon operations is summarized in Section 2 of this document. The assessment of available information, a summary of the WESTON investigation, and an assessment of the distribution of contaminants in the lagoon are contained in Section 3 of this document. A groundwater assessment under RCRA Corrective Action is being performed separately from the lagoon assessment.

Section 4 presents the proposed closure method based on available information and recent discussions with OEPA. Section 4 also includes the other appropriate parts of a closure plan, including a discussion of schedule, closure period, and cost estimates.

SECTION 2
BACKGROUND

2.1 SITE DESCRIPTION

2.1.1 Plant Description and History

The EKCO Housewares Inc. (EKCO) facility is located at 359 State Avenue Extension N.W., Massillon, Ohio. This facility is located on approximately 13 acres, 500 ft north of State Avenue Extension and 1,500 ft west of the Tuscarawas River in the northwestern portion of Massillon, Stark County, Ohio. Figure 2-1 shows the location of the facility on a 7.5-minute USGS Massillon quadrangle map of Stark County. The area surrounding the site is largely urban and industrial. Newman Creek, which flows eastward into the Tuscarawas River, borders the northern and northwestern boundaries of the facility. The Penn Central and Baltimore and Ohio Railroads border the facility to the east and west, respectively. Figure 2-2 shows the layout of the EKCO facility. The plant consists of several buildings comprising a total area of approximately 240,000 ft^2. The buildings are subdivided into office space, warehouses, machine shops, coating process lines, and packaging and shipping areas.

The plant was built circa 1900 and in 1945 began producing aluminum cookware. In 1946 the plant started manufacturing pressure cookers and stainless steel cookware. In 1951, during the Korean conflict, the plant produced 90-mm and 105-mm cartridge cases for the U.S. Government. AHPC acquired EKCO Housewares in 1965 and sold the division and the facility to the EKCO Group in 1984. At present, the plant is engaged in the manufacture of cooking utensils from metal pressing and coating operations, producing nearly 26 million pans per year and employing about 350 people in a 24-hours-per-day, 5-days-per-week operation. Further information can be found in the Groundwater Assessment Report (WESTON, 1989).

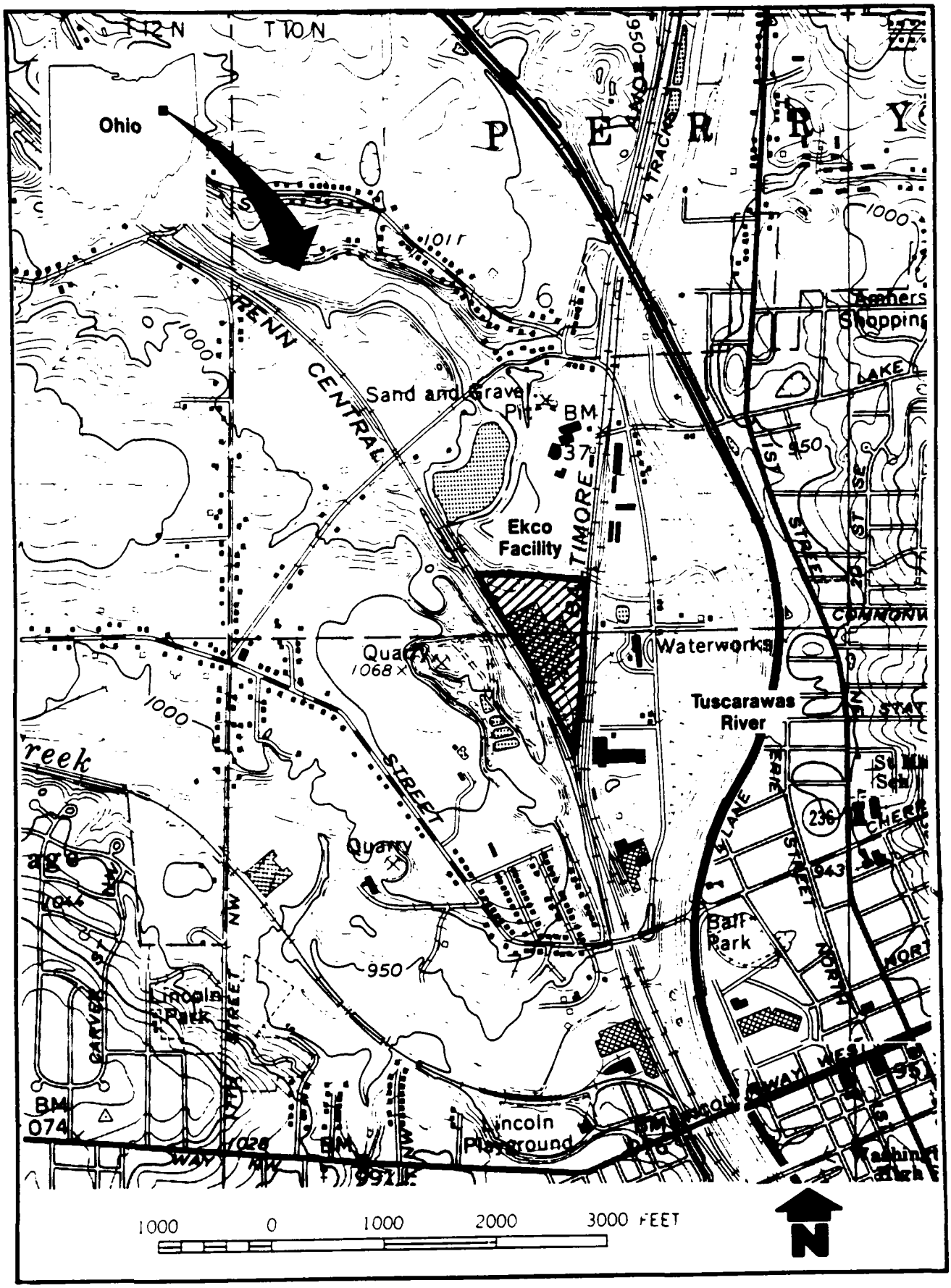


FIGURE 2-1 SITE LOCATION MAP
EKCO HOUSEWARES, INC., MASSILLON, OHIO
(Ref. 7.5 Minute Massillon Quad, Ohio, 1978)

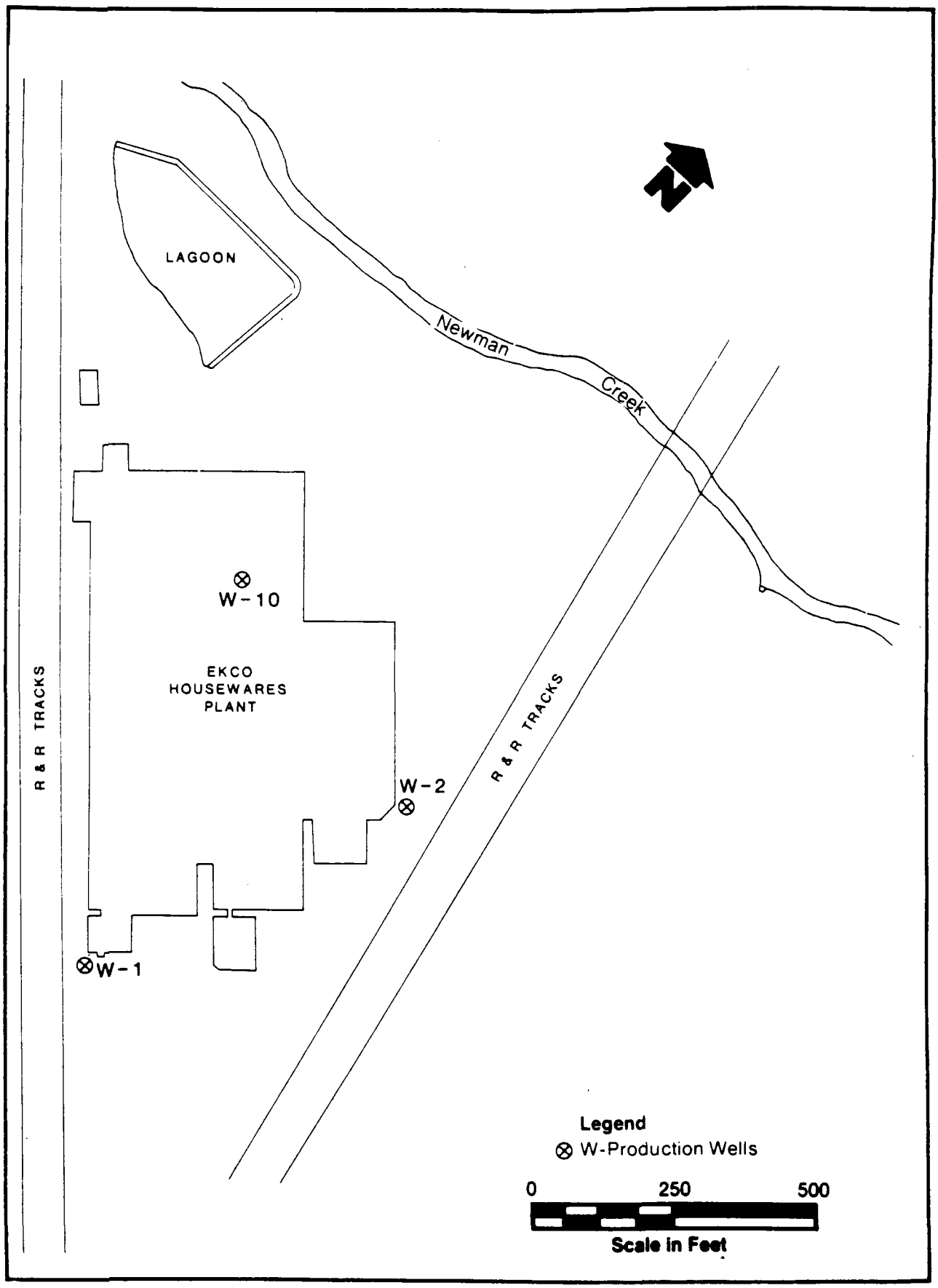


FIGURE 2-2 SITE DIAGRAM OF EKCO HOUSEWARES, INC., MASSILLON, OHIO

2.1.2 Waste Management Description and History

There is no effluent wastewater treatment handling at this facility. Only noncontact process cooling water is currently discharged to an NPDES permitted outfall (001) at Newman Creek. Figure 2-3 details the effluent flow from the plant through the storm sewers to the sanitary sewer system and to the Newman Creek outfall. This discharge is sampled and analyzed every month, and results of the analysis are furnished to the EPA and to the OEPA under the NPDES Permit requirements. Currently, all hazardous wastes, such as spent trichloroethylene (TCE), silicone wastes, and used oil wastes, are accumulated in labeled 55-gallon drums on a concrete apron along the property fence at the northwestern end of the plant (see Figure 2-3). The plant processes include several large commercial-type spray degreasers that generate a substantial amount of spent trichloroethylene and concentrated trichloroethylene stillbottoms. A total of 15,730 gallons (191,174 pounds) of waste materials was generated in 1985. Prior to 1985, this waste material was sent to an authorized facility for incineration every 2 months (EPA I.D. Number OHDO 48415665). Starting in 1985, the spent concentrated degreaser stillbottoms were sent to a reclamation service (EPA I.D. Number OHD 980587364) for reconstitution and reuse.

When copper coating and printing operations were in use after 1954, all process water, including alkaline cleaning rinse waters, boiler blowdown, and deionizer water (hydrochloric acid and sodium hydroxide), was piped to the lagoon. Approximately 0.2 mgd of wastewater, potentially containing heavy metals, solids, and alkalines, was discharged to the lagoon when the coating line was in operation until November 1978. In 1971 an application was presented to the Ohio Water Pollution Control Board for a wastewater discharge permit. Production procedures and waste abatement practices were outlined in the application. The application stated that waste abatement was practiced in the plant by segregating specific wastes and directing those wastestreams to a nonoverflowing evaporation lagoon. The lagoon also received cooling water and stormwater, which were eventually discharged into Newman Creek. Plant discharge reports from February 1972 to November 1978 indicate that the pH of the discharge to the lagoon was in the range of 6.0 to 9.5.

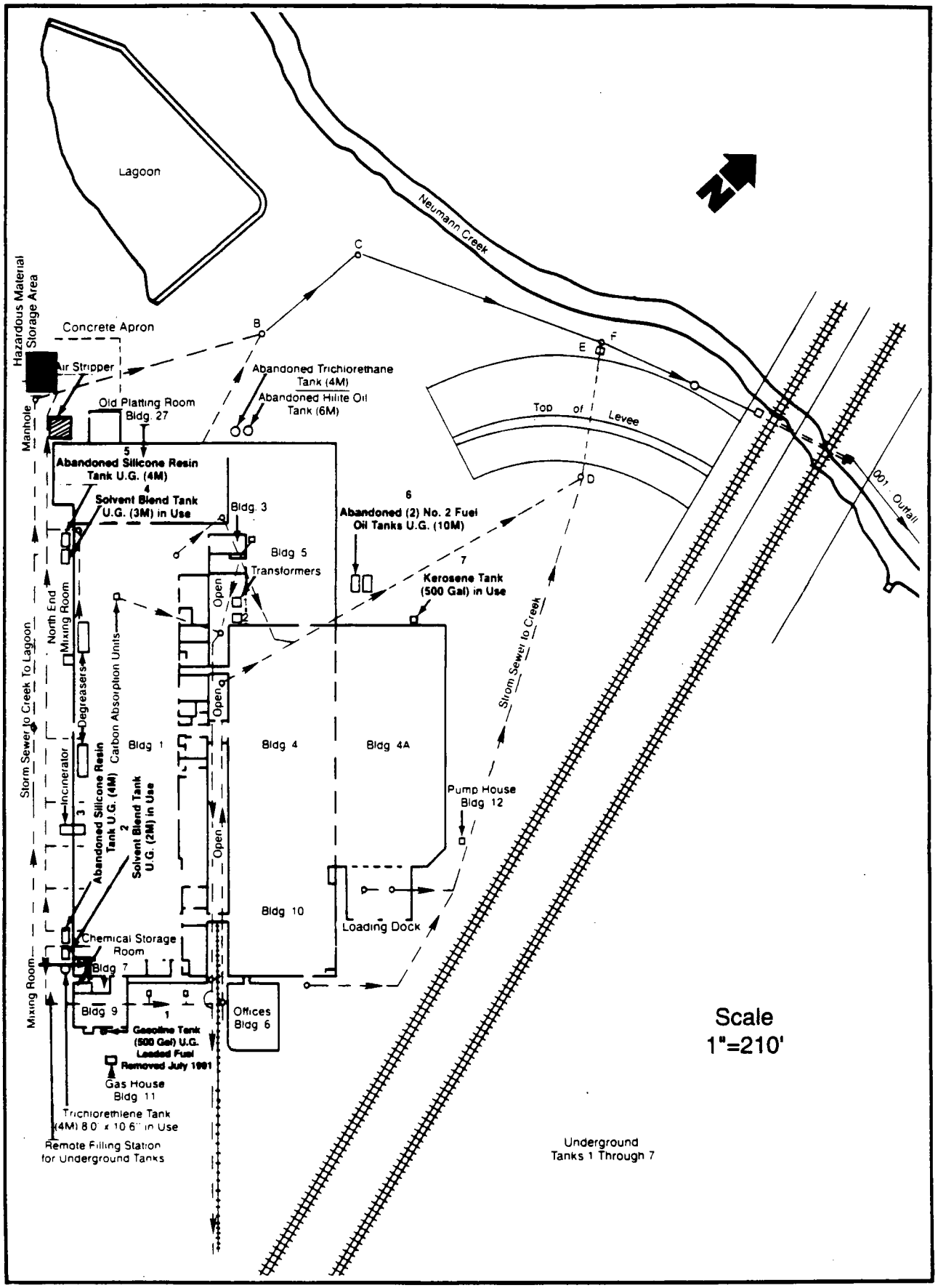


FIGURE 2-3 FACILITY DESCRIPTION AND LOCATION EKCO HOUSEWARES, INC., MASSILLON, OHIO

A spill of trichloroethylene occurred in the late 1970s near well W-10.

2.1.3 Lagoon Surface Impoundment

2.1.3.1 History

This subsection describes the use of the lagoon/surface impoundment. A chronology of the lagoon is presented in Table 2-1. In the 1950s EKCO constructed a lagoon to receive wastewater from processes at the plant. It was constructed to be an evaporation lagoon without discharge to surface waters. In 1969, with the development of new regulations and permit requirements by the State of Ohio, the lagoon was approved and permitted to receive discharge of regenerated deionizer from coating operations that contained copper, hydrochloric acid, and sodium hydroxide. In 1971 and 1972 manufacturing process waters, waste rinsate, and residues from chemical oxides in multicolored aluminum porcelain cookware cleaning were discharged to the lagoon. The discharge may have contained cadmium, cobalt, lead, and selenium. This discharge was permitted by the State of Ohio. Also, in the early 1970s washing and waste materials from a porcelain/teflon coating process consisting of aluminum frit and alkaline washers, which were approved and permitted for discharge by OEPA. Approximately 0.2 mgd of this process wastewater was discharged to the lagoon when the line was in operation.

With the exception of occasional alkaline wash degreaser filter water discharged in 1980 to mid-1984, the lagoon was not used after 1977 due to the discontinued manufacturing of aluminum porcelain cookware. Any waters currently present in the lagoon are the result of rainwater ponding. Because analyses of sludge from the lagoon exhibit hazardous characteristics as defined in 40 CFR 261.24 and discharge to the lagoon continued after the effective date of RCRA, the lagoon has been classified as a hazardous waste surface impoundment by OEPA, based on the presence of characteristic hazardous waste (cadmium-D006).

Table 2-1

Chronology of Lagoon
EKCO Housewares, Inc.
Massillon, Ohio

1950s	Lagoon constructed.
1965	AHPC acquired EKCO Housewares.
1969	Lagoon permitted to receive regenerated deionizer discharge containing copper, hydrochloric acid, and sodium hydroxide from coating operations.
Early 1970s	Lagoon received discharges of oxides used in cookware cleaning. Discharge also contained cadmium, cobalt, lead, and selenium. Lagoon also received washing from porcelain/teflon coating process under permit. Discharge contained aluminum frit and alkaline washer fluids.
1977 to 1978	Lagoon taken out of service due to discontinuing of aluminum porcelain cookware manufacturing and ceasing of all copper plating.
1980 to mid 1984	Lagoon reinstated and received occasional alkaline degreaser filter water discharges.
June 1984	All discharges to lagoon ceased.
1984	AHPC sold EKCO Housewares to the EKCO Group.
December 1985	Lagoon decommissioned.

2.1.3.2 Construction

The lagoon is approximately 250 ft north of the plant in a fenced-in area. The lagoon is roughly triangular in plan view, with a maximum northeast-southwest dimension measuring 95 ft and a maximum northwest-southeast dimension measuring approximately 260 ft. The total surface area of the lagoon bottom is approximately 20,150 ft^2. The lagoon is surrounded on the north and east by a berm, which is approximately 8 to 11 ft high. A 10-ft embankment forms the southwestern boundary. Figure 2-4 is an illustration of the layout for the lagoon.

2.1.3.3 Lagoon Stratigraphy Indicated by Previous Investigations

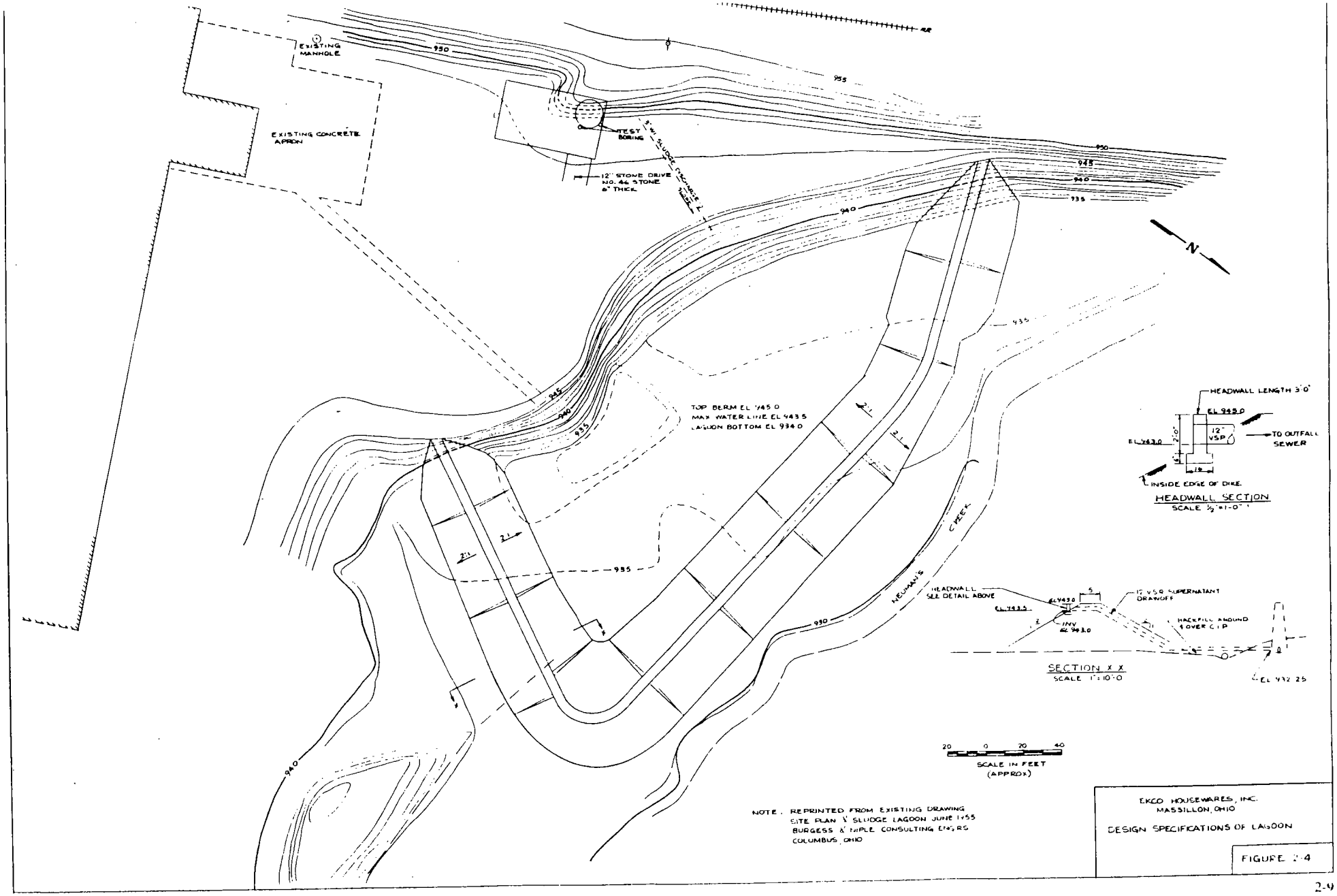
From previous site work performed by Floyd Brown Associates (FBA) in 1986 and 1987, material within the lagoon was described as green to gray sludge varying in thickness from 0.5 ft to 6 ft, with an average thickness of approximately 1 ft. A pictorial representation of this information is illustrated in Figures 2-5 and 2-6. Cross sections A-A′, B-B′, and C-C′ (lines shown in Figure 2-5) are illustrated in Figure 2-6. The sludge is underlain by fill consisting of brown to black cinders, ash, and gravel. The fill averages 1.5 ft in thickness, with a range of 1 to 3 ft thick. A clay layer varying in composition from clay to sandy gravely clay overlies permeable sand and gravels. This clay layer varies in thickness from 1 to 7 ft. WESTON's pictorial representation of the lagoon stratigraphy, based on additional information, is presented in Section 3.

The area of the lagoon bottom is 20,150 ft^2. Based on the average sludge thickness of 1 ft, the volume of sludge in the lagoon is estimated to be 20,150 ft^3.

2.2 PLANT PROCESSES

2.2.1 Manufacturing Processes

Since 1945 the EKCO Massillon plant has manufactured cookware. As summarized in Table 2-2, the products have been fabricated from metal coil or metal sheet stock, cleaned,


EXISTING MANHOLE
EXISTING CONCRETE APRON
TEST BORING
12" STONE DRIVE NO. 44 STONE 8" THICK
3" W. SLUDGE PROPOSED PIPELINE
950
945
940
935
930
TOP BERM EL 945.0
MAX WATER LINE EL 943.5
LAGOON BOTTOM EL 934.0
N
HEADWALL LENGTH 3'-0"
EL 945.0
12" VSP
TO OUTFALL SEWER
EL 943.0
INSIDE EDGE OF DIKE
HEADWALL SECTION
SCALE 1/2"=1'-0"
HEADWALL SEE DETAIL ABOVE
12" VSP SUPERNATANT DRAINOFF
BACKFILL AROUND & OVER C.I.P.
INV EL 943.0
SECTION X X
SCALE 1"=10'-0"
EL 932.25
NEUMAN'S CREEK
SCALE IN FEET (APPROX)
NOTE. REPRINTED FROM EXISTING DRAWING SITE PLAN & SLUDGE LAGOON JUNE 1955 BURGESS & NIPLE CONSULTING ENGRS COLUMBUS, OHIO
EKCO HOUSEWARES, INC. MASSILLON, OHIO
DESIGN SPECIFICATIONS OF LAGOON
FIGURE 2-4

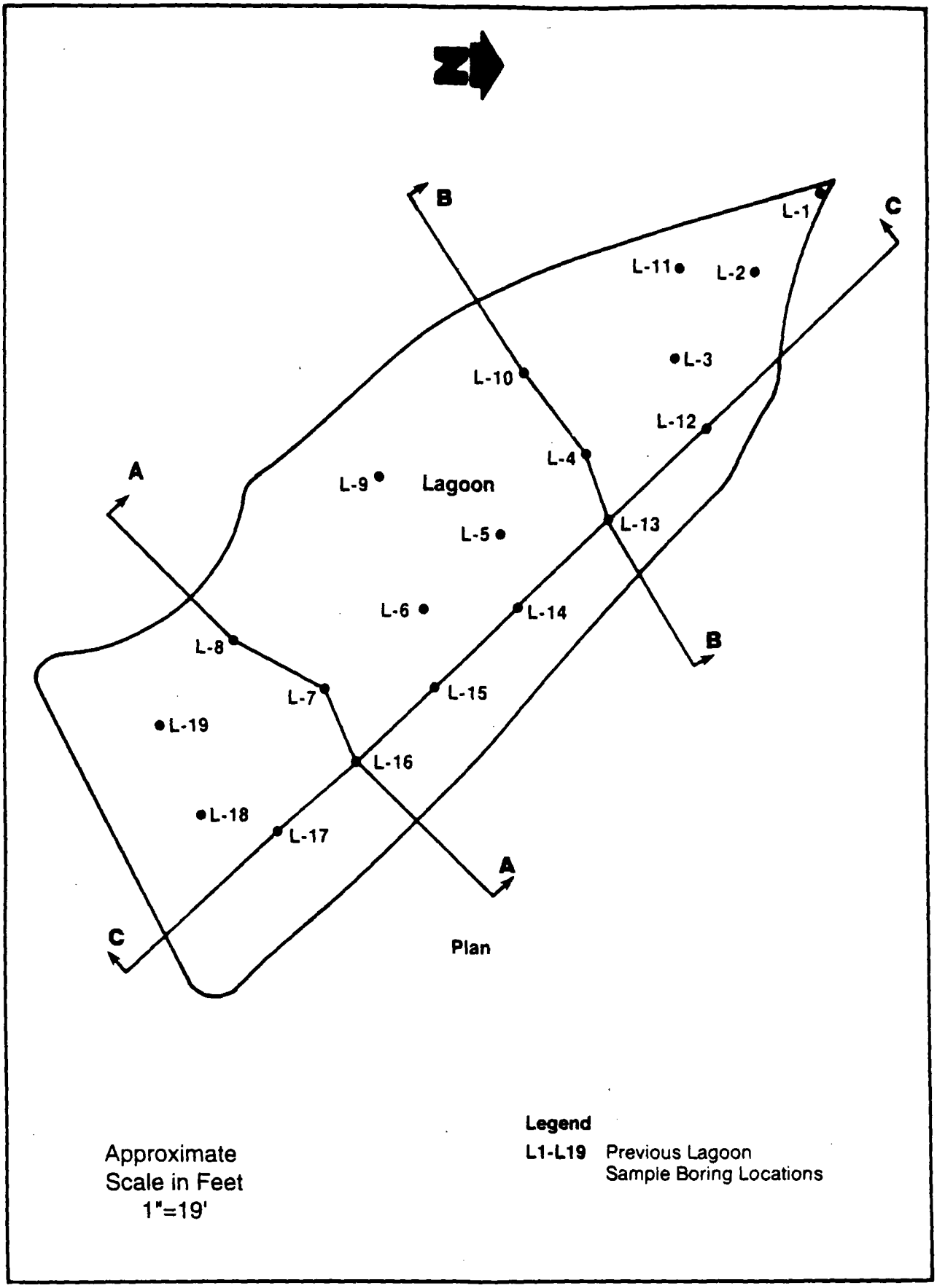


FIGURE 2-5 PREVIOUS LAGOON SUBSURFACE CHARACTERIZATION EKCO HOUSEWARES, INC., MASSILLON, OHIO

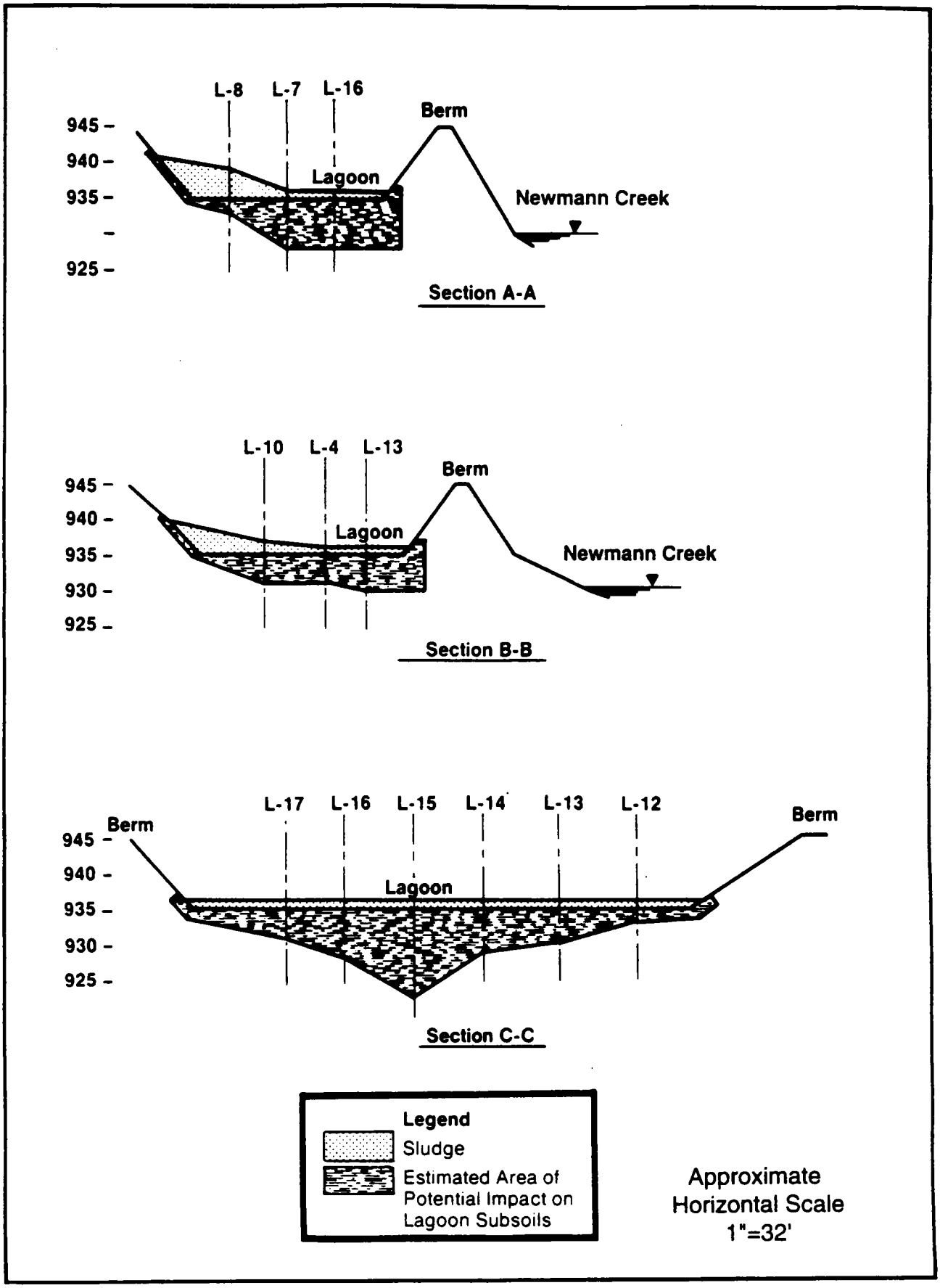


FIGURE 2-6 PREVIOUS LAGOON SUBSURFACE CHARACTERIZATION EKCO HOUSEWARES, INC., MASSILLON, OHIO

Table 2-2

Chronology of Manufacturing Processes at EKCO Housewares, Inc., Massillon, Ohio

1945	Aluminum cookware manufacturing in line operation.
1946	Pressure cooker manufacturing and stainless steel cookware lines added.
1951	Military production line installed to manufacture 90-mm and 105-mm cartridge cases.
1954	Coating line installed.
1967	Porcelain/teflon coating line installed.
1971	Production lines operational consisting of stamping and drawing stainless steel and tinplated iron material lines; stamping, drawing, and aluminum porcelain enameling line; stamping, drawing, and copper coating stainless steel line.
1978	All coating operations ceased and aluminum porcelain enameling line was discontinued.
1987	Tin-plated iron material stamping, drawing, and coating with silicone resin line in operation.

stamped, drawn and frequently coated or enameled, then labeled and packaged for retail distribution.

Operations producing aluminum cookware began in 1945, and in 1946 pressure cookers and stainless steel cookware were added. In 1951, during the Korean conflict, 90-mm and 105-mm cartridge cases were produced for the U.S. Government. This military manufacturing line consisted of acid pickling operations, washing with soap solutions and with chromic and phosphoric acid baths, and painting. In 1954 the civilian manufacturing line consisted of sulfuric acid pickling operations and nickel and copper coating.

In late 1967 a porcelain coating line and a teflon coating line were installed, and in the early 1970s metal oxides were ground and sprayed onto cookware. During this period production of copper bottom pans was approximately 3% of total production. By 1971 the plant was primarily engaged in the manufacture of cookware by the use of tools, jigs, and fixtures to punch, draw, form, or modify material under pressure. The following processes and materials were used:

- Fabrication and finishing of stainless steel cookware - stamped and drawn.
- Fabrication of aluminum cookware - stamped, drawn, porcelain enameled.
- Fabrication of purchased tin-plated iron material (tinware as pre-electroplated material) - stamped and drawn.
- Fabrication and coating of stainless steel cookware - stamped, drawn, and copper coated.

Up until the mid-1970s, the plant manufacturing processes included semiautomatic copper coating and printing. As of November 1978, this facility ceased all copper coating. The current process involves an electrostatic spray application of silicone with a solvent blend mixture using water wash spray booths to capture the overspray. Vapor degreasers using trichloroethylene (TCE) are used to clean the product prior to coating. Vapors are captured in a carbon absorption system. The carbon is subsequently steam stripped to remove the TCE. The only wastewater effluent discharged is noncontact cooling water.

2.2.2 Waste Treatment

2.2.2.1 Waste Recovery

The plant distills the solvents to keep oil out of the degreaser units. Still bottoms are reclaimed and final spent solvents consisting of a paraffin/oil mixture and trichloroethylene are accumulated in drums and transported to an authorized disposal facility on a bimonthly basis.

2.2.2.2 Wastewater Treatment

Information obtained from permit applications for plant wastewater discharge states that effluent discharge began in January 1946. Permit No. 815.20 was issued in May 1952 to discharge industrial wastes into the waters of Newman Creek by the Water Pollution Control Board of the Ohio Department of Health. In the early 1950s a sewer and inverted siphon structure was constructed to carry the effluent from the plant to a point below that of the Ohio Water Company's intake on Newman Creek. The Ohio Water Company intake was abandoned and dismantled in 1983.

Rinse waters from various plant operations were combined with approximately 800,000 gallons per day of noncontact cooling water flow and discharged to Newman Creek. In July 1974 NPDES Permit No. C-3094BD was issued to the EKCO Housewares facility. Table 2-3 (a and b) summarizes effluent quality reports submitted to the OEPA and EPA and formerly to the Ohio Department of Health. This table contains the range for each parameter tested.

The effluent discharged is primarily noncontact cooling water. However, a packed column air stripper was put into full operation in early March 1986 to remove the contaminants in the groundwater prior to use in the facility. This groundwater reclamation project requires VOC analysis to be performed monthly on the outfall. The analyses from March 1986 to September 1991 have shown concentrations ranging from 0.02 ppm to 0.86 ppm total VOCs. In mid 1987 the wastewater discharge to the Newman Creek outfall was 380 gallons per

Table 2-3a

Plant Effluent Quality Ranges
EKCO Housewares, Inc., Massillon, Ohio
February 1972 - July 1975

Period	pH (S.U.)	Conduit Flow (MGD)	Copper (mg/L)	Nickel (mg/L)	Total Iron (mg/L)	Suspended Solids (mg/L)	Total Phosphate[a] (mg/L)	COD[a] (mg/L)	Total Solids[a] (mg/L)	Oil and Grease[b] (mg/L)
Prior to 1973	7.0-7.5	0.16-0.22	100-1,500	25-900	10-600	1-65	0.013-5.02	28-33	395-527	—
1973 to July 1975	7-8	0.14-0.18	0-800	0-450	25-200	1-20	0.001-0.017	26-67	505-717	2.5-10.0

[a]Analysis required once every 6 months.
[b]Started July 1974.

Table 2-3b

Plant Effluent Quality Ranges
EKCO Housewares, Inc., Massillon, Ohio
August 1975 - January 1987

Period	pH (S.U.)	Conduit Flow (MGD)	Copper (ug/L)	Nickel (ug/L)	Iron Fe, Dis (ug/L)	Residue T. NFLT (mg/L)	Oil and Grease (mg/L)
August 1975 to January 1987	5.9-10.0	0.14-0.55	0-550	0-250	50-520	0-20	0-20

minute including groundwater after the stripping of VOCs. Currently, only a TCE/water waste stream from the degreaser units is collected and sent through the packed column air stripper which discharges through NPDES outfall 001.

2.3 WASTE CHARACTERIZATION

2.3.1 General

In March 1984, as part of the standard procedure for reapplying for a NPDES permit, water sampling and analysis were performed. The results revealed total VOC concentrations as high as 29 ppm in the lagoon water and 4.5 ppm in the incoming well water. Major contaminants were 1,1,1-trichloroethane and trichloroethylene, and to a lesser extent, 1,1-dichloroethane and 1,1-dichloroethene. When the lagoon water level was sampled in May 1984, it was estimated to be 4 ft to 6 ft deep with approximately 1 ft of sludge/sediment at the bottom. Water samples taken from the bottom of the lagoon at this time showed VOC concentrations up to 4.3 ppm. In July 1985 soil borings were installed in the lagoon and analytical results indicated the presence of VOCs ranging from 14 ppm to 71 ppm. Dichlorobenzene appeared to be the dominant volatile compound detected, ranging in concentration from nondetectable to 50 ppm. Two of five samples analyzed using EP toxicity procedures exceeded the maximum concentration levels for cadmium of 1 ppm with concentrations of 1.8 ppm and 2.0 ppm. These results indicated that the lagoon contains sludges that exhibit the characteristics of hazardous waste based on cadmium as defined in OAC 3745-51-24.

2.4 GEOLOGY

2.4.1 Regional Geology

Most of Stark County, Ohio, has been covered by at least two continental ice sheets, resulting in variable surficial geologic conditions. The glaciers covered the land surface with a veneer of glacial drift deposits, which range from fine clay particles to huge boulders. The glacial drift thickness ranges from less than 25 ft to about 100 ft. In the areas of buried

valleys, however, this unconsolidated material can exceed 500 ft in thickness (Ohio Department of Natural Resources, 1972).

Melting ice from the receding glaciers produced large quantities of water carrying outwash material. This outwash material, deposited in broadly spread outwash plains and in restricted valleys in the form of kames, eskers, and valley fill, is generally composed of well sorted, cross-bedded, and horizontally layered sands and gravels.

Underlying these glacial drift and outwash deposits are sedimentary rocks of the Pennsylvanian, Mississippian, and Devonian geologic systems. These bedrock formations dip generally to the southeast at about 20 to 40 ft per mile and consist of sandstone and shale with some interbedded coal and occasional thin limestone units (Cross, 1959).

2.4.2 Local Geology

The site directly overlies glacial outwash deposits of interbedded and interlensing clay, sand, and gravel. These unconsolidated materials appear to thicken to the northeast with thicknesses ranging from 24 ft near the southwestern corner of the plant to 92 ft at the northeastern corner. Thick (greater than 250 ft) sand and gravel outwash deposits, comprising a deep buried valley, are present immediately east of the site.

The bedrock beneath the site consists of interbedded sandstone and shale belonging to the Pottsville group of Pennsylvanian age. The thickness of this formation is reported to be approximately 255 ft (Morningstar, 1922).

Two cross sections were generated using the driller's stratigraphic logs for the site wells installed during previous site work. Sections A-A′ and B-B′ (lines shown in Figure 2-7) are illustrated in Figures 2-8 and 2-9, respectively. Both sections show that the outwash sediments thicken to the north and east.

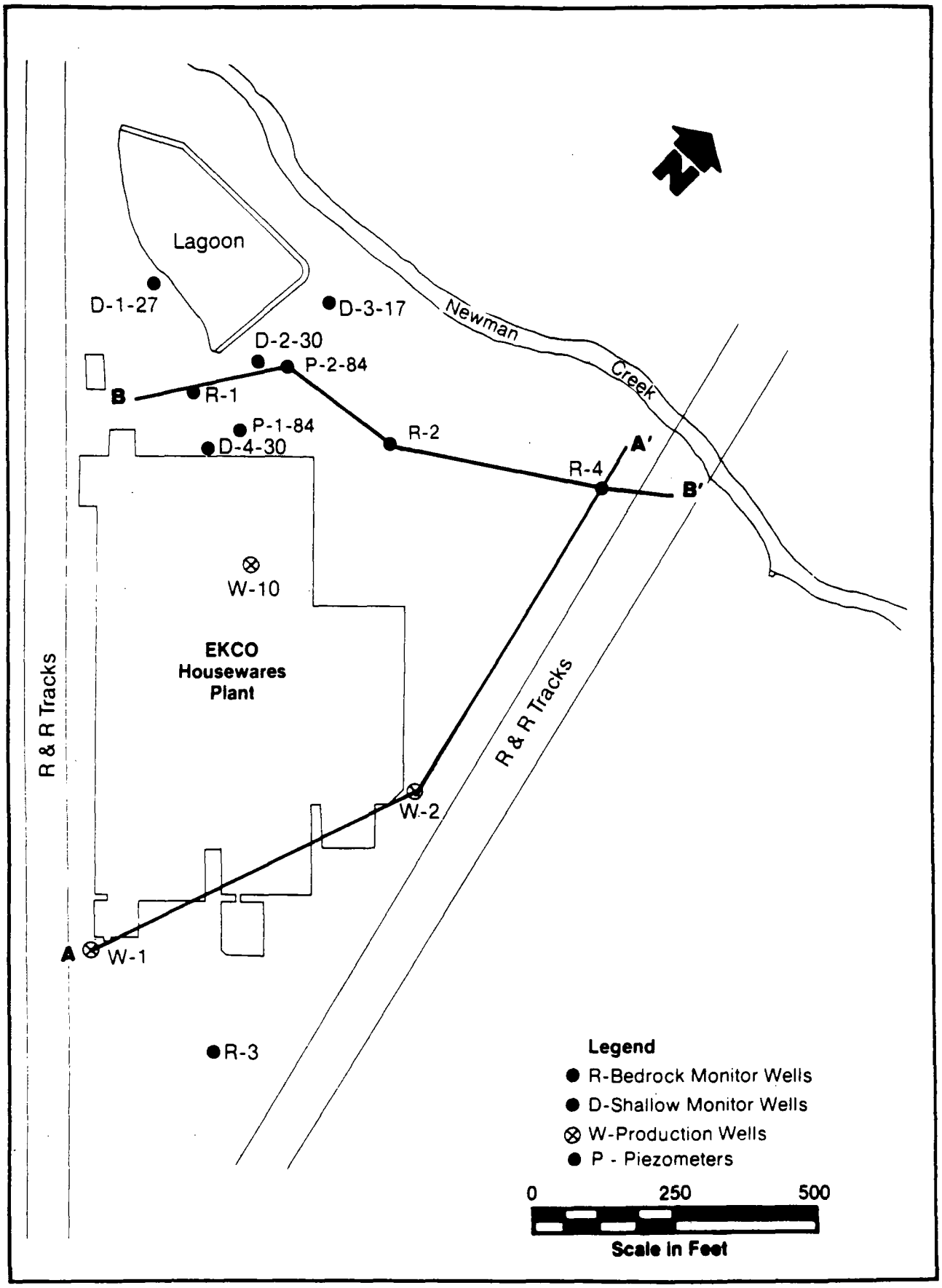


FIGURE 2-7 LOCATIONS OF CROSS SECTIONS A-A' AND B-B' EKCO HOUSEWARES, INC., MASSILLON, OHIO

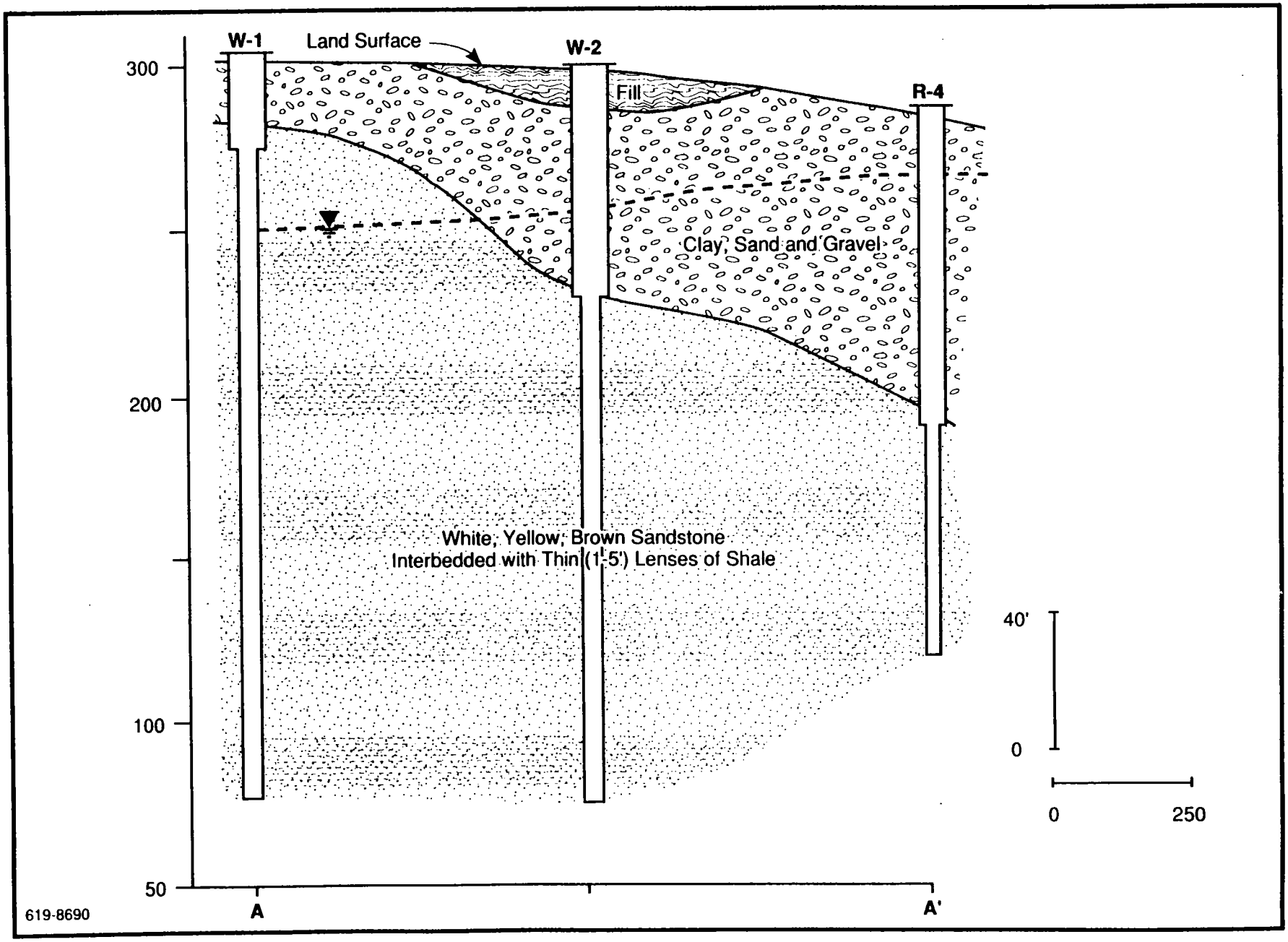


FIGURE 2-8 GEOLOGIC CROSS SECTION A-A'
EKCO HOUSEWARES, INC., MASSILLON, OHIO

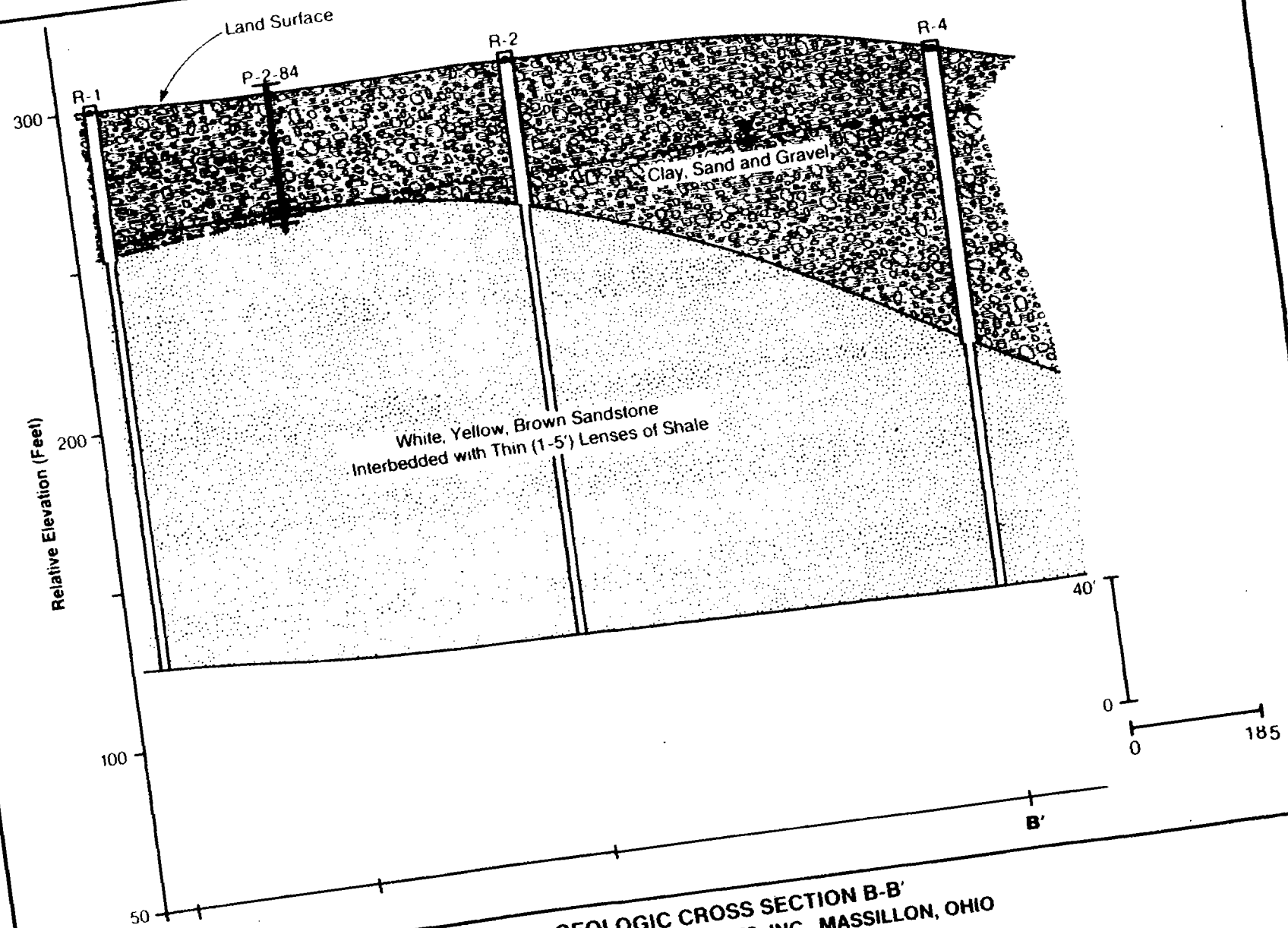


FIGURE 2-9 GEOLOGIC CROSS SECTION B-B'
EKCO HOUSEWARES, INC., MASSILLON, OHIO

WESTON

2.5 HYDROGEOLOGY AND GROUNDWATER USE

As seen in Figure 2-10, the deep buried valley deposits just east of the site and the Pottsville sandstone are the principal aquifers utilized in the Massillon area. Because of the predominance of clay in the glacial outwash deposits that directly underlie and surround the EKCO facility, water wells are often drilled through these deposits to the underlying rock. Within a 1-mile radius of the site, approximately 50 domestic and five commercial or industrial wells (including site production wells W-1, W-2, and W-10) are completed in the Pottsville sandstone and six municipal wells (Ohio Water Service wells 1, 2, 3, 5, 7, and 8) tap the highly permeable sand and gravel deep buried valley deposits. No information is available on the average depth of the domestic wells, but depths of the commercial and municipal wells average approximately 225 and 150 ft, respectively.

Although the literature has reported groundwater yields from individual wells installed in the Pottsville sandstone of only 25 to 100 gallons per minute, the two on-site production wells collectively withdraw over 400 gallons per minute. Yields of over 2,000 gallons per minute have been obtained from the Ohio Water Service municipal wells completed in the deep buried valley deposits located just 2,500 ft east and northeast of the site.

The depth to groundwater in September 1991 ranged from 9 to 33 ft below ground surface for the on-site wells installed in the glacial outwash deposits. The groundwater level in the on-site wells installed in the Pottsville sandstone ranged from 21 to 49 ft below ground surface. Adjusting for elevation, this represents a vertical head difference of 16 to 17 ft between the overburden and bedrock. The groundwater flow direction in the shallower water table zone appears to be to the southeast, as seen in Figure 2-11. The regional gradient in the bedrock aquifer is obscured due to the groundwater withdrawal from on-site production wells W-1 and W-10, thus causing a cone of depression at the property center, as seen in Figure 2-12.

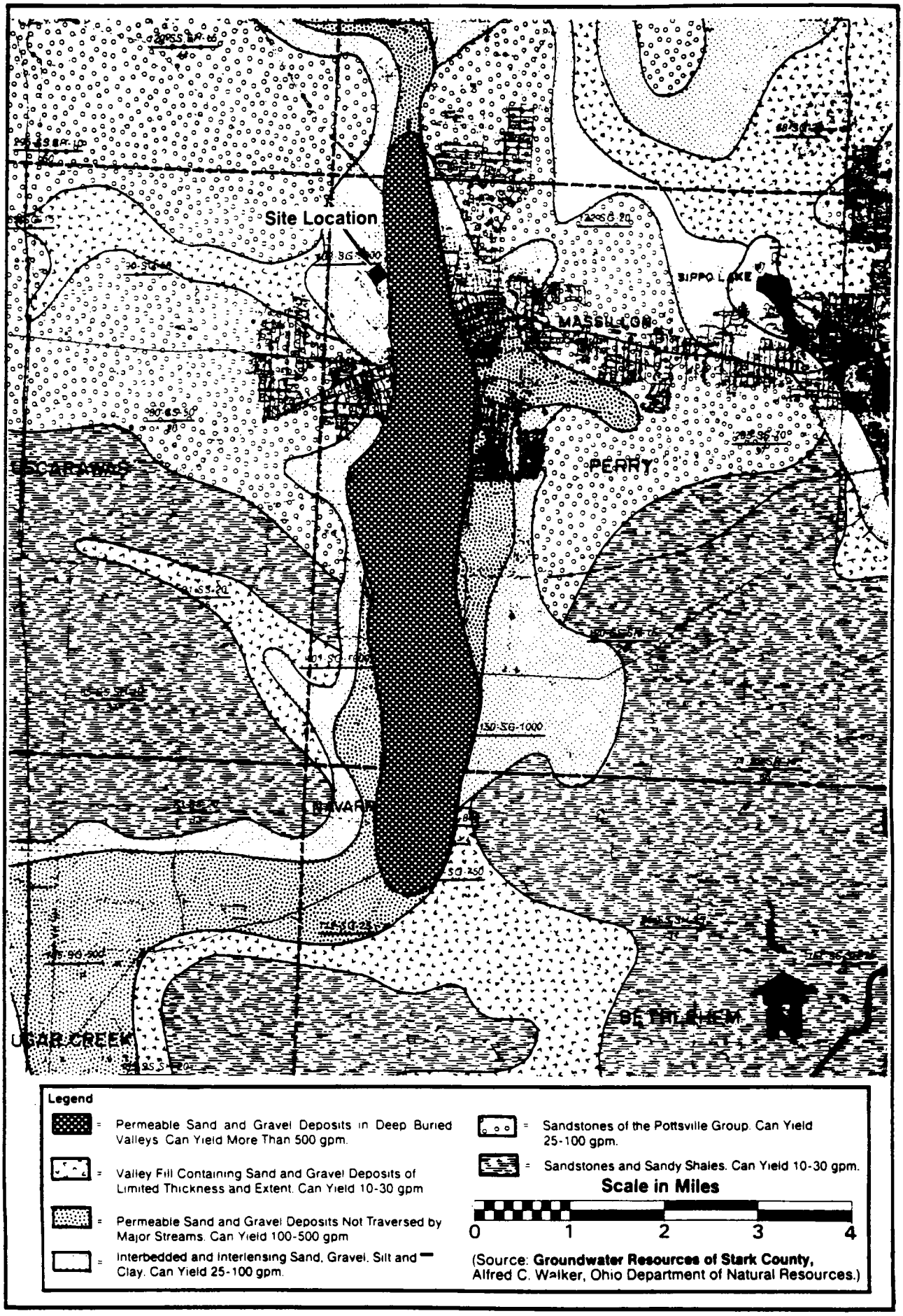


FIGURE 2-10 GROUNDWATER RESOURCES OF MASSILLON, OHIO

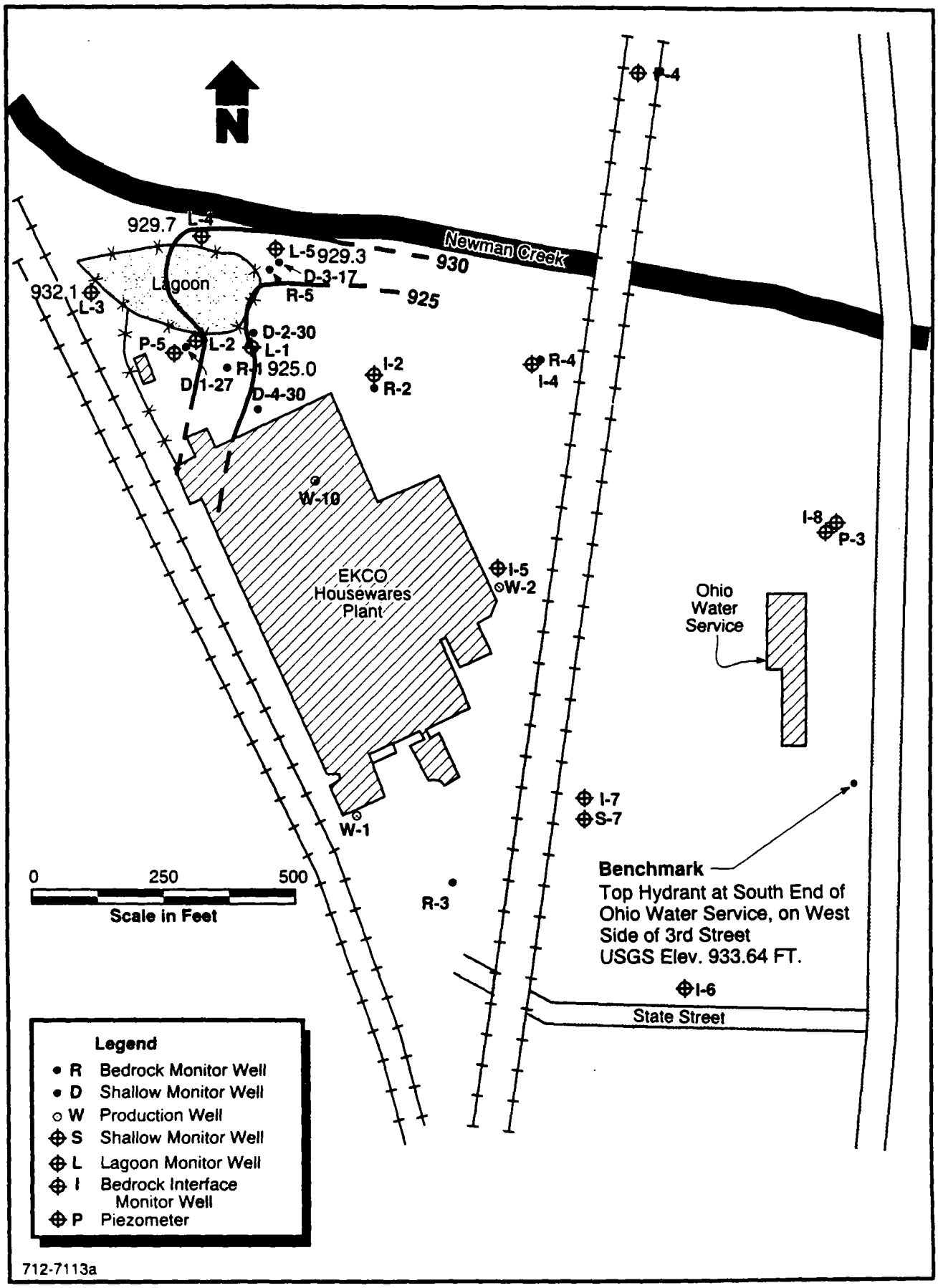


FIGURE 2-11 L-WELL GROUND WATER MAP
WATER LEVELS MEASURED 11/9/90

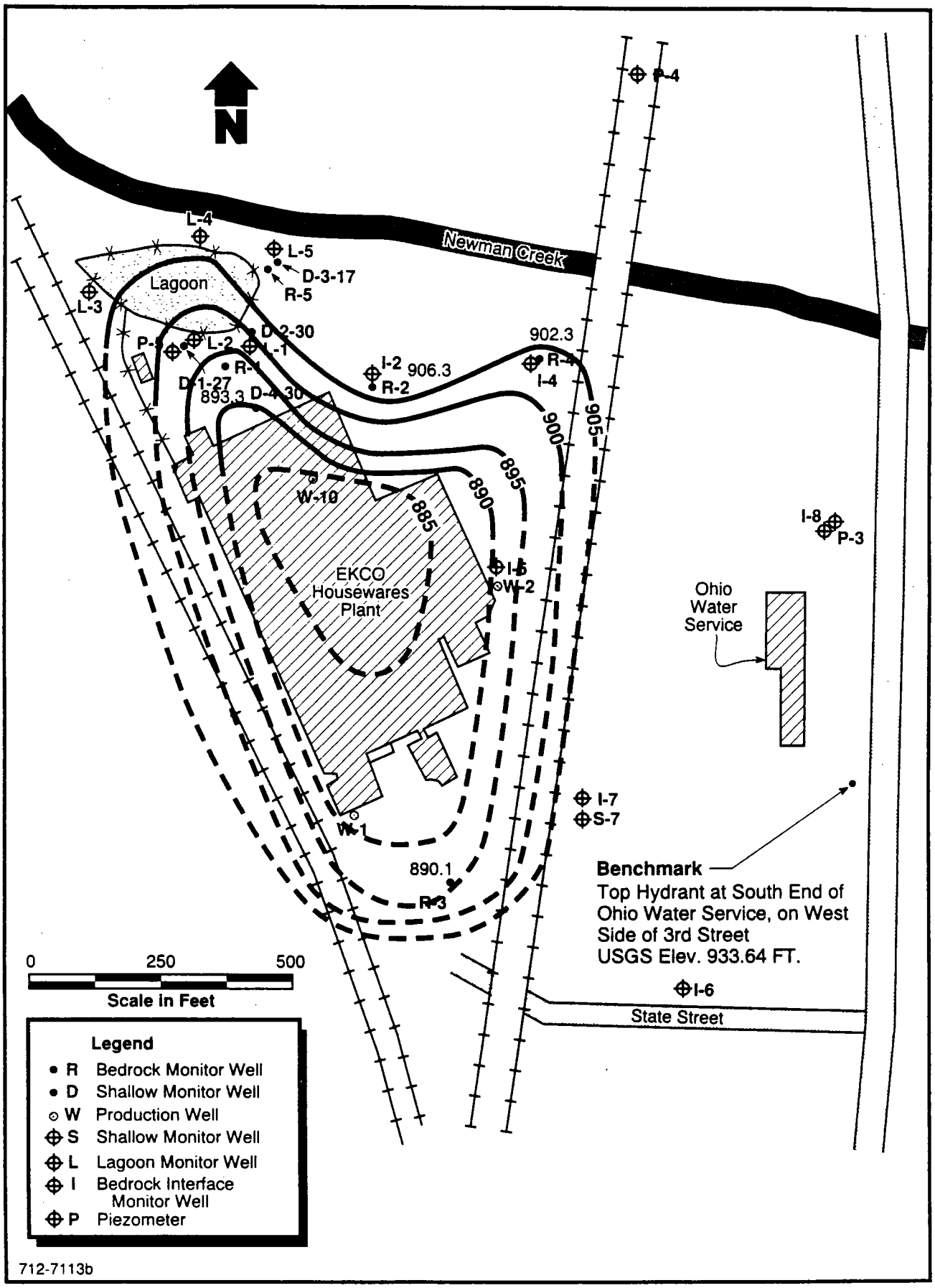


FIGURE 2-12 R-WELL GROUND WATER MAP WATER LEVELS MEASURED 12/90

2.6 CLIMATOLOGY

Information obtained from the Akron/Canton Weather Service Office reveals a precipitation rate of 35.90 inches per year based on records for a 30-year period, 1951 to 1980 inclusive. The mean annual Class A pan evaporation interpreted from a map in the Weather Bureau Technical Paper No. 37 is approximately 40 inches per year. Information regarding the pH of the precipitation in Stark County is not available. In addition, a major rainfall event, i.e., a 25-year/24-hour rainfall, is listed in Weather Bureau Technical Paper No. 40 to be approximately 4 inches for Stark County, Ohio.

2.7 ONGOING ACTIVITIES

2.7.1 RCRA Facility Investigation/Corrective Measures Study (RFI/CMS)

An RFI/CMS Work Plan for the facility was developed in May 1990. The objective of RFI/CMS activities is to collect data and complete an evaluation and selection of the appropriate corrective measures necessary to protect human health and the environment in a cost-effective manner. This ongoing program is scheduled to be completed in late 1992. The RFI/CMS will address the contaminants of concern. The primary remedial response objectives of the RFI/CMS are to:

- Identify and investigate contaminant source areas.
- Delineate the extent and magnitude of soil and groundwater contamination.
- Evaluate potential environmental impact from the identified contaminants.
- Develop and adequately evaluate sound corrective measures alternatives that will formulate a comprehensive strategy to mitigate the hazardous constituents and their potential impacts on human health and the environment.

Groundwater corrective measures are being investigated as part of the CMS.

2.7.2 Present Groundwater Recovery and Treatment Systems

2.7.2.1 Recovery System

Two on-site production wells, W-1 and W-10, recover groundwater from the bedrock aquifer. Combined, the two withdraw over 400 gallons per minute (gpm), 24 hours per day. This pumping rate influences the groundwater flow in the bedrock zone by creating a cone of depression that extends beyond the property boundary.

2.7.2.2 Treatment System

The water withdrawn from these two wells is treated by an air stripping column to remove VOCs. The unit is a single-packed column 4 ft in diameter and 30 ft high, designed to treat 600 gpm of groundwater with a total VOC concentration not exceeding 40 ppm. A study of 1986 and 1987 levels indicated that the concentration of VOCs in the recovered groundwater has decreased during this period from 18 ppm to below 8 ppm.

SECTION 3

SITE ASSESSMENT

3.1 PURPOSE

The purpose of this section is to:

- Identify the contaminants of concern and potential pathways of contaminant migration from the lagoon.
- Summarize previous investigations of the lagoon.
- Discuss WESTON's investigation.
- Identify and discuss the nature and extent of contaminants detected during WESTON's investigation.
- Develop clean levels for soil in the area of the lagoon.

3.2 PREVIOUS INVESTIGATIONS

Since 1984 various studies and investigations have been performed at the EKCO facility to assess wastewater streams and groundwater quality beneath the site and the lagoon. A summary of previous investigations at the EKCO facility and results are presented in Appendix B. However, not all of the investigations summarized were performed to assess the lagoon or subsurface conditions beneath the lagoon and therefore will not be discussed in detail in this document. The investigations that are pertinent to the lagoon are presented in Table 3-1. These will be discussed in the following subsections.

3.2.1 EKCO/Wadsworth Sampling

3.2.1.1 NPDES Sampling

Between March and May 1984, in efforts to renew a National Pollution Discharge Elimination System (NPDES) permit for the facility, a series of sampling events was performed.

Table 3-1

Previous Lagoon Investigations at EKCO Facility
Massillon, Ohio

Date(s)	Investigator	Scope of/Reason for Investigation
March - May 1984	EKCO/Wadsworth Lab	Routine Sampling for Renewal of NPDES Permit
July 1985	EKCO/Wadsworth Lab	Soil Borings in the Lagoon/ Waste Characterization
July 1986	Floyd Brown Associates Ltd. (FBA)	Phase I Soil Boring Program/ Lagoon Closure
January 1987	Floyd Brown Associates Ltd. (FBA)	Phase II Soil Boring Program and Monitor Well Installation/ Lagoon Closure

In March 1984 a sampling and analysis for volatile organic compounds (VOCs) revealed up to 22 ppm of 1,1,1-TCA and 1.1 ppm of TCE contamination in the lagoon wastewater, as well as 2.5 ppm of 1,1,1-TCA and 2.0 ppm of TCE in the incoming well water, and 3.0 ppm of 1,1,1-TCA and TCE in plant discharge. Further testing in April showed 3.7 ppm 1,1,1-TCA and TCE in the plant effluent and up to 9 ppm and 19.5 ppm of 1,1,1-TCA and TCE respectively in separate samples of influent lagoon water and soil. No traces of VOCs were detected from upstream and downstream samples on Newman Creek.

On 21 May 1984 the plant switched over to city water to test if the 1,1,1-TCA and TCE were in fact simply recharging from the lagoon to the well. Results of the 21 May 1984 test were similar to previous analyses indicating 28 ppm of total VOCs in influent lagoon water, 5 ppm total VOCs in incoming well water, 3 ppm total VOCs in plant effluent, and 0.48 ppm total VOCs in a downstream sample in Newman Creek. Table 3-2 presents these results.

On 31 May 1984 another series of samples were taken by Wadsworth Testing Laboratories, Inc. (Wadsworth), indicating up to 3.8 ppm of 1,1,1-TCA in a grab water sample from a manhole in the NPDES outfall piping system. This was an increase of 1.9 ppm from a sample taken on 21 May, when city water was used as process water. Water samples collected on 31 May 1984 indicated 3.3 ppm of 1,1,1-TCA in the plant outfall and 4.3 ppm of VOCs in the lagoon. Soil samples collected on 31 May 1984 from the northern and western tank farms indicated maximum total VOC concentrations of 200 ppm and 228 ppm, respectively. No traces of VOCs were found in upstream or downstream water samples from Newman Creek. On 4 June 1984 water samples from the discharge of the degreaser units indicated VOC concentrations up to 6.3 ppm. In addition, water samples taken from manholes further down on the NPDES sewer system showed up to 11 ppm of VOCs. Also, to test possible penetration of 1,1,1-TCA in the degreasers through internal refrigeration coils and into the refrigeration coil liquid, several samples were taken of the liquid inside refrigeration coils. Analysis showed up to 1,400 ppm of 1,1,1-TCA. In August 1984 the analysis for production well W-2 sample showed 3.41 ppm of VOCs, and water samples from

Table 3-2

NPDES Sampling
21 May 1984

Sample Location	Total VOC Concentration (ppm)
Production Well	5
Plant Effluent	3
Lagoon Influent	28
Downstream Sample in Newman Creek	0.48

the plant's carbon absorption units steam lines had up to 0.71 ppm of TCE. This was probably a contributing factor in VOCs being discharged to the lagoon.

3.2.1.2 EKCO/Wadsworth Soil Borings

In July 1985 Wadsworth installed five 3-ft soil borings in the dry lagoon to investigate the VOCs and metals (total and EP toxicity analyses). The results of these analyses indicated the presence of VOCs ranging from 14 ppm to 71 ppm. Dichlorobenzene appeared to be the dominant volatile compound detected, ranging in concentration from nondetectable to 50 ppm. Two of the five soil samples exhibited characteristics of EP toxicity, with levels of cadmium exceeding 1 ppm (1.8 ppm and 2.0 ppm). The five soil sample analyses indicated concentrations of cadmium and lead ranging from 11 to 4,500 ppm and 540 to 11,000 ppm, respectively. The analysis of these samples indicated chromium concentrations up to 150 ppm. From this investigation it became evident that the sludge contained in the lagoon may be characterized as hazardous waste and further investigation was necessary.

3.2.2 Floyd Brown Associates Soil Boring Program

On 17 June 1986 the consulting firm of Floyd Brown Associates, Limited (FBA), contracted by EKCO, submitted a preliminary closure plan for the lagoon. As a result, FBA conducted two separate field investigations at the facility. Phase I was conducted on 9 and 10 July 1986, and Phase II was conducted between 12 and 26 January 1987.

3.2.2.1 Phase I FBA Soil Boring Program

Phase I consisted of completing a total of 12 test borings at the facility for the purpose of obtaining soil samples for laboratory analyses and determining site-specific geological characteristics. Borings were installed within the lagoon, downgradient, and in background areas, as shown in Figure 3-1. Four soil borings were installed within the lagoon, each to a depth of 12 ft. Four soil borings were installed downgradient of the lagoon, each to a total depth of 12 ft, to evaluate contaminant migration, if any, from the lagoon. Four soil

WESTON

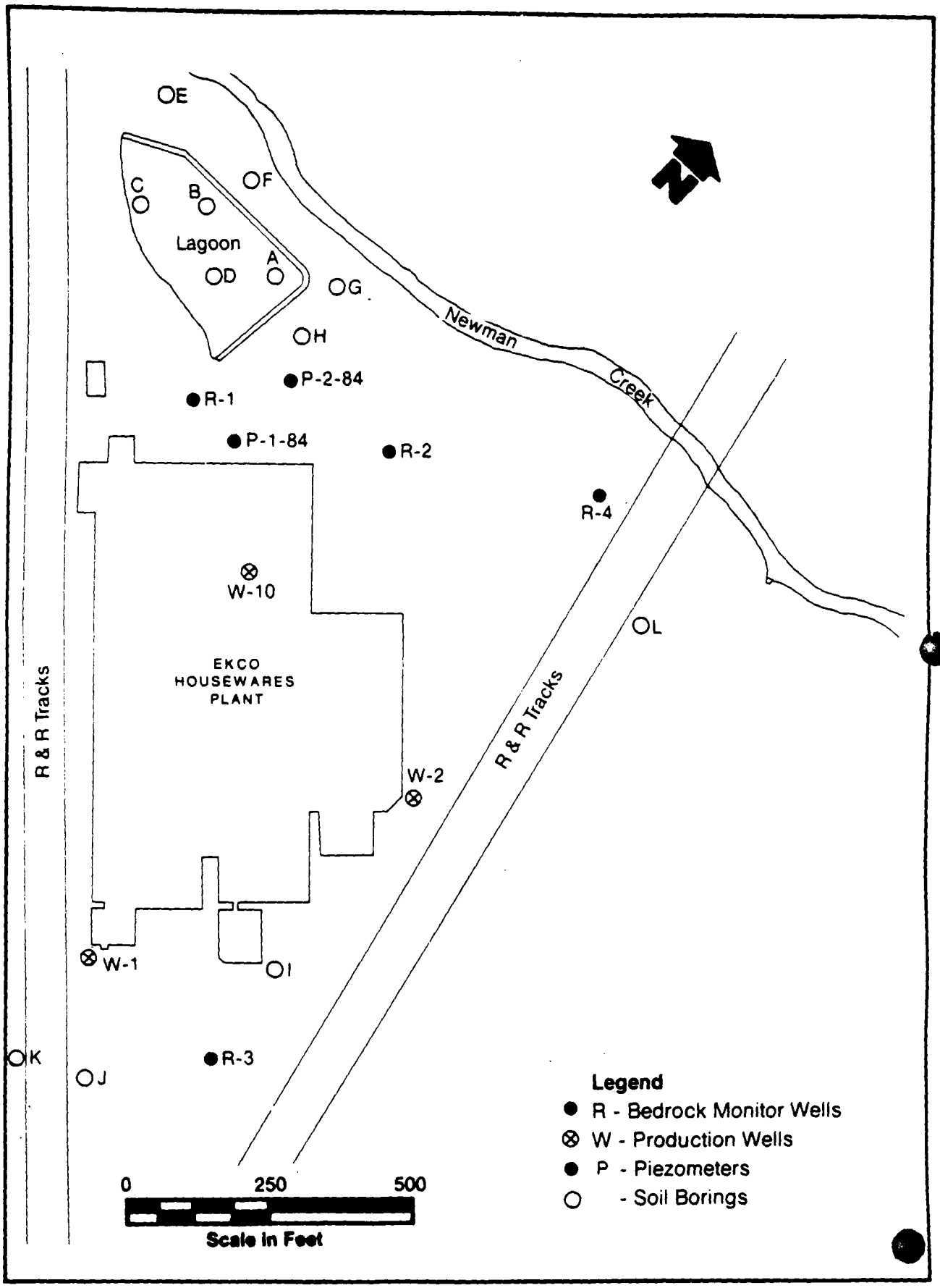


FIGURE 3-1 LOCATIONS OF FLOYD BROWN ASSOCIATES PHASE I SOIL BORINGS EKCO HOUSEWARES, INC., MASSILLON, OHIO

borings were installed, each to a depth of 3 ft, in uncontaminated areas (i.e., background). Soil samples from the lagoon and downgradient borings were composited according to depth and analyzed for total metals and VOCs. Background soil samples were analyzed for total metals. Tables 3-3, 3-4, and 3-5 present the results from the Phase I analyses. No priority pollutant VOCs were detected in the composited lagoon and composited downgradient samples. However, composited samples from the lagoon showed elevated concentrations for chromium (up to 230 ppm), and/or cadmium (up to 450 ppm), and/or lead (up to 2,430 ppm) to a depth of 4 ft.

Composited samples from downgradient areas exhibited concentrations of cadmium (up to 10 ppm) and lead (up to 57 ppm).

3.2.2.2 Phase II

Phase II was designed to delineate the extent of soil contamination beneath the lagoon based on noncomposited samples. Additionally, groundwater monitoring wells were installed in the vicinity of the lagoon to evaluate the impact, if any, of the detected heavy metals on groundwater quality. During Phase II field investigations, six test borings were installed to delineate the subsurface stratigraphy, and soil samples from discrete intervals were obtained and analyzed to assess possible soil contamination by VOCs. Four of the six test borings, three hydraulically downgradient and one hydraulically upgradient, were completed as 1.5-inch PVC groundwater monitoring wells (D-1 through D-4) (see Figure 3-2). The two remaining test borings (B-1 and B-2) were installed in areas adjacent to the lagoon to further assess background. Soil samples from discrete intervals of these six test borings were analyzed for the priority pollutants volatile (PPV) organic compounds, as well as for total concentrations of cadmium, chromium, and lead. Metals data for five of the six test borings are contained in Appendix C. VOCs were detected in soil samples from D-2 and D-4 as follows:

Table 3-3

Results of Composited (by Depth) Lagoon Soil Boring Samples FBA Phase I Soil Boring Program[a]

	Lagoon Composite Soils (Stations A through D)[b]							
Interval (ft)	0-1	1-2	2-3	3-4	6	8	10	12
Arsenic, mg/kg	13	12	12	21	9	10	11	13
Barium, mg/kg	600	130	77	140	58	42	120	42
Cadmium, mg/kg	450	4	<0.9	1.3	0.7	0.9	27	0.7
Chromium, mg/kg	230	130	35	120	9	7	14	10
Copper, mg/kg	880	400	93	47	20	12	230	15
Lead, mg/kg	2,430	1,670	12	17	18	8	190	13
Nickel, mg/kg	55	28	12	29	23	23	23	38
Selenium, mg/kg	3	<3	<4	<5	<3	<2.4	<4	<3
Zinc, mg/kg	830	1,370	70	500	120	170	200	73
Cyanide, mg/kg	0.3	0.4	0.6	1.6	0.4	0.2	0.2	0.2

[a]Referenced from Floyd Brown Associates *Closure Plan Presentation*, Memorandum Draft, 4 November 1986.

[b]Locations found on Figure 3-1.

Table 3-4

Results of Composited (by Depth) Downgradient Soil Boring Samples FBA Phase I Soil Boring Program[a]

	Downgradient Composite Soils Samples (Stations E through H)[b]							
Interval (ft)	0-1	1-2	2-3	3-4	6	8	10	12
Arsenic, mg/kg	13	14	7	9	6	25	14	17
Barium, mg/kg	72	99	47	69	58	18	58	17
Cadmium, mg/kg	10	3	0.7	0.7	<0.9	<0.7	<0.6	<0.6
Chromium, mg/kg	13	8	5	7	19	9	9	9
Copper, mg/kg	42	15	8	23	5	18	16	12
Lead, mg/kg	57	15	6	12	8	20	15	20
Nickel, mg/kg	28	24	30	16	6	26	16	22
Selenium, mg/kg	<2	<6	<3	<3	<3	<3	<2	<2
Zinc, mg/kg	65	86	56	89	18	91	52	65
Cyanide, mg/kg	0.2	0.4	0.1	0.1	1.8	<0.1	0.1	0.3

[a]Referenced from Floyd Brown Associates *Closure Plan Presentation*, Memorandum Draft, 4 November 1986.

[b]Locations found on Figure 3-1.

Table 3-5

Results of Background Soil Samples
FBA Phase I Soil Boring Program[a]

	Background Soil Samples (Stations I through L)[b]							
Boring Interval (ft)	I (0-1.5)	I (1.5-3.0)	J (0-1.5)	J (1.5-3.0)	K (0-1.5)	K (1.5-3.0)	L (0-1.5)	L (1.5-3.0)
Arsenic, mg/kg	15	18	2	6	10	10	11	5
Barium, mg/kg	350	51	45	26	70	14	110	72
Cadmium, mg/kg	<0.9	<1.0	<0.8	<0.8	2	<0.9	14	<0.6
Chromium, mg/kg	10	7	6	2	5	6	54	7
Copper, mg/kg	18	13	16	7	17	52	54	34
Lead, mg/kg	20	7	9	8	11	28	93	98
Nickel, mg/kg	14	230	35	23	19	72	24	32
Selenium, mg/kg	<4	<4	<3	<3	<3	<4	<4	<2
Zinc, mg/kg	32	54	65	23	64	32	180	100

[a]Referenced from Floyd Brown Associates *Closure Plan Presentation*, Memorandum Draft, 4 November 1986.

[b]Locations found on Figure 3-1.

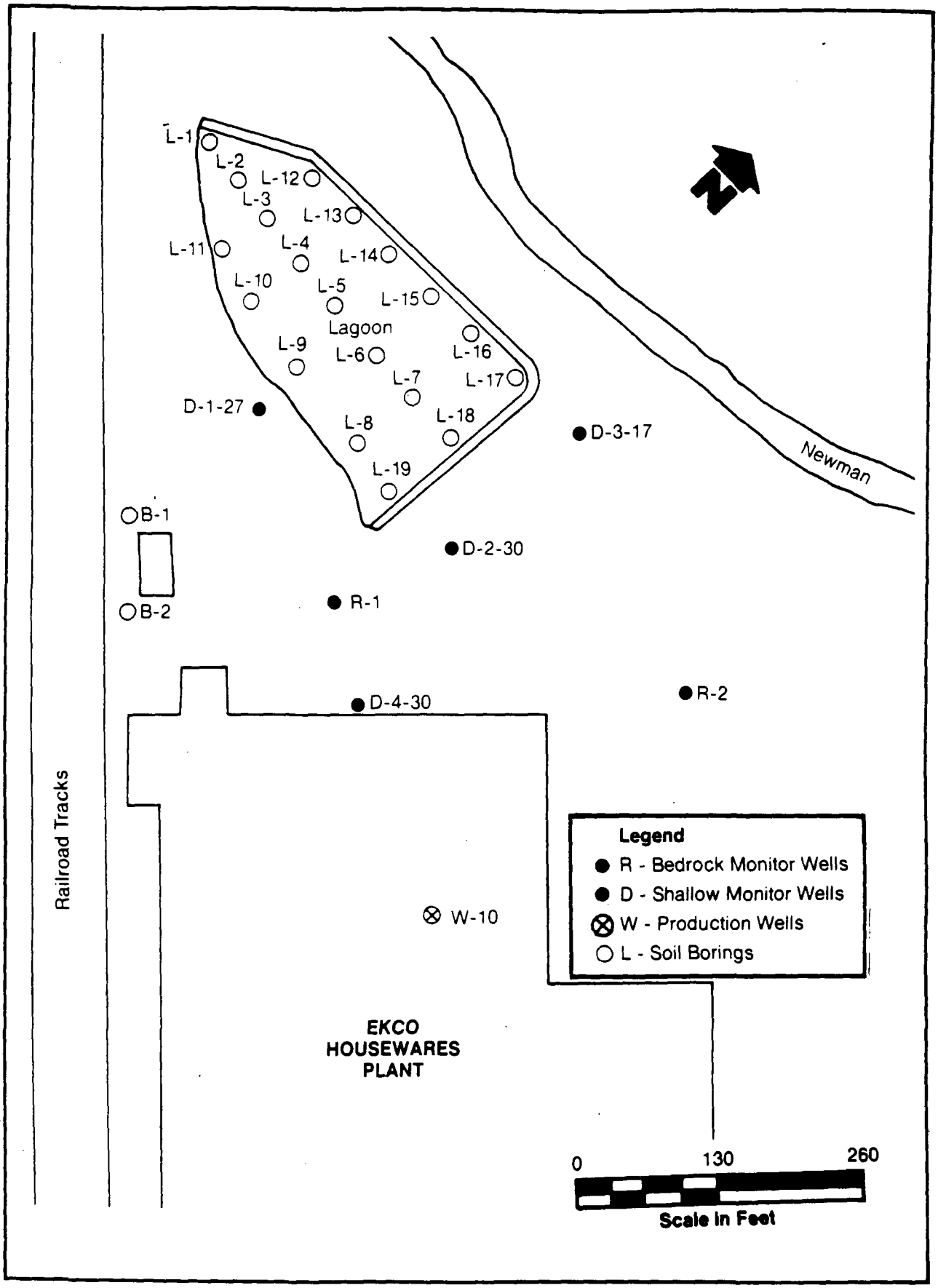


FIGURE 3-2 LOCATIONS OF FLOYD BROWN ASSOCIATES PHASE II SOIL BORINGS EKCO HOUSEWARES, INC., MASSILLON, OHIO

D-2		D-4	
Sample Depth (ft)	Total VOCs (ppm)	Sample Depth (ft)	Total VOCs (ppm)
13	0.21	2	7.56
15	0.05	5	0.26
17	0.00	8	1.48
		12	0.08
		15	1.43
		19	0.00

These data indicated that the detected concentrations of VOCs have decreased by greater than one order of magnitude between 1984, when Ohio Drilling completed nearby test holes for soil analysis, and this investigation's date of January 1987.

Also, 19 soil borings were installed in the lagoon (L-1 through L-19 in Figure 3-2), each to a maximum depth of 12 ft, with samples for laboratory analyses collected over each 1-ft interval. All lagoon soil samples were analyzed for total concentrations of cadmium, chromium, and lead. The analytical results from L-1 through L-19 are summarized in Appendix D. Results indicate elevated concentration of the metals of concern in soils to the maximum depth of the borings. However, this situation is localized in the area near the inlet of the lagoon. Maximum concentrations near the surface up to 8,400 ppm cadmium, 2,630 ppm chromium, and 19,500 ppm lead were indicated.

3.3 CONTAMINANTS OF CONCERN

3.3.1 Organic

Previous environmental investigations at this facility indicate the presence of several organic compounds in the groundwater and sludges/sediments within the lagoon, including trichloroethylene (TCE), trichloroethane (TCA), dichloroethylene, dichloroethane, dichlorobenzene, and vinyl chloride. The March 1988 lagoon soil borings confirmed the presence of trichloroethylene, dichloroethylene, dichloroethane, chlorobenzene, vinyl chloride, 2-butanone, and methylene chloride at relatively low levels.

3.3.2 Inorganic

Soil borings installed within the lagoon during previous investigations indicated elevated total metal concentrations for cadmium, chromium, and lead. The March 1988 lagoon soil borings confirmed the presence of elevated levels of cadmium, chromium, and lead.

3.3.3 Potential Migration Pathways

3.3.3.1 Air

The potential of airborne migration of contaminants from the volatilization of VOCs and from the dispersion of soil particles contaminated with heavy metals may exist during excavation of soils from the lagoon. This could result in contaminant migration downwind from excavation activities.

3.3.3.2 Groundwater

EKCO has implemented a groundwater quality assessment program for the lagoon in accordance with rules 3745-65-90 through 3745-65-94 of the OAC, which will continue until final closure is completed. This program is presented in the *Quality Assurance Management Plan for EKCO Housewares, Inc., Massillon, Ohio*, September 1988, which is presented in Appendix E. OEPA conducted a Comprehensive Groundwater Monitoring Evaluation (CME) on 7 February 1991 to evaluate compliance with the above rules. The results of the CME are presented in Appendix E. A summary of the results of this program is presented in Subsection 3.4.3.3.

3.3.3.3 Surface Water

The potential for migration to Newman Creek may have existed through the berms when the lagoon was operational. This may have resulted in discharges to Newman Creek. Another potential pathway exists via the discharge of groundwater to Newman Creek.

3.4 WESTON INVESTIGATION

3.4.1 Purpose and Scope

The purpose of WESTON's investigation was to further assess the nature and extent of subsurface contamination beneath the lagoon and to establish a compliance monitoring network for the lagoon closure. To accomplish this, soil samples from six soil borings in the bottom of the lagoon and three soil borings along the side slopes were collected for chemical analysis and lithologic description. Based on previous wastestream characterizations and lagoon investigations, the WESTON investigation focused on heavy metal and VOCs. In addition, five monitoring wells and one piezometer were installed around the perimeter of the lagoon. Groundwater samples and water levels have been collected in five monitoring wells quarterly from May of 1989 to the present. These activities are further detailed in the following subsections.

3.4.2 Field Investigation Activities

3.4.2.1 Lagoon Soil Boring Program

To sufficiently characterize the sludge/sediment and subsurface material within the lagoon, nine test borings were completed using a hollow-stem auger rig. Appendix F contains the soil boring logs for these nine test borings.

Six borings were drilled to 16 ft below ground surface or until auger refusal in the bottom of the lagoon. The bottom soil borings (BSB) were approximately located on two perpendicular lines with the lateral line located at the former lagoon outfall and running approximately north to south, as shown in Figure 3-3. Each bottom soil boring was continuously sampled with a 2-ft split-spoon sampler, and a maximum of eight samples per boring were collected. Each sample was analyzed for total metals and cyanide. Four of these samples (the first, third, fifth, and eighth samples) were also analyzed for VOCs.

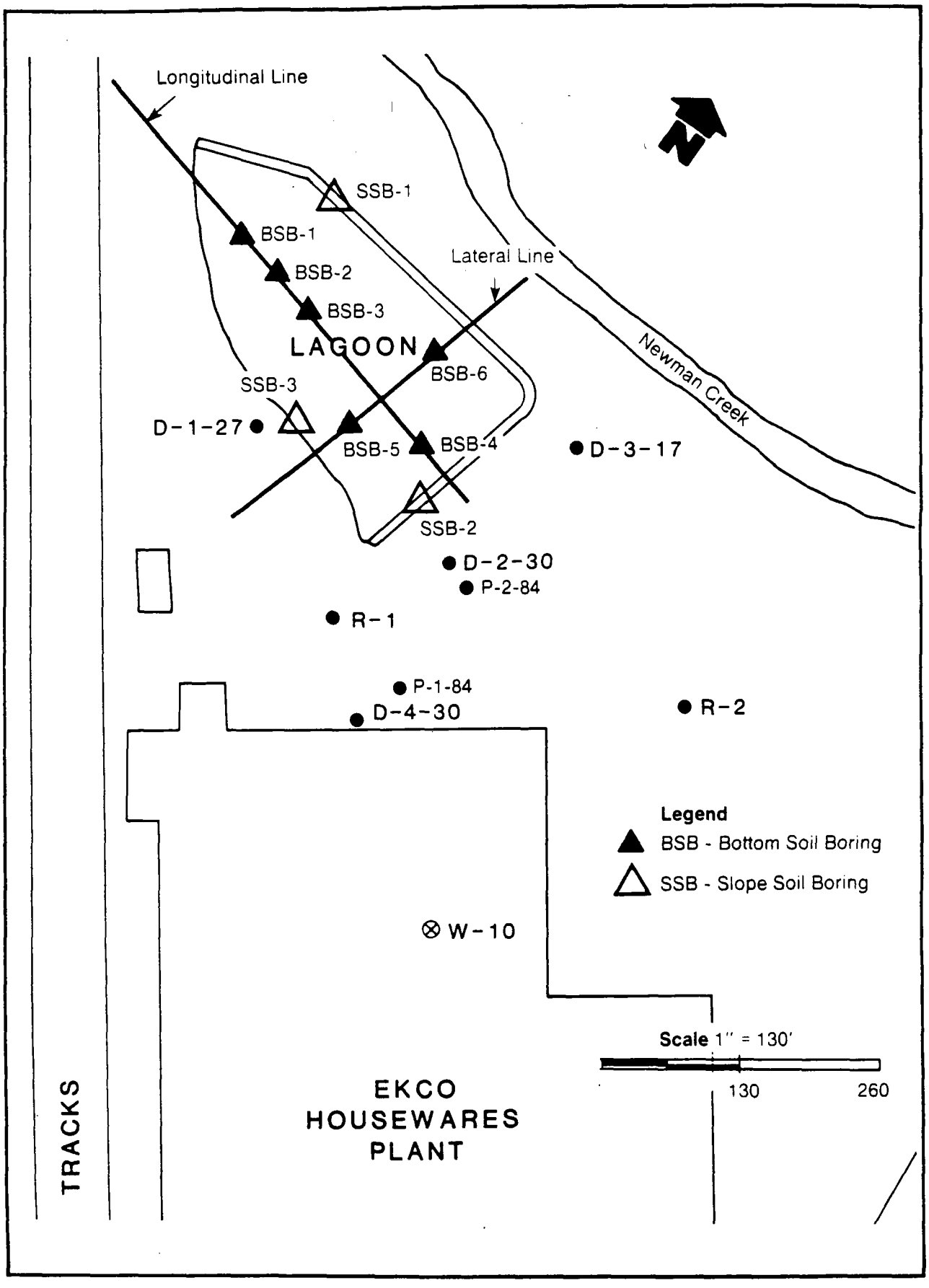


FIGURE 3-3 LOCATIONS OF LAGOON SOIL BORINGS
EKCO HOUSEWARES, INC., MASSILLON, OHIO

The remaining three borings were slope soil borings (SSB) and were drilled, when possible, to a depth of 6 ft below ground surface on the encircling berm and embankment. Since the lagoon is roughly triangular in plan view, the three slope soil borings were located as follows: one on the northern berm, one on the eastern berm, and one on the natural embankment that forms the southwest boundary. Continuous split-spoon samples were taken from each slope soil boring except for SSB-3, which was hand sampled because the area was inaccessible to the drill rig. Samples from the first and last spoon sample of each slope soil boring were analyzed for VOCs. Total metal and cyanide analyses were performed on all samples.

Prior to the start of drilling at each location all downhole equipment was decontaminated using a steam cleaner. Between each split-spoon sample, the split-spoon sampler was washed in a solution of Alconox and tap water followed by a tap water rinse.

Following compl ion of the soil borings, the pilot holes were grouted, and the ground surface elevation at all locations were surveyed relative to mean sea level. These data are included in the soil boring logs found in Appendix F.

3.4.2.2 Groundwater Monitoring Well Installation

In order to establish a groundwater monitoring system that can adequately monitor the groundwater beneath the surface impoundment, five monitoring wells and one piezometer were installed at the locations shown in Figure 3-4. Four downgradient wells (L-1, L-2, L-4, and L-5) were installed in order to monitor the contaminant migration toward Newman Creek and the Tuscarawas River. One upgradient well (L-3) was installed to provide background groundwater quality data. One piezometer (P-5) was installed adjacent to L-2 to assess whether two hydrologic zones existed in the subsurface soil surrounding the lagoon. These wells serve as replacements for the existing D-wells (shallow monitoring wells). The D-wells are not adequate monitoring points because of their inner diameter (2-inch) and possible inadequate development procedures (each contain large amounts of sediment). However, because of the location and past sampling results, monitoring well D-4-30 will

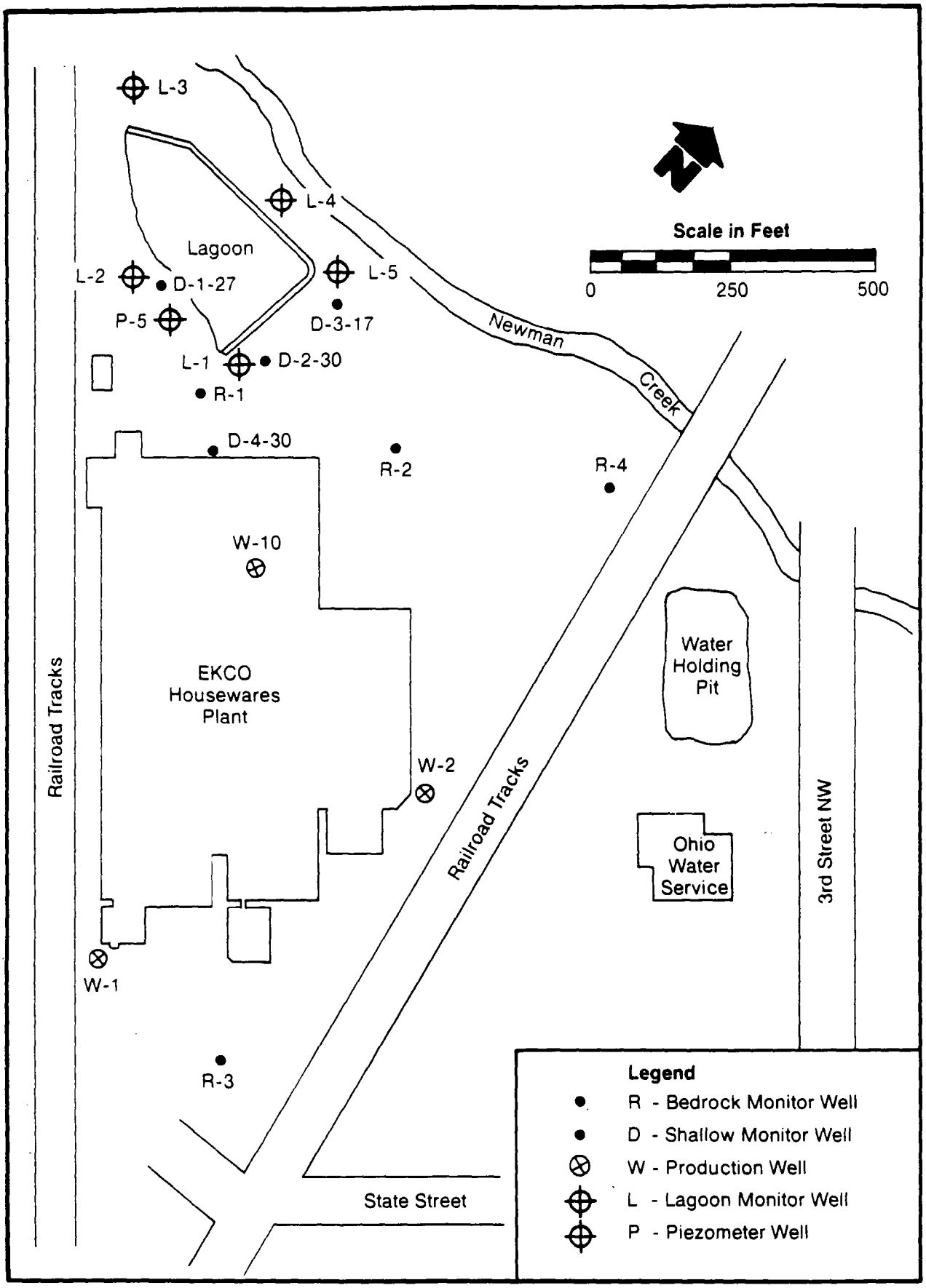


FIGURE 3-4 LOCATIONS OF NEW AND EXISTING MONITORING WELLS AT EKCO HOUSEWARES, INC., MASSILLON, OHIO

continue to be a groundwater quality monitoring point and will be sampled at the same frequency as the new monitoring wells. The remaining D-wells will be used solely to monitor groundwater levels.

Prior to the start of drilling activities, the new well locations were staked, cleared of underground obstructions and utilities, and then approved by representatives of EKCO. Also, prior to and in between drilling, all downhole equipment (the augers, drilling rods, rig tools, and split-spoon samplers) were decontaminated using a steam cleaner. Split-spoon samplers were cleaned between samples in an Alconox and tap water solution followed by a tap water rinse.

The monitoring wells are constructed of 10 ft of 4-inch-diameter wound wire type 304 stainless steel screen, low carbon steel riser pipe, and a protective black iron surface casing with lockable lid. The screens were installed approximately 10 ft into the first water-bearing zone. The piezometer is constructed of 5 ft of 2-inch 10-slot PVC screen, schedule 40 PVC riser pipe, and a protective black iron surface casing with lockable lid. The screen was installed 15 ft into the first water-bearing zone.

At the bottom of each borehole, the well screen and riser were installed and the augers withdrawn to the top of the screen. Silica sand was used, when necessary, to fill the annular space after the augers were withdrawn. When plumbing the hole indicated that the sand pack was at the desired height (approximately 2 to 5 ft above the screen), a 2-ft bentonite pellet seal was installed. The wells were completed by gravity feeding a neat cement mixture into the remaining annular space as the augers were gradually withdrawn to ensure that no collapse of the borehole occurred. The upper 2.5 ft of annular space was then filled with a cement/sand mixture and a protective casing was installed.

Each well was developed by airlifting or bailing until at least five well volumes were removed. Each well did not maintain a sufficient head, went dry, and was slow or very slow to recover. All purge water was collected in a tank and was taken to the on-site air stripper for processing and discharge.

All data were recorded on well construction summary forms and are presented in Appendix G. Well construction details are presented in Table 3-6.

Subsequent to well installation and development, the top of casing and surface elevations were surveyed relative to mean sea level to the nearest 0.01 ft and water level measurements were collected (see Table 3-6). Groundwater samples and water levels have been collected from these wells quarterly from May 1989 to the present.

3.4.3 Results

3.4.3.1 Sludge/Subsurface Soil

The boring logs in Appendix E indicate that the sediments beneath and surrounding the lagoon are both variable and irregular. Cross section A-A′ (line runs south to north across the lagoon and is shown in Figure 3-5) is illustrated in Figure 3-6, which shows that up to 10 ft of sludge or soil displaying the characteristics of the sludge are at the bottom of the lagoon. The southern embankment of the lagoon is comprised of up to 23 ft of fill material consisting of sand, gravel, clay, silt, wood chips, and cinders. The northern berm of the lagoon was constructed of clay, sand, sandy silt, and silt and gravel. Underlying these are undisturbed sediments consisting of fine- to medium-grained sand and gravel that grades into a silty sand and silt. Beneath this is bedrock.

Cross section B-B′, illustrated in Figure 3-7 (line runs west to east across the lagoon and is shown in Figure 3-5), shows that up to 10 ft of sludge or soils displaying the characteristics of sludge overlies a 1- to 4-ft thick clay layer. The clay layer thins to the southeastern corner of the lagoon and is not present at soil boring BSB-5. This clay layer is also observed in cross section A-A′. However, it is not as defined. Beneath the clay layer are sediments typical of glacial outwash sediments, which consist of sand, sandy silts, some gravel, and clay. The bedrock beneath the undisturbed sediments appears to dip to the east and southeast. A fence diagram showing the stratigraphy of the lagoon is presented in Figure 3-8.

Table 3-6

Well Construction Summary

Well	Total Depth (ft bgs)	Screened Interval (ft)	Depth to Water* (from top of casing, ft)	Well Head Elevation (ft above MSL)	Groundwater Elevation (ft above MSL)
L-1	40	39.5 to 29.5	26.27	946.25	919.98
L-2	25	25 to 15	20.58	947.48	926.90
L-3	20	19.5 to 9.5	18.19	946.78	928.59
L-4	16	16 to 6	9.42	938.11	928.69
L-5	27	24 to 14	8.33	936.86	928.53
P-5	33	33 to 27	24.73	948.34	923.61

*Depth to water measured on 12 July 1988.
Note: bgs = below ground surface; MSL = mean sea level.

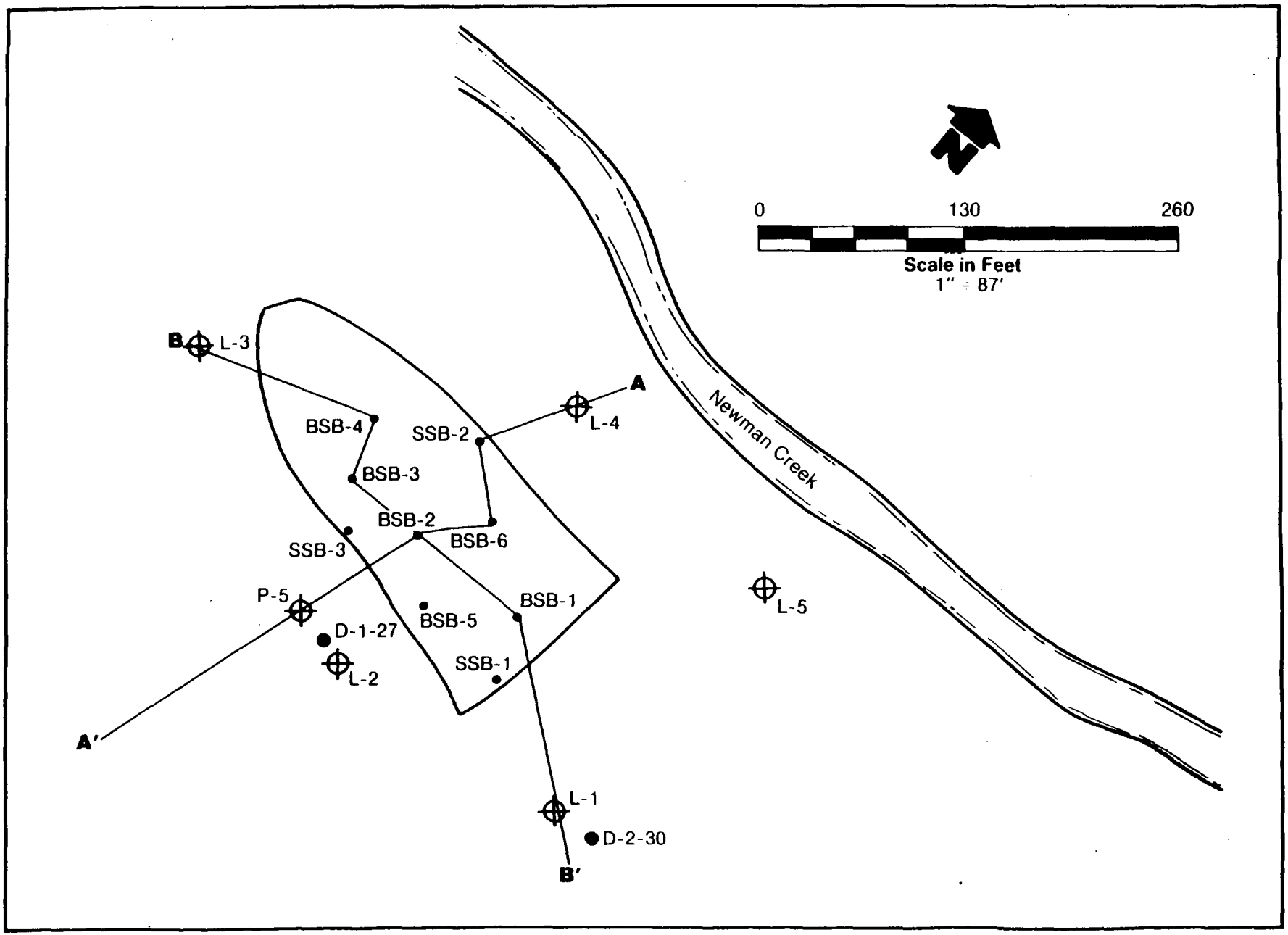


FIGURE 3-5 CROSS SECTION LINES A-A' AND B-B' THROUGH THE LAGOON

3.4.3.2 Groundwater Elevations

Groundwater elevation measurements have been taken in the L-wells quarterly from May 1989 to the present. The groundwater elevations for 1989 and 1990 are listed in Table 3-7.

Groundwater elevation contour maps for each are shown in Figures 3-9 through 3-15. These figures show that the shallow groundwater gradient in the area of the lagoon is to the southeast, which is toward the site production well W-10.

3.4.3.3 Analytical Data

The inorganic analyses from the soil boring samples in the lagoon (see Appendix H for the laboratory analytical data) show that high concentrations of chromium, cadmium, and lead were present in the samples. Table 3-8 summarizes these data.

The volatile organic analyses from the soil borings (see Appendix H for the laboratory analytical data) indicated that 14 parameters were detected. These results are summarized in Table 3-9.

WESTON has been conducting quarterly groundwater sampling at the EKCO site since May 1989. The sampling is required by the interim status standards for owners and operators of hazardous waste treatment storage and disposal facilities, specifically rules 3745-65-90 through 3745-65-94 of the OAC. The above-noted OAC regulations pertain to groundwater monitoring. The five lagoon wells, L-1 through L-5, have been sampled quarterly, during the months of February, May, August, and November.

The results of the past 13 sampling events indicate that the groundwater has not been impacted by heavy metal contamination from the lagoon. The analytical sampling results for cadmium, chromium, and lead are shown in Table 3-10. No chromium was detected in any of the samples. Cadmium was detected one time, at a concentration of 0.004 mg/L in

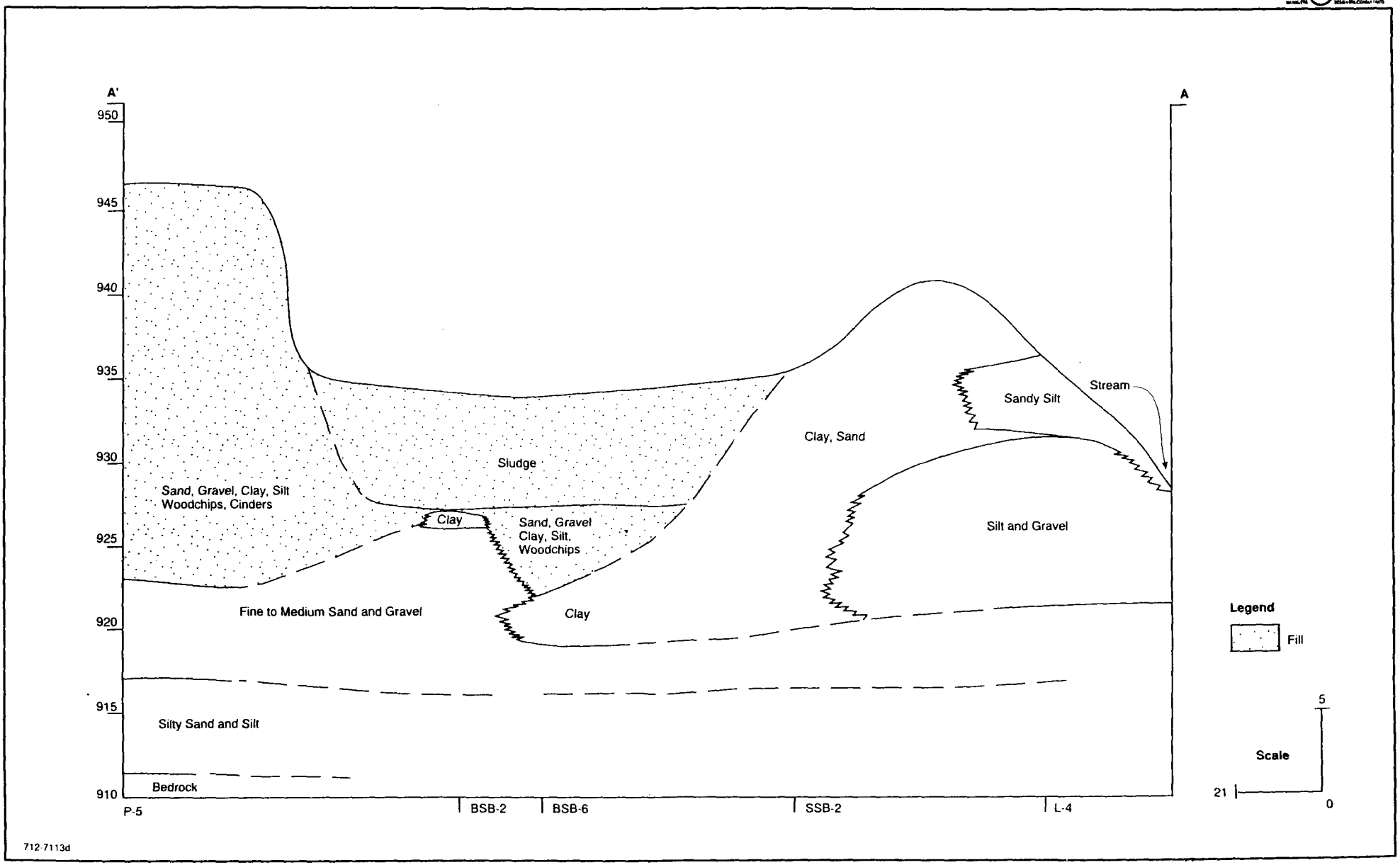


FIGURE 3-6 CROSS SECTION A-A' THROUGH THE LAGOON

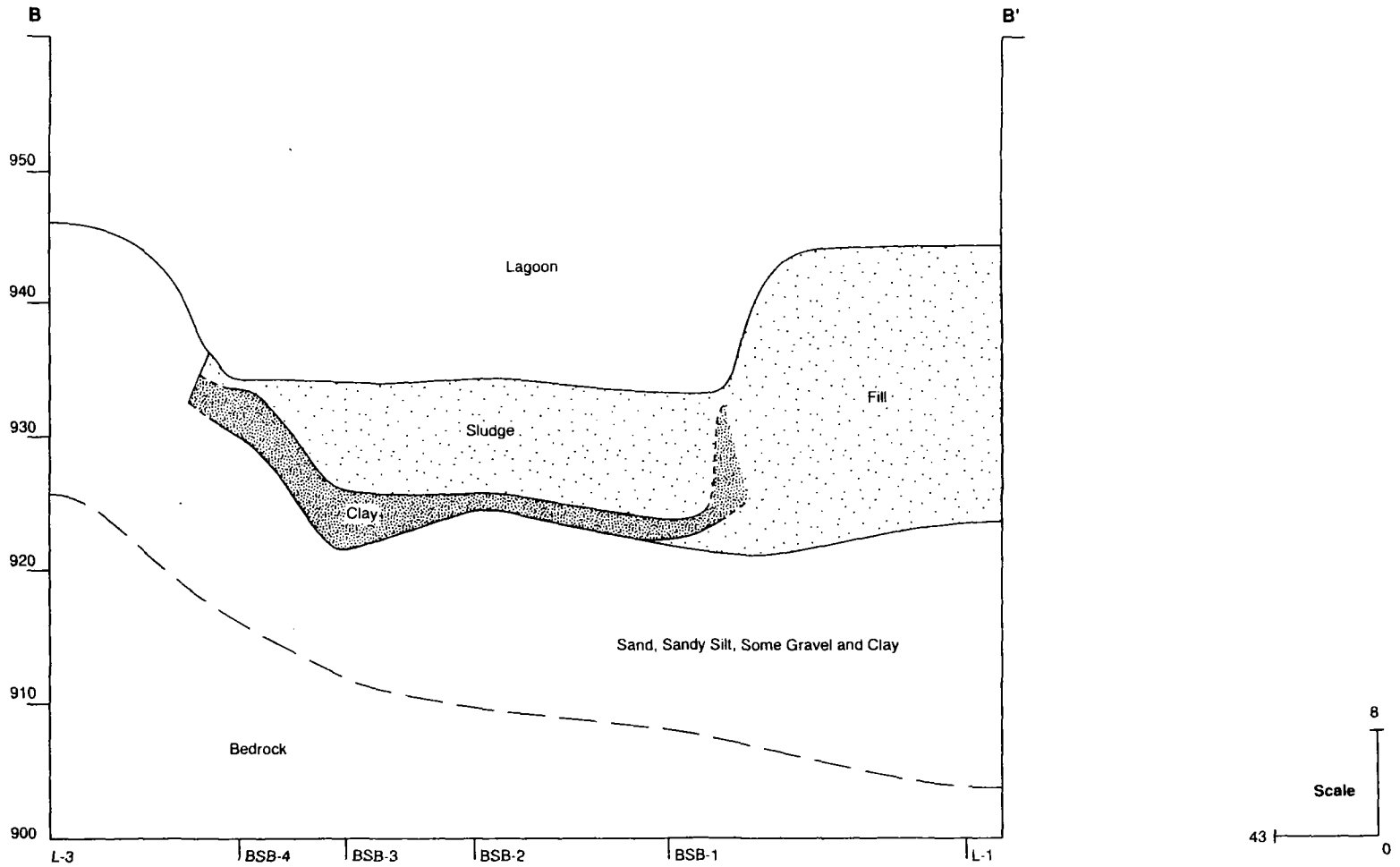


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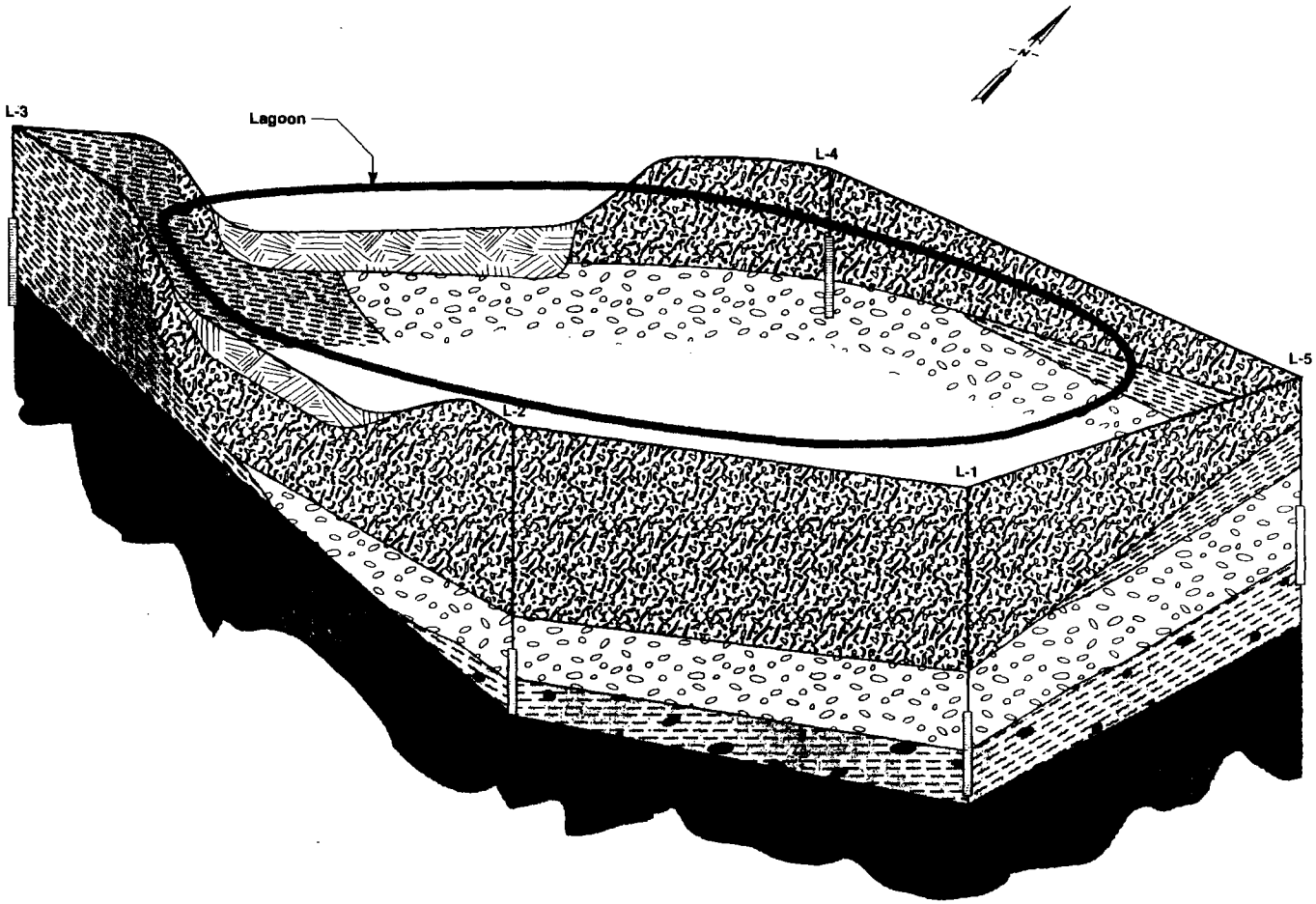
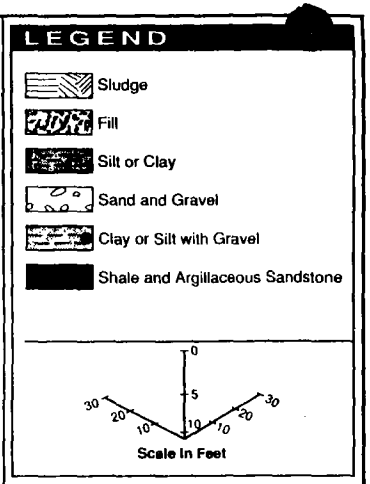
FIGURE 3-7 CROSS SECTION B-B' THROUGH THE LAGOON





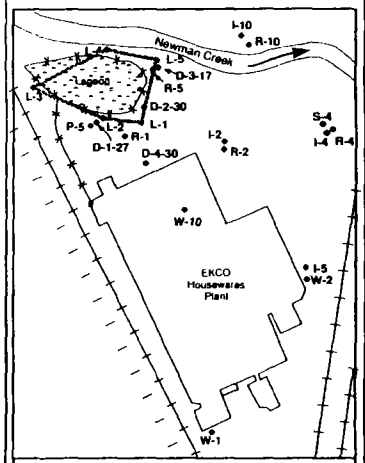


FIGURE 3-8
LAGOON WELL FENCE DIAGRAM AT THE HOUSEWARES PLANT, MASSILLON, OHIO

619-8688 7/23/92

Table 3-7

L-Well Groundwater Surface Elevations (MSL)

Well I.D.	2nd Quarter 5/10/89	3rd Quarter 8/10/89	4th Quarter 11/14/89	1st Quarter 2/8/90	2nd Quarter 5/8/90	3rd Quarter 8/9/90	4th Quarter 11/9/90
(DN) L-1	919.80	920.16	920.33	924.73	921.30	923.08	425.00
(DN) L-2	930.57	929.12	929.57	930.57	931.90	930.89	932.13
(DN) L-4	929.97	928.97	929.22	929.62	929.44	929.47	929.79
(DN) L-5	930.08	928.40	928.98	928.95	929.18	928.92	929.31
(UP) L-3	931.66	929.41	929.91	932.66	931.81	931.66	932.09

Notes: (DN) indicates a downgradient well.
(UP) indicates an upgradient well.

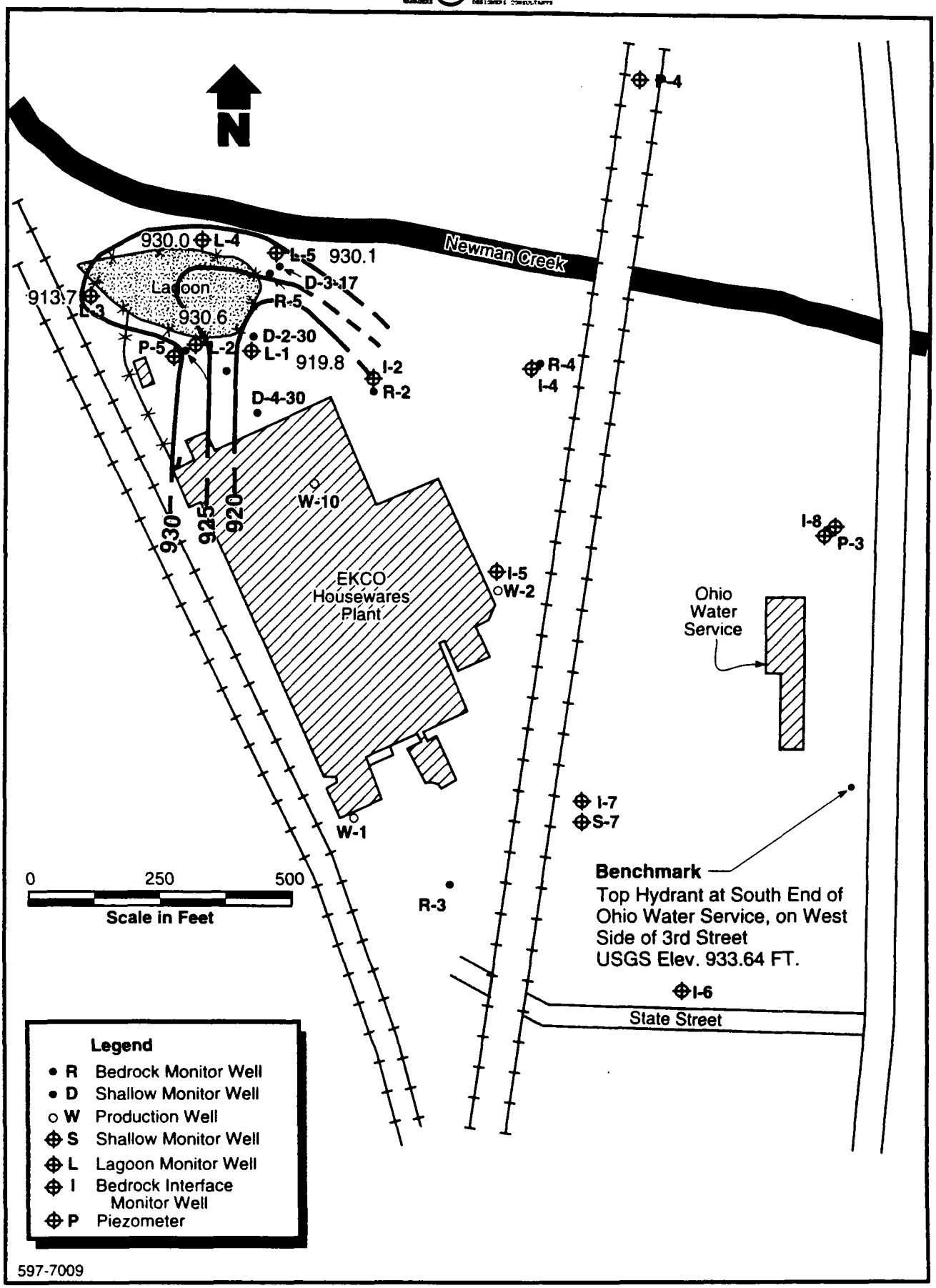


FIGURE 3-9 L-WELL GROUNDWATER MAP WATER LEVELS MEASURED 5/10/89

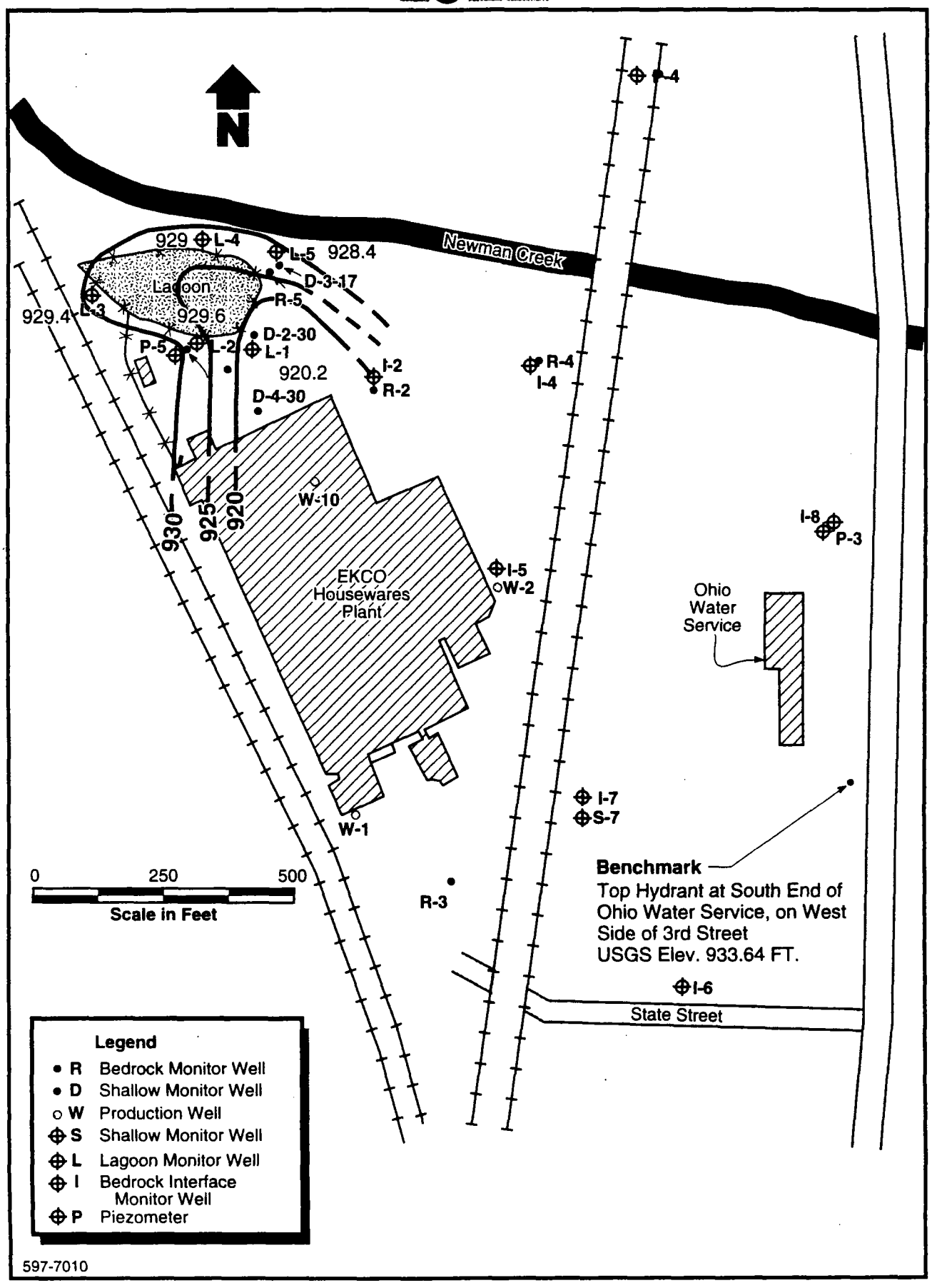


FIGURE 3-10 L-WELL GROUNDWATER MAP WATER LEVELS MEASURED 8/10/89

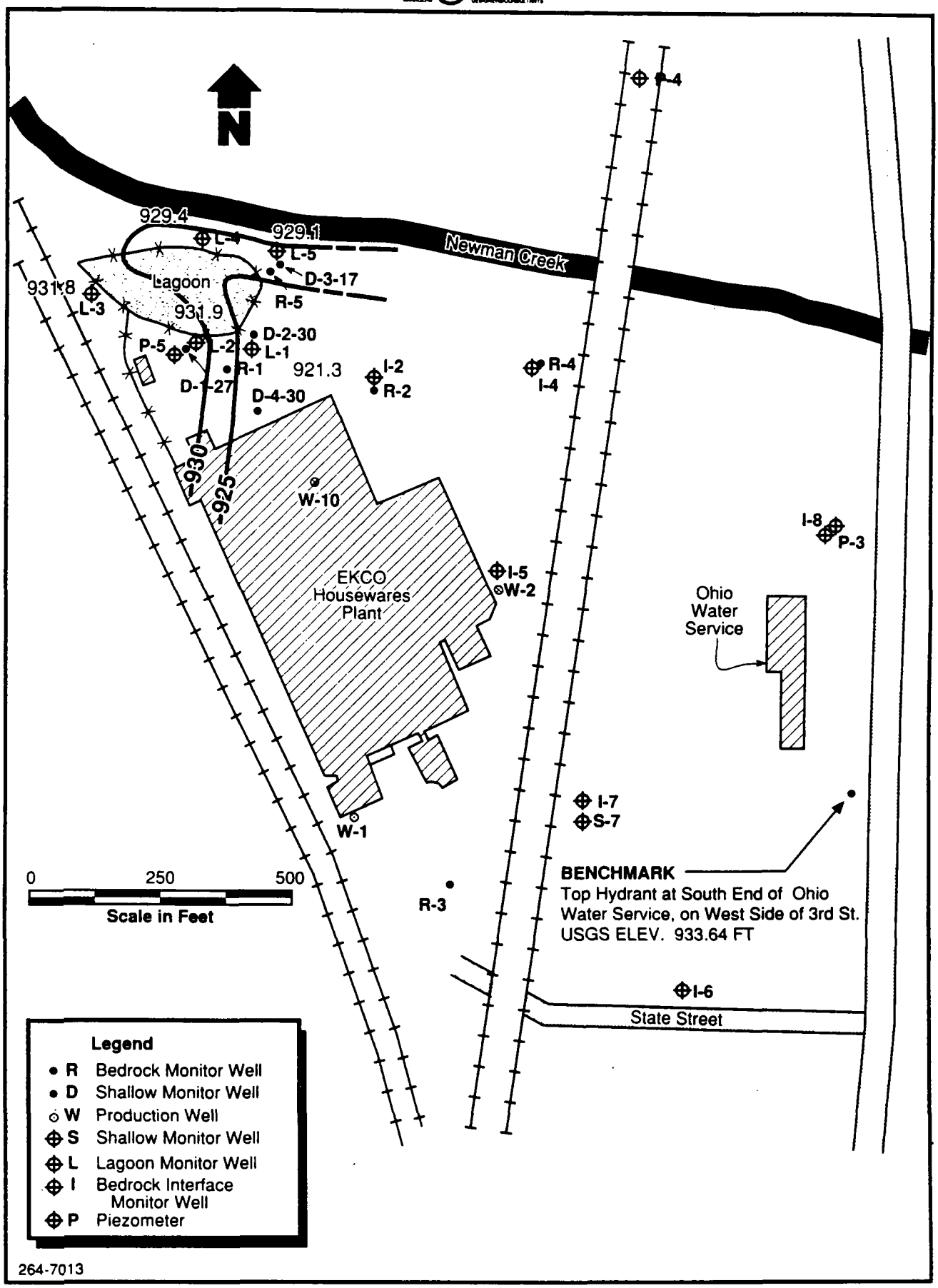


FIGURE 3-13 L-WELL GROUNDWATER MAP WATER LEVELS MEASURED 5/8/90

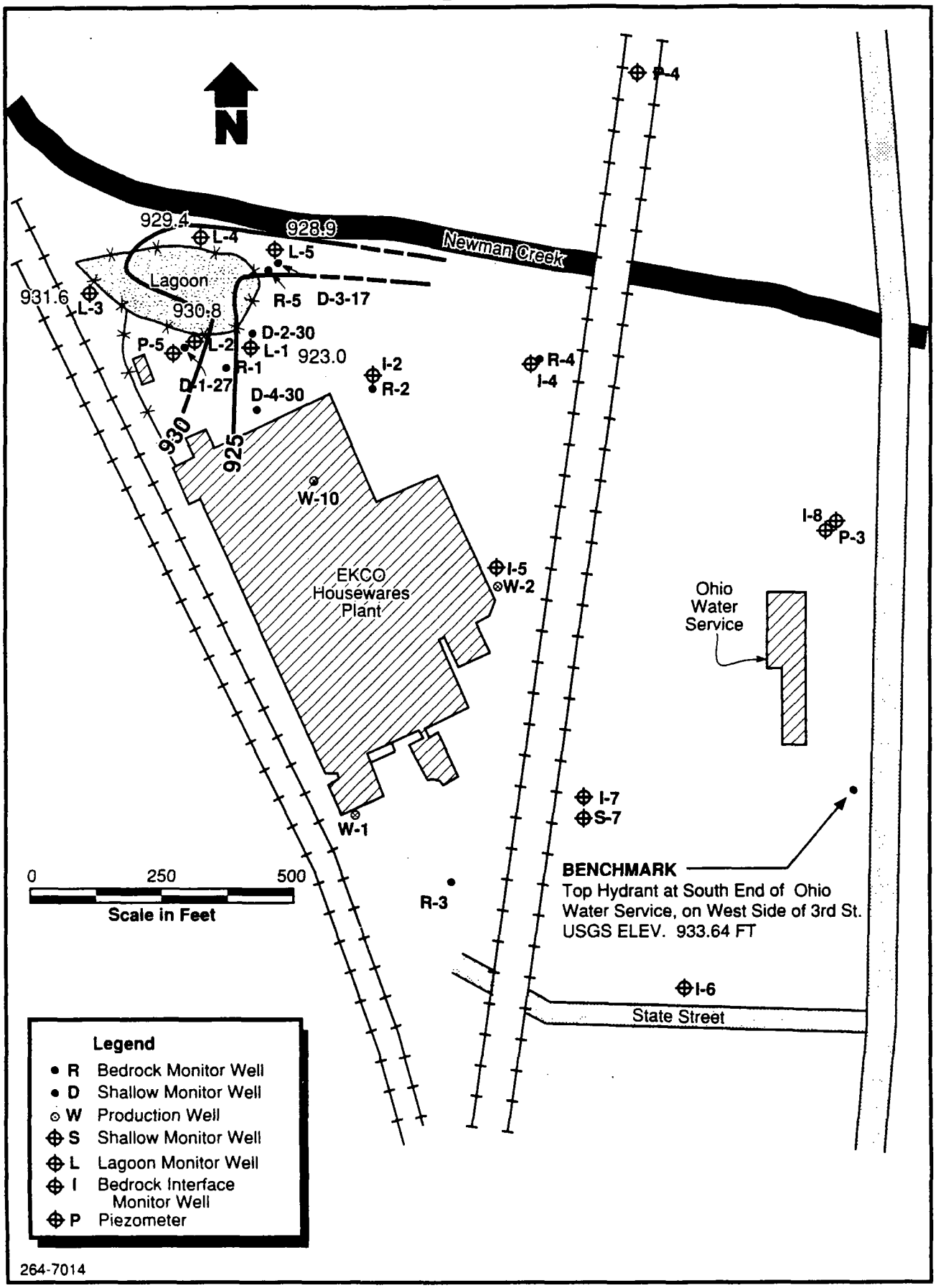


FIGURE 3-14 L-WELL GROUNDWATER MAP WATER LEVELS MEASURED 8/9/90

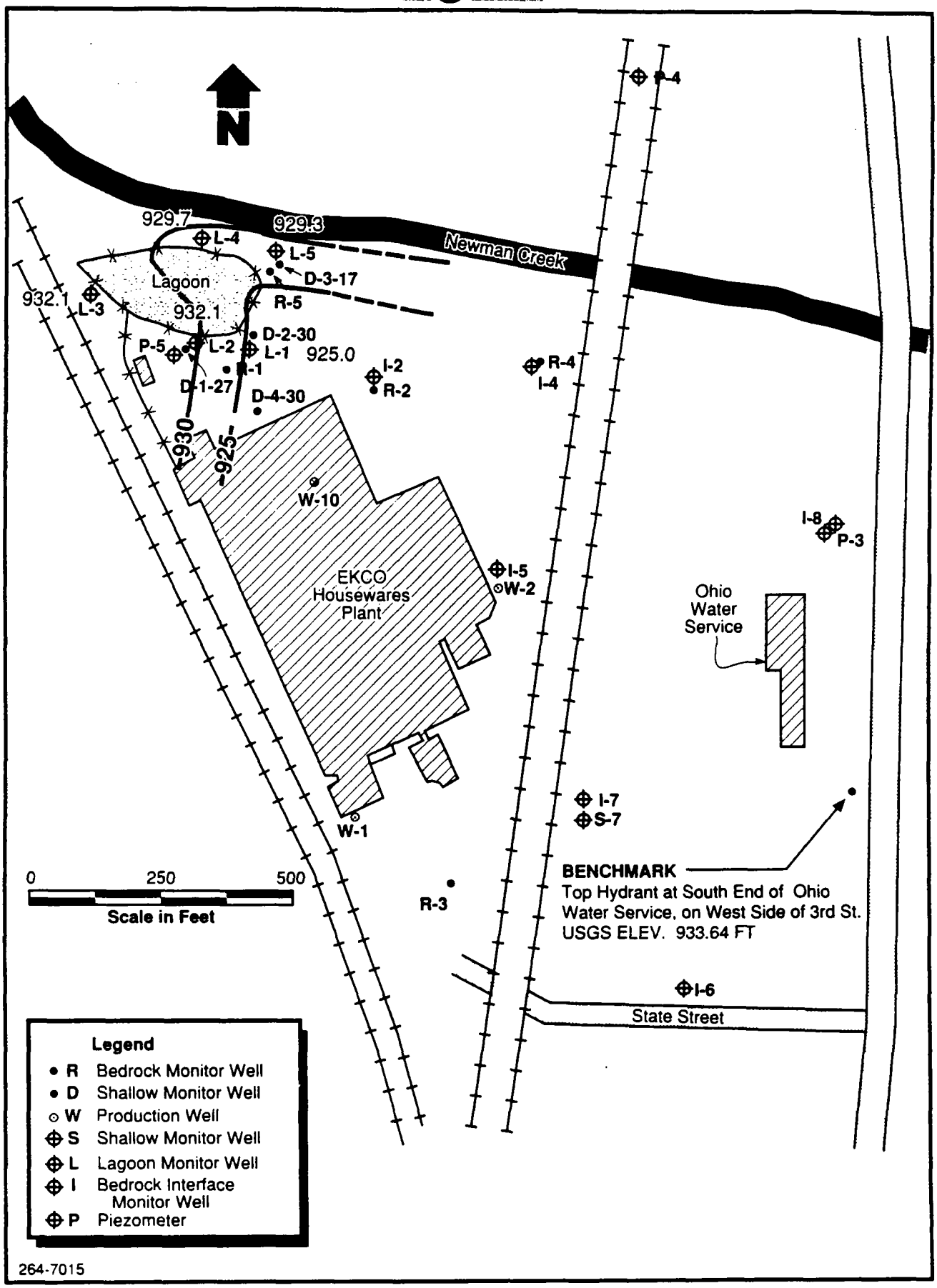


FIGURE 3-15 L-WELL GROUNDWATER MAP WATER LEVELS MEASURED 11/9/90

Table 3-8

Summary of Concentrations of Cadmium, Chromium, and Lead in Lagoon Soil Borings

Sample	Depth (ft)	Parameters*		
		Cadmium	Chromium	Lead
SSB-1				
1R	0 - 2	1,680	880	6,100
2R	2 - 4	3.26	414	55
3R	4 - 6	2.58	235	20
SSB-2				
1R	0 - 2	188	121	1,300
2R	2 - 4	77.2	53.8	320
3R	4 - 6	7.78	23.6	150
SSB-3				
1R	0 - 2	1,550	354	8,600
2R	2 - 4	2.29	93.0	170
BSB-1				
1R	0 - 2	19.2	262	900
2R	2 - 4	9.13	103	72
3R	4 - 6	6.73	17.0	38
4R	6 - 8	215	295	860
5R	8 - 10	16.1	61.5	91
6R	10 - 12	0.789	4.74	42
6RD	10 - 12	0.563	5.55	42
BSB-2				
1R	0 - 2	1,370	405	5,100
2R	2 - 4	6.10	11.8	42
2RD	2 - 4	6.04	13.5	43
3R	4 - 6	136	70.4	760
4R	6 - 8	<0.381	8.92	20
5R	8 - 10	84.6	8.72	320
6R	10 - 12	11.1	7.15	58
7R	12 - 14	2.70	7.60	33
7RD	12 - 14	3.46	8.30	32
8R	14 - 16	<0.396	6.81	36
BSB-3				
1R	0 - 2	18.9	152	990
2R	2 - 4	1.24	384	36
3R	4 - 6	1.21	527	43
4R	6 - 8	3,790	264	13,000
5R	8 - 10	<0.369	6.55	36
5RD	8 - 10	5.62	11.3	52
6R	10 - 12	5.23	11.6	39
7R	12 - 14	8.06	15.2	56
8R	14 - 16	2.27	4.44	16
8RD	14 - 16	0.728	5.16	13

Sample	
BSB-4	
1R	
2R	
3R	
4R	
5R	
6R	
7R	
8R	
BSB-5	
1R	
2R	
2RD	
3R	
4R	
5R	
5RD	
6R	6
7R	8 -
8R	8 -
	10 -
	12 -1
	14 - 16
BSB-6	
1R	
2R	
3R	0 - 2
4R	2 - 4
5R	4 - 6
6R	6 - 8
7R	8 - 10
8R	10 - 12
	12 - 14
	14 - 16

*Concentrations presented in parts per m

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Table 3-9

Summary of Volatile Organic Compounds Present in Lagoon Soil Borings*

Depth (ft)	0 - 2	4 - 6	8 - 10
Sample No.	1R	3R	5R
Boring BSB-1			
Vinyl Chloride	BDL	BDL	BDL
Methylene Chloride	30B	14B	6B
Acetone	10B	11B	29B
Carbon Disulfide	4J	BDL	BDL
1,1-Dichloroethane	2J	2J	8
1,2-Dichloroethene (total)	7	3J	BDL
2-Butanone	4J	5J	10
1,1,1-Trichloroethane	BDL	BDL	BDL
Trichloroethene	10	6	BDL
Benzene	BDL	1JB	BDL
Toluene	BDL	BDL	BDL
Chlorobenzene	BDL	BDL	BDL
Ethylbenzene	BDL	BDL	BDL
Xylene	BDL	BDL	BDL

Depth (ft)	0 - 2	4 - 6	8 - 10	12 - 14
Sample No.	1R	3R	5R	8R
Boring BSB-2				
Vinyl Chloride	BDL	BDL	BDL	BDL
Methylene Chloride	30B	4JB	3JB	1JB
Acetone	37B	64B	22B	13B
Carbon Disulfide	BDL	2J	BDL	BDL
1,1-Dichloroethane	BDL	13	BDL	10
1,2-Dichloroethene (total)	44	BDL	BDL	BDL
2-Butanone	11	16	6J	6J
1,1,1-Trichloroethane	BDL	BDL	BDL	BDL
Trichloroethene	64	9	8	5
Benzene	BDL	BDL	BDL	BDL
Toluene	BDL	1J	1J	BDL
Chlorobenzene	BDL	BDL	BDL	BDL
Ethylbenzene	BDL	2J	BDL	BDL
Xylene	BDL	3J	BDL	BDL

Table 3-9

Summary of Volatile Organic Compounds Present in Lagoon Soil Borings* (continued)

Depth (ft)	0 - 2	4 - 6	8 - 10	8 - 10	14 - 16
Sample No.	1R	3R	5R	5D	8R
Boring BSB-3					
Vinyl Chloride	37	1J	9J	BDL	BDL
Methylene Chloride	5B	7B	9	3J	6
Acetone	190B	44B	12B	34B	23B
Carbon Disulfide	4J	2J	5	BDL	BDL
1,1-Dichloroethane	BDL	10	5	BDL	BDL
1,2-Dichloroethene (total)	80	3J	140	3J	6
2-Butanone	82	13	5JB	7JB	8JB
1,1,1-Trichloroethane	2J	BDL	BDL	BDL	BDL
Trichloroethene	12	15	13	5	12
Benzene	BDL	BDL	BDL	BDL	BDL
Toluene	2J	3J	BDL	BDL	BDL
Chlorobenzene	BDL	BDL	BDL	BDL	BDL
Ethylbenzene	BDL	BDL	BDL	BDL	BDL
Xylene	BDL	BDL	BDL	BDL	BDL

Depth (ft)	0 - 2	4 - 6	8 - 10	12 - 14
Sample No.	1R	3R	5R	8R
Boring BSB-4				
Vinyl Chloride	BDL	BDL	8J	BDL
Methylene Chloride	11	1J	2J	8
Acetone	86B	48B	8JB	22B
Carbon Disulfide	BDL	BDL	1J	BDL
1,1-Dichloroethane	5	10	BDL	4J
1,2-Dichloroethene (total)	22	6	130	120
2-Butanone	20	12B	4JB	6JB
1,1,1-Trichloroethane	BDL	BDL	BDL	BDL
Trichloroethene	10	3J	3J	140
Benzene	BDL	BDL	BDL	BDL
Toluene	2J	BDL	BDL	1J
Chlorobenzene	BDL	BDL	BDL	BDL
Ethylbenzene	BDL	BDL	BDL	BDL
Xylene	BDL	BDL	BDL	BDL

Table 3-9

Summary of Volatile Organic Compounds Present in Lagoon Soil Borings* (continued)

Depth (ft)	0-2	4-6	8-10	8-10	14-16
Sample No.	1R	3R	5R	5D	8R
Boring BSB-5					
Vinyl Chloride	BDL	7J	BDL	BDL	BDL
Methylene Chloride	18B	10B	7B	7B	5B
Acetone	28B	45B	47B	67B	13B
Carbon Disulfide	3J	BDL	BDL	BDL	BDL
1,1-Dichloroethane	40	25	4J	BDL	13
1,2-Dichloroethene (total)	20	BDL	7	BDL	24
2-Butanone	BDL	11	BDL	11	4J
1,1,1-Trichloroethane	BDL	BDL	2J	BDL	BDL
Trichloroethene	29	5	7	BDL	85
Benzene	BDL	BDL	BDL	BDL	BDL
Toluene	BDl	BDL	1J	BDL	BDL
Chlorobenzene	5	BDL	BDL	BDL	BDL
Ethylbenzene	BDL	BDL	BDL	BDL	BDL
Xylene	BDL	BDL	BDL	BDL	BDL
	BDL	4J	BDL	BDL	BDL

Depth (ft)	0-2	4-6	8-10	12-14
Sample No.	1R	3R	5R	8R
Boring BSB-6				
Vinyl Chloride	BDL	BDL	BDL	BDL
Methylene Chloride	24B	20B	6B	8B
Acetone	23B	370B	21B	18B
Carbon Disulfide	BDL	4J	BDL	BDL
1,1-Dichloroethane	BDL	70	10	5
1,2-Dichloroethene (total)	44	8	2J	BDL
2-Butanone	10	110		4J
1,1,1-Trichloroethane	BDL	BDL	6J	BDL
Trichloroethene	13	12	BDL	3J
Benzene	BDL	BDL	3J	BDL
Toluene	BDL	3J	BDL	1J
Chlorobenzene	BDL	6	BDL	BDL
Ethylbenzene	BDL	2J	BDL	BDL
Xylene	BDL	BDL	BDL	BDL
			BDL	

Table 3-9

Summary of Volatile Organic Compounds Present in Lagoon Soil Borings* (continued)

Depth (ft)	0 - 2	4 - 6
Sample No.	1R	3R
Boring SSB-1		
Vinyl Chloride	BDL[3]	BDL
Methylene Chloride	10B[5]	5B
Acetone	8JB[4]	33B
Carbon Disulfide	BDL	BDL
1,1-Dichloroethane	BDL	1J
1,2-Dichloroethene (total)	BDL	BDL
2-Butanone	4J	7J
1,1,1-Trichloroethane	BDL	BDL
Trichloroethene	BDL	BDL
Benzene	BDL	BDL
Toluene	BDL	BDL
Chlorobenzene	BDL	BDL
Ethylbenzene	BDL	BDL
Xylene	BDL	BDL

Depth (ft)	0 - 2	4 - 6
Sample No.	1R	3R
Boring SSB-2		
	BDL[3]	BDL
Vinyl Chloride	18B[5]	11B
Methylene Chloride	9JB[4]	42B
Acetone	BDL	BDL
Carbon Disulfide	BDL	6
1,1-Dichloroethane	BDL	16
1,2-Dichloroethene (total)	3J	8J
2-Butanone	BDL	2J
1,1,1-Trichloroethane	2J	10
Trichloroethene	BDL	BDL
Benzene	BDL	1J
Toluene	BDL	BDL
Chlorobenzene	BDL	BDL
Ethylbenzene	BDL	BDL
Xylene		

Table 3-9

Summary of Volatile Organic Compounds Present in Lagoon Soil Borings* (continued)

Depth (ft)	0 - 2
Sample No.	1R
Boring SSB-3	
Vinyl Chloride	BDL[3]
Methylene Chloride	15B[5]
Acetone	7JB[4]
Carbon Disulfide	BDL
1,1-Dichloroethane	BDL
1,2-Dichloroethene (total)	17
2-Butanone	5
1,1,1-Trichloroethane	4J
Trichloroethene	12
Benzene	BDL
Toluene	BDL
Chlorobenzene	BDL
Ethylbenzene	BDL
Xylene	BDL

*Compounds not listed were below detection limits.

Notes: Concentrations presented in parts per billion.
BDL = Below detection limit.
J = Present below detection limit.
B = Present in blank as well as the sample.

Table 3-10

Results for Lagoon Well Groundwater Quality Sampling (mg/L)

	MCL	L-1	L-2	L-3	L-4	L-5
Chromium (Cr)	0.1					
05/89		0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
08/89		0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
11/89		0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
02/90		0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
05/90		0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
08/90		0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
11/90		0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
02/91		0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
05/91		0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
08/91		0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
11/91		0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
02/92		0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
05/92		0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Cadmium (Cd)	0.005					
05/89		0.0040 U	0.0040 U	0.0040 U	**0.0040**	0.0040 U
08/89		0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U
11/89		0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U
02/90		0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U
05/90		0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U
08/90		0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U
11/90		0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U
02/91		0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U
05/91		0.0040 U	0.0040 U	0.0040 U	0.0040 U	0.0040 U
08/91		0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U
11/91		0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U
02/92		0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U
05/92		0.0050 U	0.0050 U	0.0050 U	0.0050 U	0.0050 U
Lead (Pb)	0.05					
05/89		0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U
08/89		0.0100 U	0.0100 U	**0.0046**	0.0020 U	0.0020 U
11/89		0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U
02/90		0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U
05/90		0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U
08/90		0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U
11/90		0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U
02/91		0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U
05/91		0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U
08/91		0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U
11/91		0.0020 U	0.0020 U	**0.0044**	0.0020 U	0.0020 U
02/92		0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U
05/92		0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U

0.0020 U indicates that the compound was not detected at the detection limit of 0.0020 mg/L.

well L-4 in May 1989. Lead was detected twice, at a concentration of 0.004 mg/L in well L-3 in August 1989 and November 1991.

The L-wells were sampled for dissolved metals and VOCs. The results for the 1989 and 1990 sampling are listed in Table 3-11. Total dissolved metals concentrations ranged from nondetected (ND) to 0.2432 mg/L. The VOCs commonly detected were TCE, 1,1,1-TCA, 1,2-DCE, 1,1-DCA, and vinyl chloride. The two wells with the highest concentrations of VOCs were wells L-2 and L-5 with average concentrations of 244 and 205 ppb, respectively. Concentrations in wells L-1 and L-4 averaged 176 and 54 ppb, respectively. Well L-3 had 1 to 2 ppb of methylene chloride.

3.5 NATURE AND EXTENT OF CONTAMINANTS OF CONCERN

This subsection will discuss the results presented in Subsection 3.4 and their effects on the closure of the surface impoundment. This discussion forms the technical basis for the selection of the appropriate closure methodology.

3.5.1 Description of Contaminants of Concern

The investigation performed by WESTON verified the presence of the contaminants found in the previous investigations performed at this site. The contaminants found during this study can be categorized into two subsets: organics and inorganics.

3.5.1.1 Organic Compounds

The VOCs found in the sludges and subsurface soils of the lagoon are present at very low concentrations. The maximum concentration of 140 ppb of TCE was detected. The concentrations of detected compounds presented in Table 3-9 of the previous subsection range from nondetectable to 140 ppb. The two compounds detected most frequently and with the highest concentrations are 1,2-dichloroethene and trichloroethene (TCE). The second most frequently detected compounds were 2-butanone and 1,1-dichloroethane. The

Table 3-11

L-Well Analytical Results

Date	L-1	L-2	L-3	L-4	L-5	Total
5/11/89						
Total VOCs	229	173	ND	29	202	722
Total Dissolved Metals	ND	ND	ND	0.1615	0.063	0.2245
8/11/89						
Total VOCs	234.2	56	ND	129.4	257	676
Total Dissolved Metals	ND	ND	0.0046	0.12	ND	0.1246
11/14/89						
Total VOCs	257	42.9	1.0	95.7	120	516.6
Total Dissolved Metals	ND	ND	ND	0.121	.0635	0.1845
2/8/90						
Total VOCs	298	176	1	29	202	706
Total Dissolved Metals	0.0051	ND	ND	0.1684	.0654	0.2389
5/8/90						
Total VOCs	119	452	ND	33	155	759
Total Dissolved Metals	0.0173	ND	ND	0.165	0.0609	0.2432
8/9/90						
Total VOCs	122	198	2	78	236	636
Total Dissolved Metals	ND	ND	ND	0.132	0.0584	0.1904
11/9/90						
Total VOCs	166.7	151	ND	79	241	637.7
Total Dissolved Metals	0.0064	ND	ND	0.135	0.0647	0.2061

Notes: ND indicates none detected; VOCs measured in ppb; total dissolved metals measured in $\mu g/L$.

frequencies at which the organic compounds were detected are presented in Table 3-12. Vinyl chloride and carbon disulfide were detected in less than 5% of the samples and, therefore, will be disregarded in accordance with EPA guidance. Benzene, toluene, xylene, and ethylbenzene (BTXE) were detected below 5 ppb.

The organic compounds detected in and beneath the lagoon represent residual concentrations of trace solvents that may have entered through the plant wastewater. The chlorinated hydrocarbons and 2-butanone are common industrial solvents. These compounds are characterized as being volatile and mobile. It should be noted that these compounds have been found in the groundwater beneath the site. The groundwater assessment being performed by WESTON will address the presence of these compounds. At this time, WESTON feels the lagoon is not the primary source of organic contaminants in the groundwater because the concentrations of the organic contaminants in other on-site monitoring wells (Table 3-13) are significantly higher than the concentrations in the lagoon wells (Table 3-11).

3.5.1.2 Inorganic Compounds

The analyses of the sludges and subsurface soils for the heavy metals indicate three metals are present in elevated concentrations in the sludge and some subsurface soils. These metals are cadmium, chromium, and lead as indicated by previous investigations of this lagoon. Cyanides were not observed above the analytical detection limit. These metals occur naturally in the environment and as different compounds or forms and may have varying mobility based on environmental factors.

Cadmium concentration in soil is influenced by soil organic matter, iron, manganese, aluminum hydrous oxides, and reduction-oxidation (redox) potential. At lower pH values, exchange reactions control the removal of cadmium that is bound as hydrous oxides from solution, while at higher pH values, the formation of cadmium hydroxide [$Cd(OH)_4$] controls the equilibrium concentration of cadmium that is available. Organic matter has been proposed by Frost and Griffin (1977) as indirectly influencing cadmium retention in soil

Table 3-12

Frequency of Detects of Organic Compounds in Sludges and Subsurface Soils

Compound	Number of Detects*	Total
Vinyl Chloride	1	26
Methylene Chloride	4	26
Carbon Disulfide	1	26
1,1-Dichloroethane	14	26
1,2-Dichloroethene (total)	16	26
2-Butanone	11	26
Trichloroethylene	20	26
Chlorobenzene	2	26

*Data do not include estimated values or those detects that were also detected in blanks.

Table 3-13

Total VOC Concentrations for Selected Monitoring Wells at EKCO Housewares (December 1988)

Well	Total VOCs (ppb)
D-4-39	276,393
W-10	4,042
R-1	1,424
R-2	3,250
I-2	1,185

through its contribution to cation exchange capacity over a pH range of 3 to 9. Under reducing conditions, precipitates of cadmium sulfide occur in the presence of adequate sulfide ions.

Adsorptive type mechanisms are the dominant means of controlling cadmium retention in soil, except when cadmium concentrations in waste leachate are high. Then, precipitation probably becomes the controlling factor. Stones, Sommers, and Silviera (1976) concluded that the order of prevalent forms of cadmium in soil are:

Carbonates > Sulfides = Organic Complexes > Adsorbed = Exchangeable

This order would indicate that the effect of pH on cadmium retention in soil is the production and maintenance of the insoluble hydroxides and carbonates of cadmium. Lead is present in soils as Pb^{2+}, which precipitates easily as lead sulfite, hydroxides, and carbonate. Lead is also readily adsorbed on clay surfaces and on aluminum silicates (Fuller, 1977).

The availability of lead in soils is related to moisture content, soil pH, organic matter, calcium, and phosphates. As soil pH increases, lead is precipitated as lead hydroxide, carbonate, and phosphate. Organometallic complexes are formed with organic matter. Increasing pH and Ca^{2+} availability provides competition with the Pb^{2+} for exchange sites on the soil.

Chromium may exist in the hexavalent form (Cr^{6+}) as chromate or as dichromate and as trivalent chromium (Cr^{3+}). Hexavalent chromium is toxic and quite mobile in a soil system. Overcash and Pal (1979) reported that in an anaerobic soil, hexavalent chromium is quickly converted to the less toxic trivalent chromium, which is quite immobile. The trivalent chromium precipitates from pure solutions as hydroxy-oxides of varying degrees of hydration. Trivalent chromium may be retained in soils by adsorption on soil surfaces, complexation with organic matter, and coprecipitation as minor constituents with other metals such as iron and aluminum.

3.5.2 Distribution of Contaminants of Concern

3.5.2.1 Organic Compounds

The distribution of organic compounds in and beneath the lagoon as characterized by the six bottom soil borings indicate that the contaminants are present at a depth of 16 ft below the present-day lagoon surface. Table 3-14 presents the total volatile organics in these borings. However, these results may be misleading because the soil samples were collected in the water table and may represent the presence of these compounds in both the groundwater and in the subsurface soils.

3.5.2.2 Inorganic Compounds

The analytical results of the sludges and subsurface soils indicate a high degree of variability in the concentrations of cadmium, chromium, and lead. The range of concentrations indicated by this study are:

Metal	Range of Concentration (ppm)
Cadmium	< 0.37 to 8370
Chromium	4.52 to 923
Lead	13 to 25,000

Because of the variability of these metals, it is appropriate to discuss the distribution of these metals in terms of differences in ranges occurring at different depths below the surface of the lagoon.

In reviewing the soil boring descriptions and the ranges of concentrations indicated by the chemical analyses, a depth of approximately 8 ft demonstrates where the range of concentrations of chromium, cadmium, and lead and soil description change. The change in range of concentrations is presented in Table 3-15. From this table a decrease of at least one order of magnitude can be observed at the 8-ft depth. Sludge material is generally present to a depth of 8 ft. However, it should be noted that spacial variation in this depth

Table 3-14

Distribution of Total Volatile Organic Compounds*
in the Bottom Soil Borings

Depth (ft)	Soil Boring					
	BSB-1	BSB-2	BSB-3	BSB-4	BSB-5	BSB-7
0 - 2	17	119	211	68	94	67
4 - 6	6	38	38	16	41	206
8 - 10	18	8	172	130	14	10
14 - 16	N.S.	15	25	268	122	5

*Total volatile organics DO NOT include estimated values or values noted as present in blank.

Notes: N.S. = No Sample. Concentrations are in ppb.

Table 3-15

Comparison of Ranges of Metals Occurring Beneath the Lagoon

Soil Boring	Depth (ft)	Cadmium	Chromium	Lead
BSB-1	0 to 8 8 to 12	6.7 to 215 0.56 to 16.1	17 to 295 4.74 to 61.5	38 to 900 42 to 91
BSB-2	0 to 8 8 to 16	0.38 to 1,370 <0.40 to 84.6	8.92 to 405 6.81 to 8.72	20 to 5,100 32 to 320
BSB-3	0 to 8 8 to 16	<0.38 to 1,370 <0.40 to 84.6	152 to 527 4.44 to 15.2	36 to 13,000 13 to 56
BSB-4	0 to 8 8 to 16	<0.37 to 1,560 <0.375 to 13.4	4.52 to 354 10.2 to 16	22 to 1,400 36 to 93
BSB-5	0 to 8 8 to 16	282 to 8,320 0.46 to 14.3	226 to 923 8.4 to 24	1,100 to 25,000 18 to 70
BSB-6	0 - 8 8 - 16	3.52 to 5,400 5.2 to 53.4	8.43 to 743 6.1 to 12.6	29 to 18,000 42 to 180

Note: Concentrations in ppm.

can be seen from one boring to another. A maximum depth of approximately 10 ft occurs in the area of BSB-2 and BSB-6. This may be a result of the absence of the clay layer beneath the southeastern corner of the lagoon and the presence of fill material, which may itself have elevated metals concentrations due to the cinder content.

3.6 DETERMINATION OF CLEAN LEVELS FOR SOILS

A clean level for lead, chromium, and cadmium contamination in the soil was determined following the statistical procedure outlined in OEPA's *Closure Plan Review Guidance* (May 1991). The procedure requires that the two populations being compared (closure area versus background) are normally distributed. The closure area population consisted of 42 lagoon soil sampling points, while the background population consisted of 28 fill soil sampling points. Lead, chromium, and cadmium populations were analyzed individually. Probability plots and the Kolmogorov-Smirnov (KS) test with Lilliefors critical values (Lindgren, 1978) were used to evaluate the normality of all the populations. The results indicated that none of the populations was normally distributed. Consequently, various transformations ($x^{0.5}$, $x^{0.25}$, $\ln(x)$) were applied to the populations in an effort to normalize them. As with the untransformed populations, probability plots and the KS test with Lilliefors critical values were used to evaluate the fit of the transformed distributions to the normal distribution. Only the lognormal distribution ($y = \ln(x)$) adequately transformed all the populations to normality.

Unfortunately, it is difficult to interpret or apply the results of the statistical analysis when left in the transformed (lognormal) scale. Statistical quantities such as means, variances, standard deviations, and confidence intervals calculated in the transformed scale result in misleading estimates when they are transformed back into the original scale. Therefore, specific estimation procedures for the lognormal distribution were followed in evaluating the transformed populations. The means, variances, standard deviations, and confidence intervals for each population were estimated using probability plots and the methods outlined by Gilbert (1987). The upper 95% confidence intervals (0.975 quantiles) for lead, chromium, and cadmium contamination in the background (fill) soil are summarized in Table 3-16. These will be the concentrations for determining that clean closure has been achieved. Analytical data, probability plots, data tables, and sample calculations used to derive these confidence intervals are presented in Appendix I.

Table 3-16

Upper 95% Confidence Interval for Fill Soil (mg/kg)

Constituent	95% Confidence Interval
Cadmium	3.7
Chromium	91.0
Lead	700.0

SECTION 4

CLOSURE PLAN

4.1 PURPOSE AND SCOPE

This section presents the proposed clean closure method for the lagoon. This section also contains the other requirements of a closure plan, including health and safety, closure period, closure cost estimates, and certification.

Subsection 4.2 presents the approach to the closure. Subsection 4.3 presents the specific regulatory requirements for the closure of a surface impoundment in accordance with RCRA. Subsection 4.4 presents a proposed closure method to achieve clean closure based on the available site characterization information. Subsection 4.5 discusses the requirements of a health and safety plan and decontamination procedures during closure. Subsection 4.6 discusses the closure period and schedule for closure. Subsections 4.7 and 4.8 present a closure cost estimate and the approach to certification of the closure, respectively.

4.2 APPROACH

The clean closure of the EKCO surface impoundment is based on the site characterization presented in the preceding section. Closure of the lagoon will be performed in a manner that will minimize future environmental impacts from the facility. Environmental impacts may potentially occur through the following pathways:

- Air emissions.
- Leaching of contaminants into groundwater.
- Migration of waste and/or waste constituents via surface water runon and runoff.
- Direct contact.

The closure method presented in this closure plan will effectively negate these pathways. This closure method will include stabilization within the footprint of the lagoon, followed by the removal of the stabilized waste materials with off-site disposal. Table 4-1 presents how this closure will affect each of these pathways.

4.3 REGULATORY REQUIREMENTS

4.3.1 Applicable Regulations and Standards

As discussed in Section 1, the lagoon is classified as a hazardous waste surface impoundment because characteristic hazardous wastes have been identified in the lagoon and the lagoon was in operation after the effective date of the RCRA regulations. This closure plan is written as required by OAC 3745-66-10 through -20, OAC 3745-67-20 through -30, and OAC 3745-68-10. To achieve clean closure, all waste residues, contaminated subsoil, and structures contaminated with waste and leachate will be removed.

The following subsections address compliance with these requirements or standards.

4.4 METHOD OF CLOSURE

The closure of this surface impoundment will include the in situ stabilization of sludges and subsoils to a depth of 4 ft to render the waste nonhazardous. All material will be excavated to a depth of 8 ft and transported off-site for disposal as a solid waste. The intent of this closure method is to excavate the waste material in order to remove all waste, system components, and contaminated soil above the clean levels developed in Subsection 3.6.

The following steps will be used to close the lagoon:

- Remove parts of the fence around the lagoon to facilitate equipment access.
- Stabilize material within the base of the lagoon in approximately 15-inch lifts through addition of stabilizing agents to a depth of 4 ft.

Table 4-1

Migration Pathway Disruption

Pathway	Performance
Air Emissions	Removal of waste constituents will effectively negate this pathway.
Leaching of Constituents into Groundwater	Removal of waste constituents followed by replacement with clean fill will eliminate quantity of waste material that could leach into groundwater.
Migration of Waste and/or Waste Constituents by Way of Surface Water	Removal of waste constituents followed by replacement with clean fill will eliminate contact of the waste material with surface water.
Direct Contact	Removal of waste constituents followed by replacement with clean fill will eliminate incidental contact by humans or animals with the waste material.

- Excavate treated soils and dispose off-site as a solid waste.
- Following removal of treated soils, sample base excavation to verify removal of the hazardous waste.
- Remove soil to a total depth of 8 ft.
- Sample and excavate base and sidewalls of excavation until all meet closure criteria.
- Regrade existing berm into excavation.
- Import clean backfill as required.
- Continue groundwater quality assessment program described in Subsection 3.3.3.2.

4.4.1 Stabilization

4.4.1.1 Summary of Treatability Study

A treatability study of sludge collected from the lagoon was performed from February through May 1990. In the study, six treatment formulations were examined. The TCLP metals results for four of the six formulations were less than the values for a characteristic hazardous waste. The results of the treatability study are summarized in Table 4-2. The vendors whose formulations meet treatment requirements were:

- Enreco, Inc. (Enreco) of Cincinnati, Ohio.
- Williams Environmental Services, Inc. (WES), formerly Harmon Environmental Services, Inc. (Harmon), of Plymouth Meeting, Pennsylvania.
- Silicate Technology Corporation (STC) of Scottsdale, Arizona.

The Enreco Soil Stabilization system stabilizes waste in situ to a depth of 1.5 ft. Upon completion of one layer, a bulldozer removes the stabilized material, allowing treatment of the next lift. This process is repeated until the entire contents of the lagoon have been stabilized. This system can stabilize an estimated 600 yd^3 per day. This process will produce a soil-like material, which will pass TCLP criteria within 3 days of curing. Within

Table 4-2

Comparison of Untreated and Treated Soil TCLP Metals Concentrations with the Maximum Allowable Concentrations

Parameter	Total Metals Concentration in TCLP Extract, milligrams per liter[a]							
	Untreated Soil[b]	Enreco		Harmon AHG	STC 1327	WESTON		Maximum Allowable[c]
		A	B			1	2	
Silver	0.030U	0.030U	0.030U	0.030U	0.030U	0.030U	0.030U	5.0
Arsenic	0.016U	0.016U	0.016U	0.016U	0.016U	0.016U	0.016U	5.0
Barium	0.77	0.43	0.78	0.47	0.44	0.43	0.68	100
Cadmium	4.9	0.0040U	0.0040U	0.0040U	0.0052	6.6	1.7	1.0
Chromium	0.020U	0.060	0.079	0.140	0.098	0.020U	0.140	5.0
Mercury	0.0010U	0.0010U	0.0010U	0.0010U	0.0010U	0.0010U	0.0010U	0.2
Lead	0.050U	0.050U	0.050U	0.050U	0.050U	0.050U	0.050U	5.0
Selenium	0.039	0.050	0.051	0.041	0.029	0.039	0.062	1.0

[a]U - indicates compound was analyzed for but not detected
[b]Average results of triplicate soil samples collected from a mixed composite sample representing the site.
[c]40 CFR 261.24(b)

Note: NA = not applicable

1 day the material is sufficiently cured to support heavy equipment. This process is not affected by weather with the exception of subfreezing temperatures.

STC presented the option of treating the lagoon sludge and soils in cement mixing trucks. With STC's technology a wet, concrete-like slurry is formed. The treated waste would pass TCLP by the end of mixing. If cement mixing trucks were used, a processing rate of 80 yd^3 per truck per day could be reached.

The WES treatment process produces a clay-like soil material that will meet TCLP requirements after curing for 3 days. WES recommended their Harmon HSS™ stabilization system. The HSS™ is a dozer-mounted high energy mixing system that uses a 265-horsepower engine to drive two front-mounted mixers. With this system 400 yd^3 daily of waste can be stabilized per day.

The detailed results of this stabilization study are contained in WESTON's June 1990 report, *Evaluation of Stabilization Processes for Closure of the Surface Impoundment at the EKCO Housewares, Inc. Massillon, Ohio, Facility.* The stabilization process that will be used is based on Enreco's soil stabilization technology.

4.4.1.2 Stabilization Chemistry

The sludge in the EKCO lagoon is a classified as a D006 waste. Stabilization treatability studies have indicated that mixing the waste with a stabilization reagent (portland cement) mix ratio of 15% by weight will result in a stabilized waste meeting project objectives (< 1.0 ppm, TCLP-Cd). Portland cement contains 62% cadmium oxide with the remainder being composed of silicon, aluminum, ferric, magnesium, and sulfur oxides.

Two actions in the stabilization process serve to reduce the leachability of the cadmium. The stabilization process includes a reaction involving the portland cement, cadmium, and water. Calcium oxide present in the portland cement reacts with available cadmium and

water to produce calcium hydroxide and cadmium hydroxide, an insoluble salt in alkaline conditions. This reaction is presented below:

$$CaO + Cd + H_2O \rightarrow CdOH + CaOH$$

The addition of portland cement increases the pH of the waste material, which reduces the solubility of cadmium hydroxide. The introduction of portland cement further reduces the mobility of cadmium through a microencapsulation process in which the cadmium is bound into a cement matrix.

4.4.1.3 On-Site Stabilization

Stabilization of sludges and subsoils will be performed to render all waste materials nonhazardous prior to off-site disposal. Soils and sludges will not be removed from the footprint of the lagoon until sampling results indicate that the material is not hazardous waste.

The closure activities will begin with mobilization of all personnel and equipment. Following mobilization, support facilities, including a trailer for project administration and one for QA/QC activities, will be sited. All portions of the fence surrounding the lagoon, necessary to permit equipment access, will be removed. In addition, any small trees and brush material will be removed. The vegetation will be grubbed using a bulldozer and removed for off-site disposal. All roots, however, will be treated during stabilization. As part of site preparation, all existing influent and drainage pipes will be removed from the lagoon. No wells will be removed as part of site preparation.

During all site activities, organic vapor levels in the work area will be monitored with a portable photo ionization detector (HNu). If an instrument response of 5 ppm is registered, work activities will cease. Work activities will not commence until an instrument response reading of 1 ppm or less is registered for 10 minutes.

After the site has been prepared, Enreco will begin stabilizing the waste with the Enreco Soil Stabilizer. The Enreco Soil Stabilizer is used to incorporate reagents with contaminated soils at a very shallow depth. The system allows for the stabilization of material in lifts as deep as 18 inches.

The reagent, portland cement, can either be applied to the surface of the waste using a loader or can be blown directly into the mixing chamber of the soil stabilizer. Once the reagent is distributed onto the surface of the waste, the Soil Stabilizer mixes and blends the reagent and waste in parallel strips approximately 10 ft wide. As the Soil Stabilizer passes over the reagent-covered, contaminated soil, the tilling blades cut the ground and pull the reagent and soil into the mixing chamber, where they are thoroughly blended together. The strips of processed waste are readily recognizable from adjacent areas by physical appearance (texture and color). The Soil Stabilizer overlaps its previous pass by 6 to 12 inches to ensure proper mixing.

Enreco will stabilize the lagoon following the approximate east-west pattern shown in Figure 4-1.

After reagents have been applied and homogeneously mixed into the waste, Enreco will use a bulldozer to remove the upper 15 inches of the stabilized lift. Stabilization and removal will occur until 4 ft of soil has been excavated. This will ensure that no hazardous waste is removed from the lagoon, and that the surface of the lagoon is always clean.

The bulldozer will move the treated material to the southwestern end of the lagoon where the material will be stockpiled on the lagoon sidewall prior to sampling.

After treatment of hazardous waste is completed, 3 days are needed to allow the material time to cure sufficiently to be rendered nonhazardous. Once the material is stabilized, TCLP testing will be performed before removing the stockpiled sludge to confirm that the stabilized material is nonhazardous. Sampling requirements are presented in Subsection 4.4.1.4.1. The stabilized material will then be removed and sent off-site to the selected solid waste disposal facility.

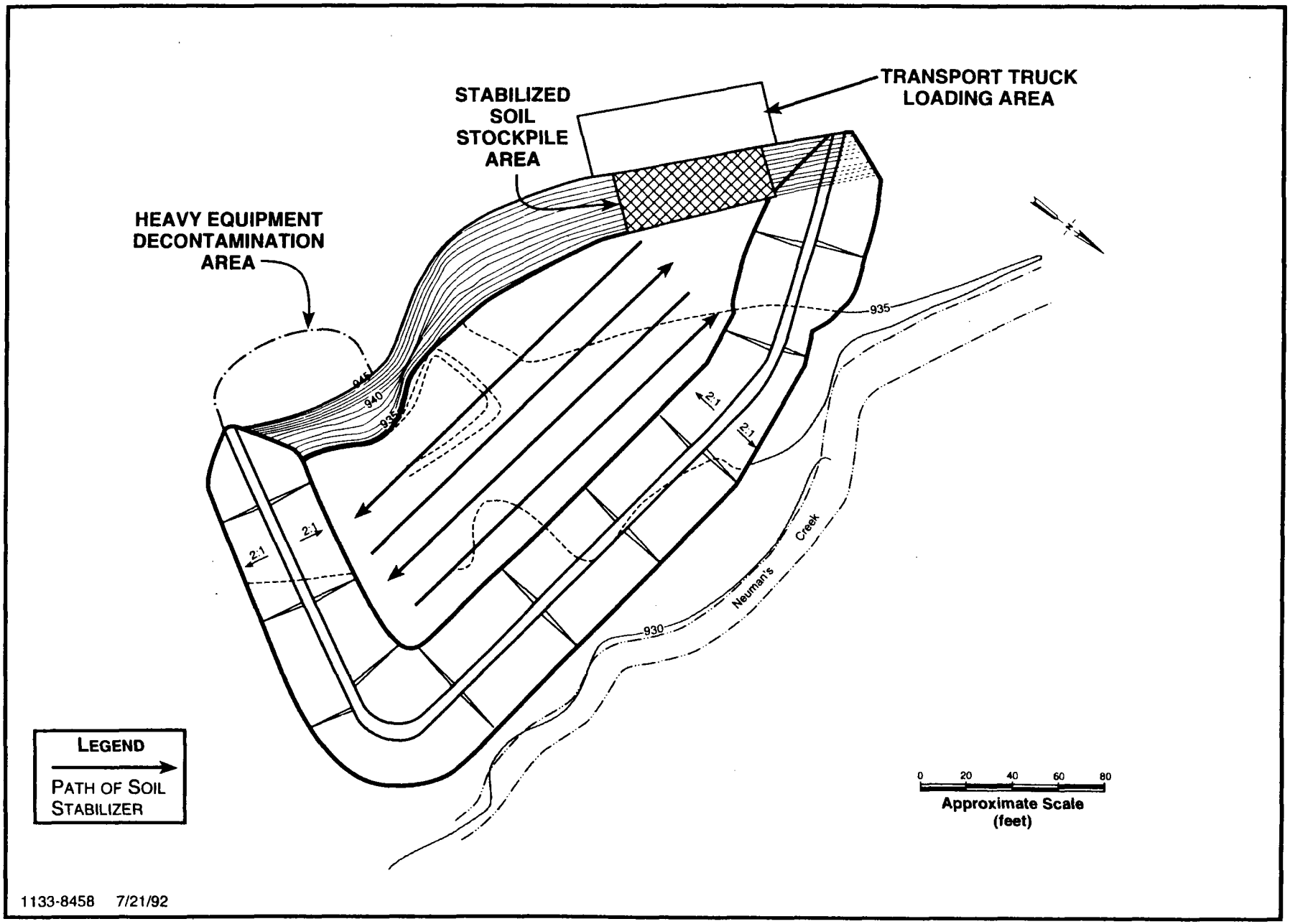

FIGURE 4-1 SOIL STABILIZER PATH

Following removal of the stabilized material, soil sampling will be performed to either confirm that the remaining soil is nonhazardous and may be removed without stabilization, or to indicate that the soil is hazardous and further stabilization is required. If further stabilization is required, the material will be regraded onto the lagoon surface and treated as before. Sampling and analyses of soil samples collected during this phase will be as discussed in Subsection 4.4.1.4.2.

Once all hazardous waste is removed from the base of the lagoon, excavation (without stabilization) will proceed to remove all soil to a total depth of 8 ft. Soil excavated during this phase will be stockpiled against the sidewall within the footprint of the lagoon at the southwestern end for transport to the selected solid waste facility.

Following excavation of the soil, confirmatory sampling of the base and sidewalls can occur. The requirements for confirmatory sampling are detailed in Subsection 4.4.1.4.3. Confirmatory sampling will be performed to determine the limits of the excavation.

After the results of the confirmatory samples indicating that the soil samples meet the clean closure objectives are received and approved, backfill operations can begin. The backfill material to be used will be sampled and analyzed as discussed in Subsection 4.4.1.4.4. Backfill will be extended to final grades that will provide for positive drainage of surface water. The grading plan is shown in Figure 4-2. The fill material will be placed in 6 to 9-inch lifts. Each lift will be compacted to 85% Standard Proctor density and scarified before the next lift is placed.

Topsoil will be placed over the compacted fill and the area revegetated with crown vetch or equivalent.

After the vegetative cover is installed, equipment and personnel will be demobilized.

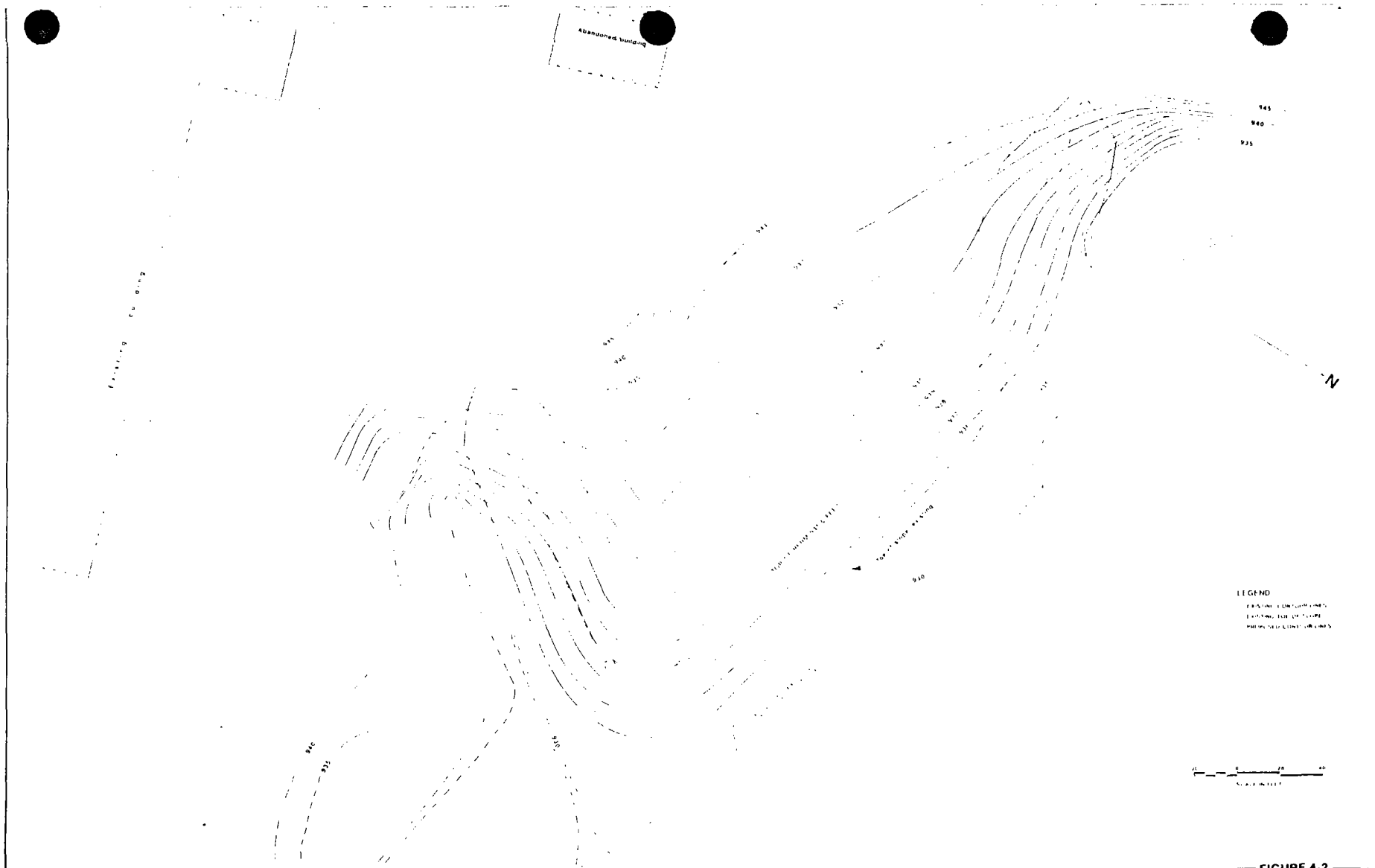

FIGURE 4-2

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4.4.1.4 Sampling and Analysis

The sampling and analysis program is divided into three phases. The goal of the first phase of sampling and analysis is to confirm sufficient treatment of the stockpiled lagoon sludges and subsoils. The second phase of sampling and analysis will be performed to verify that exposed soil after the initial 4-ft excavation is not a hazardous waste. The third phase of sampling will be performed to confirm that the vertical and horizontal extent of contamination has been removed. In the fourth phase sampling and analysis will be performed to identify a source of clean fill. Sampling, analytical, and quality assurance/ quality control (QA/QC) procedures that will be used during closure activities are detailed in Subsection 4.5.2.

4.4.1.4.1 Verification of Treatment

Following stabilization, three samples from each 500 yd^3 of stockpiled, stabilized material will be collected by the QA/QC technician, placed in individual 2-inch plastic cube molds, and covered to prevent air drying. Once the material has cured, it will be tested with a pocket penetrometer to ensure the compressive strength requirements of 14 psi are being achieved. The material will also be tested for density. If the first sample from a given 500 yd^3 area is found to meet the strength specification, then that batch will be considered suitable by the Enreco QA/QC technician. Should the first sample fail, the second and third samples will be tested. If both the second and third samples pass, the first sample will be disregarded. However, should either the second or third sample also fail, the area will be declared unfit, and steps to strengthen that area, such as adding more reagent, will be recommended.

After testing the treated samples for strength and density, the QA/QC technician will combine the three samples from each 500 yd^3 area. The composite sample will be extracted according to the Toxicity Characteristic Leaching Procedure (TCLP) (EPA Method 1311) to ensure the leachate meets D006 (cadmium) requirements. Material that does not meet these requirements will be regraded onto the surface of the lagoon and retreated.

4.4.1.4.2 Verification of Hazardous Waste Extent

Following removal of the 4 ft of stabilized material from the base of the lagoon, a total of nine grab soil samples will be collected based on a 50-ft by 50-ft grid system. Samples will be analyzed for TCLP cadmium. If results from any grid indicate that the soil at the base of the lagoon contains concentrations of TCLP cadmium exceeding 1 mg/L (in the extract), the soil will be considered hazardous, and an additional 15 inches of soil will be stabilized as discussed in subsection 4.4.1.3 and removed from each grid not in compliance. After this stabilized material has been removed, stockpiled, and sampled as per Subsection 4.4.1.3.1, each grid not previously in compliance will be resampled for TCLP cadmium. Sampling, stabilization, and removal will occur in each grid considered hazardous until sample results indicate that material within all grids is nonhazardous.

4.4.1.4.3 Verification of Extent

Verification samples will be collected from the base and sidewalls of the lagoon to verify that the clean closure criteria have been met in both the horizontal and vertical directions.

The sidewall is herein defined as the planar surface extending from the top of the berm to the base of the excavated area. Two grab samples will be collected from each 50 linear-foot section of the sidewall of the lagoon. A total of approximately 28 samples will be collected from the entire sidewall; this may vary depending on actual field dimensions and site-specific conditions. Approximate locations of sidewall samples are depicted in Figure 4-3. Further details related to sampling methodology are discussed in Subsection 4.5.2 of this Closure Plan. Sidewall samples will be analyzed for total cadmium, chromium, and lead.

Analytical results from sidewall samples will be compared to the clean action levels to determine if the samples meet the following requirements for clean closure:

- Cadmium: 3.7 mg/kg
- Chromium: 91.0 mg/kg
- Lead: 700.0 mg/kg

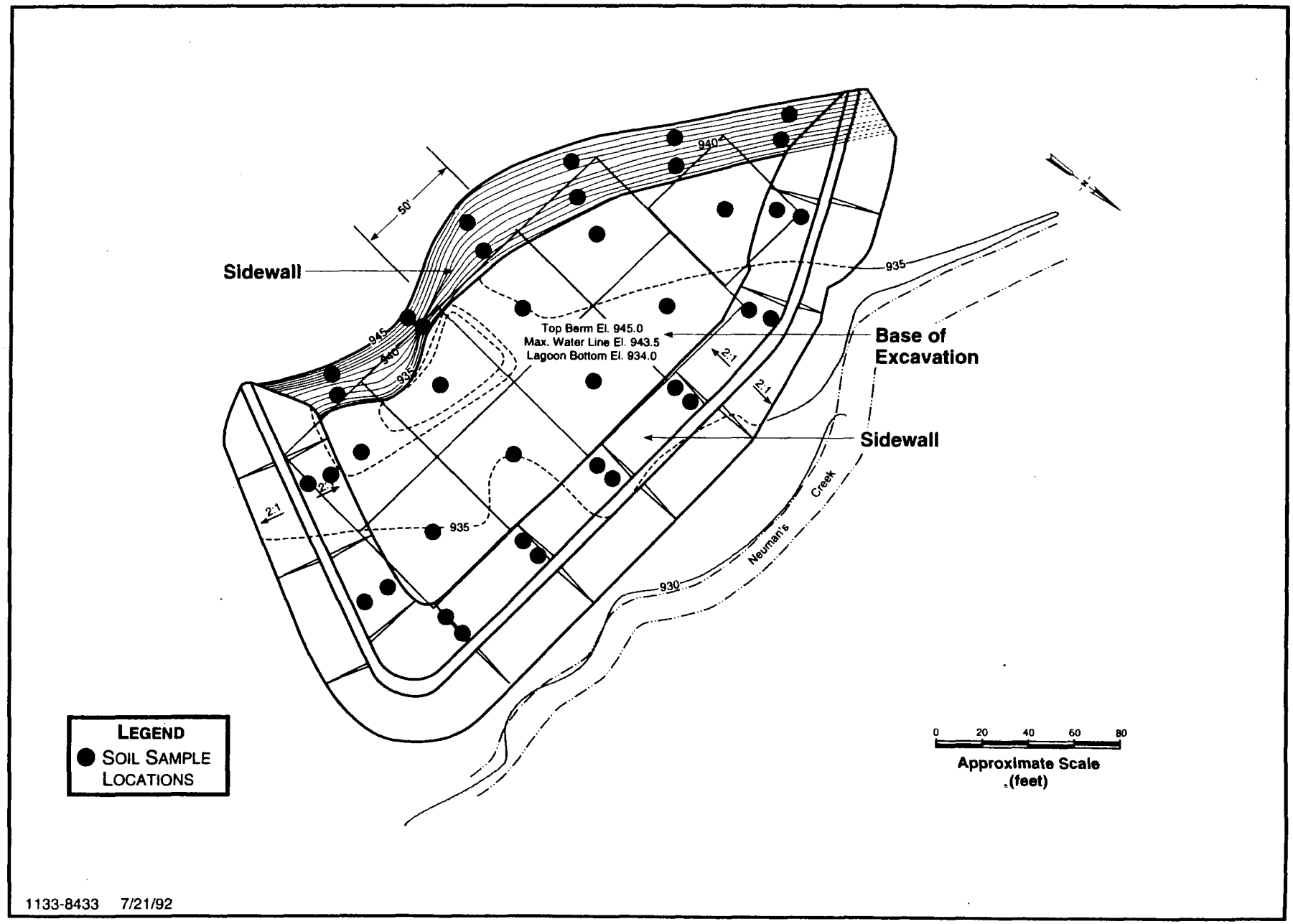

FIGURE 4-3 EXAMPLE VERIFICATION SAMPLING LAYOUT

Further excavation will occur in sidewall areas where samples do not meet the cleanup criteria. An area 50 ft by half the total sidewall height (centered around each sample not meeting cleanup criteria) will be excavated parallel to the sidewall to a depth of 1 ft. Excavation and verification sampling will occur for all sidewall areas not meeting the cleanup criteria until all samples meet the cleanup criteria.

Prior to sampling, the base (footprint) of the lagoon will be excavated to a total depth of approximately 8 ft. Sampling of the base of the lagoon will based on a 50-ft by 50-ft grid system. One grab sample will be collected from each grid as shown on Figure 4-3. The exact sample location will be determined in the field based on field conditions and visual observations present at the time of sampling. A total of approximately nine (9) grab samples will be collected from the base of the excavated area. Further details related to sampling methodology are discussed in Subsection 4.5.2 of this Closure Plan. Samples will be analyzed for total cadmium, chromium, and lead. Analytical results from base sampling will be compared to the clean criteria mentioned above. Grids where sample results indicate the cleanup criteria have not been met will be excavated to a depth of approximately 1 ft; stabilization should not be required because the soil should not be a hazardous waste. Excavation and subsequent verification sampling will proceed in each grid until samples within all grids meet the clean closure criteria.

4.4.1.4.4 Testing of Soils Used as Backfill

Borrow material to be used for fill will be sampled for acceptance. Each separate source of fill, including any soil taken from the existing berm, will be separately sampled and analyzed. The analytical parameters will include the following:

- HSL VOA
- HSL semivolatile organic analysis (BNA)
- HSL pesticides/polychlorinated biphenyls (PCB)
- RCRA metals

4.5 IMPLEMENTATION REQUIREMENTS

4.5.1 Health and Safety Plan

A health and safety plan (HASP) has been prepared for the site to ensure the health and safety of all site personnel during the activities covered by the plan. The HASP presented in Appendix J will be used to direct site activities.

The HASP defines specific procedures and protocols that will be implemented to protect the health and safety of all personnel during the completion of closure activities at the EKCO Housewares site. The plan identifies potential health and safety hazards at the site during the specific site activities and prescribe procedures to minimize effects of the hazards on personnel performing on-site activities. A copy of the HASP will be available at the site. The plan will address chemical and physical hazards.

The HASP includes:

- Personal levels of protection.
- Environmental monitoring
- Contingency plans.
- Emergency contacts.
- Work zone delineation.
- Personnel decontamination procedures.

All subcontractors will be required, at a minimum, to comply with the HASP. In addition, the subcontractors will be required to comply with all pertinent federal, state, and local health and safety standards.

The following information must be supplied to WESTON by each subcontractor:

- A general statement indicating that the subcontractor's health and safety program(s) is in compliance with applicable sections of 29 CFR 1910 and 1926. Specifically, the statement must identify that the subcontractor's employees are aware of, and that the subcontractor is in compliance with, the OSHA standard 1910.120, "Hazardous Waste Operations and Emergency Response."

- A statement indicating that all employees who will or may take part in site operations during the closure activities are enrolled with a medical monitoring program that complies with OSHA.

- A statement indicating that the subcontractor will provide protective equipment for its own employees, and that the equipment is NIOSH/OSHA-approved.

4.5.2 Sample Collection Procedures

Independent of the type of sample to be collected, certain sample collection procedures will be required. First, documentation of sample collection will be maintained in a bound logbook. For each sample, an accurate description of the sample type, location, identification and characteristics will be recorded. The date, time, and the name of the individual collecting the sample will be noted in the logbook.

Following sample collection, sample information will be recorded on the label applied to the laboratory certified clean bottle and on the chain of custody form (see Subsection 4.5.3). This form will accompany the samples to the laboratory and provides documentation of sample custody. Chain-of-custody seals will be placed on each sample container as well as the shipping container to provide documentation that the samples remained unopened during shipment.

Samples will be shipped in such a manner as to maintain their integrity. Samples will be packed in the shipping container with packing material, such as vermiculite, to minimize breakage. Ice will be placed in the shipping container per EPA protocol.

Following sample collection, equipment used for sampling will be decontaminated unless designed for a single use. The goal of decontaminating sampling equipment is to prevent the cross-contamination of materials at one location with materials from another. Outer gloves (latex) worn by sampling personnel will be removed and discarded between samples to minimize the potential for cross contamination of samples by contact with the gloves.

Any solution generated during decontamination of sampling equipment will be sampled and analyzed to determine disposal.

4.5.3 Equipment Decontamination

4.5.3.1 Sampling Equipment Procedures

Soil sampling equipment will be decontaminated prior to arrival on-site. All sampling equipment will be decontaminated between each sample collection using the following sequence:

- Scrub with detergent in potable water.
- Rinse with tap water.
- Rinse with 3% nitric acid.
- Follow with a deionized water rinse.
- Air dry.
- Finish with a deionized water rinse.

Finally, all sampling equipment will be decontaminated prior to removal from the EKCO facility using the procedures outlined above.

4.5.3.2 Construction Equipment Procedures

The locations of the exclusion zone, contamination reduction zone, and support zone are shown in Figure 4-4. Any heavy equipment leaving the exclusion zone will be decontaminated by scraping debris from the surface, followed by a triple-rinse steam cleaning with a high pressure spray wash. Heavy equipment decontamination wash water will be collected and either used for dust control in the exclusion zone, used as liquid for the stabilization process, or sampled and analyzed to determine appropriate disposal.

4.5.4 Sample Custody Procedures

The samples collected during closure activities will be recorded on a chain-of-custody form (Figure 4-5 is an example). Typically, the chain-of-custody documentation is combined with

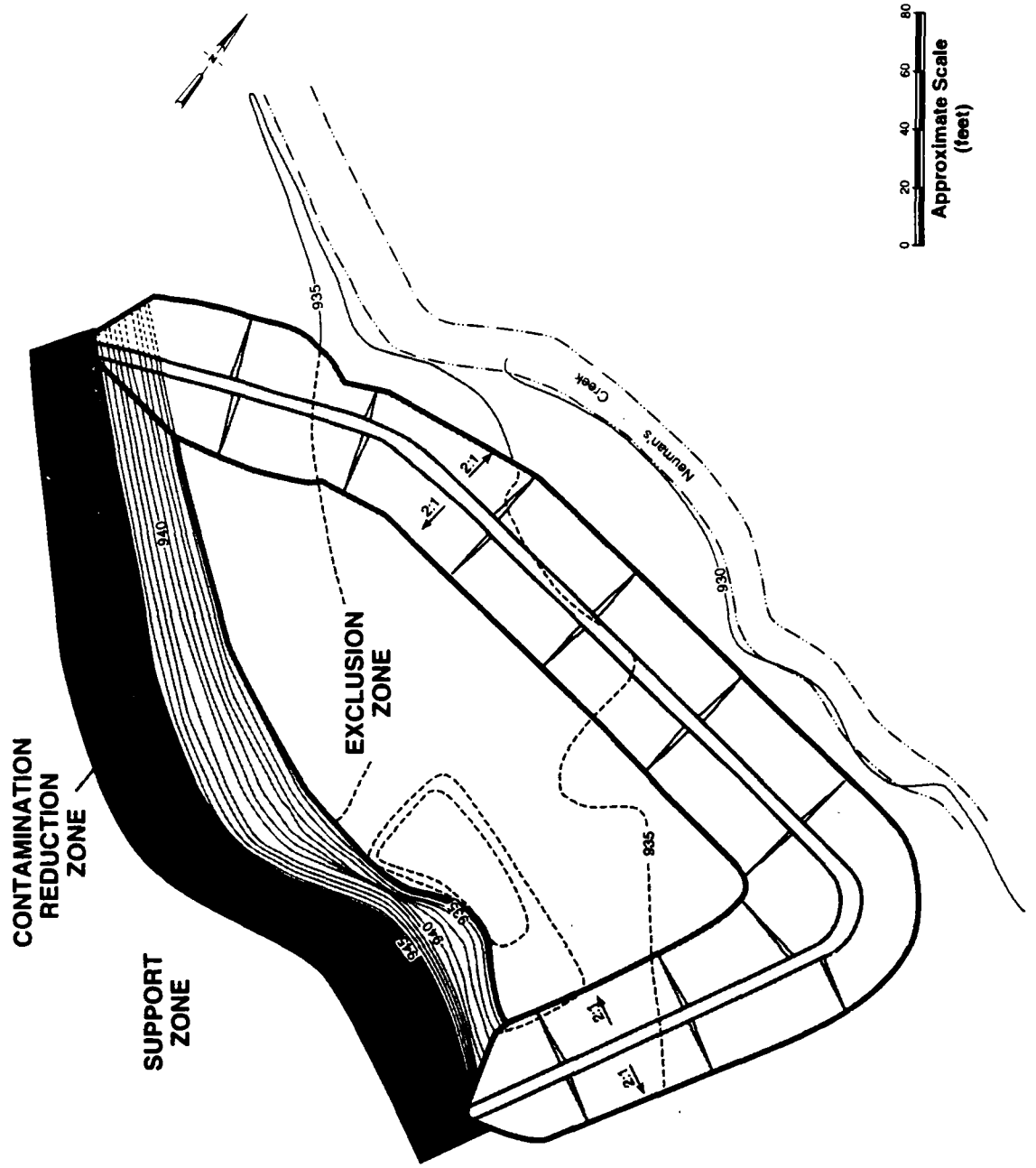

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FIGURE 4-4 EXAMPLE WORK ZONE CONFIGURATION

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJ. NAME (use site code only)
SAMPLERS: (Signature)	

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS							REMARKS

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks:	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

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FIGURE 4-5 EXAMPLE CHAIN-OF-CUSTODY FORM

the laboratory work request (see Figure 4-5) although separate forms may be prepared to serve each function.

Following sample collection, the chain-of-custody form is prepared listing each sample. The samples must remain in the custody of the field team until custody is relinquished. The chain-of-custody record is employed as physical evidence of sample custody. The sampler completes a chain-of-custody record to accompany each sample container shipped from the field to the laboratory.

A sample is considered to be in an individual's custody if the following criteria are met: it is in your possession or it is in your view after being in your possession; or it was in your possession and then locked up or sealed to prevent tampering; or it is in a secured area. Under this definition, the team member actually performing the sampling is personally responsible for the care and custody of the samples collected until they are transferred or dispatched properly. In followup, the sampling team leader reviews all field activities to confirm that proper custody procedures were followed during the field work.

Similar information to that entered on the sample label is recorded on the chain-of-custody record. When relinquishing the samples for shipment, the sampler signs in the space indicated at the bottom of the form, entering the date and time the samples are relinquished. The sampler enters the shipper's name and airbill number under the "Remarks" section on the bottom right of the form.

The custody record is completed using waterproof ink. Any corrections are made by drawing a line through and initialing the error, then entering the correct information. Erasures are not permissible.

The top, original signature copy of the chain-of-custody record is enclosed in plastic and secured to the inside of the shipping container lid. A copy of the custody record is retained for the sampler's files.

Shipping coolers are secured and custody seals are placed across cooler openings. As long as custody forms are sealed inside the sample cooler and custody seals remain intact, commercial carriers are not required to sign off on the custody form.

The laboratory representative who accepts the incoming sample shipment signs and dates the chain-of-custody record to acknowledge receipt of the samples, completing the sample transfer process. It is then the laboratory's responsibility to maintain internal logbooks and records that provide a custody record throughout sample preparation and analysis.

4.5.5 Analytical Procedures

4.5.5.1 Laboratory Certification

Both WESTON's Analytics Division and Enreco's Laboratory may be used to supply analytical support for the closure activities. Both laboratories will be responsible for ensuring the following:

- The laboratory and personnel are qualified to perform assigned tasks.
- Adequate equipment and facilities are available.
- Documentation procedures, including chain-of-custody of samples are implemented.
- Proper analytical methods are being used.
- Adequate analytical quality control is being provided.
- Acceptable data handling and documentation techniques are being used.

4.5.5.2 Sample Containers and Preservation

The types of samples to be collected are soil and water samples. For soil samples, no preservation is required. Suggested sample containers for all samples and preservation for water samples only are provided in Table 4-3. All sample bottles will be laboratory-certified clean. Holding times are provided in Table 4-3.

Table 4-3

Sample Collection and Analytical Information

Parameter	Container[a]		Water Preservation	Analytical Method	Holding Time
	Soil	Water			
HSL VOA	125 mL G	40 mL VOA	HCl	SW-846, 8240, 8010	14 days
HSL BNA	250 mL Amber G	1/2 Gallon Amber G	None	SW-846, 8270	7 days[b]
Selected Metals	250 mL P	1 Liter P	HNO_3	SW-846, 6010, and 7000s	Hg - 28 days Others - 6 months
HSL Pesticides/PCBs	250 mL Amber G	1/2 Gallon Amber G	None	SW-846, 8080	7 days[b]
TCLP VOA	125 mL G	40 mL	HCl	SW-846, 8240, 8010	14 days
TCLP Metals	250 mL P	1 Liter P	HNO_3	SW-846, 6010, and 7000s	Hg - 28 days Others - 6 months

[a]P stands for plastic; G stands for glass.
[b]Seven-day holding time for extraction, 40-day holding time for analysis following extraction.

4.5.5.3 Analytical Methods

Table 4-3 summarizes the analytical methods to be employed during analysis of samples collected during closure activities. In addition, specific analyses and detection limits for each analysis is listed as follows:

- Selected Metals - Table 4-4.
- Hazardous Substances List (HSL) VOA (see Appendix A).
- HSL Base Neutral Acid Analysis (see Appendix A).
- HSL Pesticides/PCBs (see Appendix A).
- Toxicity characteristic leaching procedure (TCLP) VOA.
- TCLP metals.

The analytical method for volatile compounds may be either Method 8240 or 8010 of EPA SW-846. In general, analyses will be by Method 8240.

4.5.6 Quality Assurance and Quality Control

Quality assurance/quality control (QA/QC) will be implemented throughout the sampling and analytical activities required during closure.

4.5.6.1 Field QC Samples

The number and type of field QC samples collected during closure activities will depend on the nature of the area to be closed and the samples required to characterize the area as clean. The following type of field QC samples may be required:

- Duplicate sample
- Decontamination field blank (rinse blank)
- Trip blank (for VOAs)

The following description provides the method for collecting these samples and the frequency with which they will be collected:

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Table 4-4

Selected Metals

Analyte	Method Detection Limit (ug/L)	Analytical Method
Arsenic	10	EPA SW-846, Method 7060
Barium	100	EPA SW-846, Method 6010
Cadmium	5	EPA SW-846, Method 6010
Chromium	10	EPA SW-846, Method 6010
Lead	3	EPA SW-846, Method 7421
Mercury	2	EPA SW-846, Method 7470
Nickel	40	EPA SW-846, Method 6010
Selenium	5	EPA SW-846, Method 7740
Silver	10	EPA SW-846, Method 6010
Thallium	10	EPA SW-846, Method 7841
Zinc	20	EPA SW-846, Method 6010

- Duplicate Sample - a sample of the same matrix from the same area. Duplicate soil samples will be collected by homogenizing sufficient soil for the two samples (routine and duplicate) and placing the soil in separately identified laboratory bottles. A duplicate soil sample will be collected at a frequency of one for every ten samples.

- Decontamination Field Blank - a water sample collected by pouring HPLC (High Performance Liquid Chromatography) grade water (as defined by the American Chemical Society) over decontaminated sampling equipment. The water is collected and placed in separately identified laboratory bottles. These samples provide verification that sampling equipment is sufficiently decontaminated to prevent cross contamination of samples. A field blank will be collected once per day and analyzed for all analytes required for the samples collected that day.

- Trip Blank - a water sample prepared to accompany samples collected to be analyzed for volatile organic compounds. Two 40-mL vials with septum caps will be prepared to accompany the samples in each shipping container containing samples collected for volatile organic compounds.

4.5.6.2 Laboratory QA/QC

Laboratory QA/QC procedures will be performed as required in the individual analytical procedures. Quality Control will be according to the specified methods, but as a minimum QC will include:

- GC/MS Analyses (VOA and BNA) - instrument tuning once per 12-hour shift; initial calibration using at least five concentration solutions; continuing calibration at a mid-point concentration each 12-hour shift; analysis of a method blank, two method blank spikes; and appropriate surrogate spike analyses.

- GC Analyses (Pesticides, PCBs, Herbicides) - initial calibration daily with a blank and at least five calibration standards; continuing calibration at a mid-point concentration will be run every 10 samples; and analysis of a method blank and two method blank spikes.

- AA Analyses (Metals) - initial calibration daily with a blank and at least three calibration standards; continuing calibration blank and standard analyses will be run after every 10 samples; and analysis of a method blank and two laboratory control samples.

- ICP Analyses (Metals) - initial calibration with a blank and at least five calibration standards quarterly; daily calibration with a blank and the highest concentration standard; continuing calibration with a blank and standard after every 10 samples; and analysis of method blank and two laboratory control samples.

The laboratory QA review of the analytical package and accompanying QC results will document accurate analytical results. Data package deliverables will consist of a cover page, case narrative (dates sampled, received, extracted/prepared and analyzed; method reference and a description of any technical problem), QC and sample data summary, and a list of up to five tentatively identified compounds per each sample for GC/MS fractions.

4.5.7 Abandonment of Wells

It is not expected that groundwater monitoring wells and piezometers located near areas requiring remediation at the site will be abandoned during the field activities. However, if it should prove necessary to do so, the following procedures will be used:

- The well screen will be removed.
- The open borehole will be grouted with a portland cement/bentonite mixture to the ground surface. The mixture will be pumped through a tremie pipe beginning at the bottom of the borehole until the grout mixture rises to the surface.

4.6 CLOSURE PERIOD

4.6.1 Schedule

The schedule for the closure of the EKCO surface impoundment depends primarily on the predominant weather conditions during the construction period. There are two factors involved in the timing of the construction of this closure method. They are:

- The seasonal variation in the elevation of the water table.
- The climatic conditions expected during construction.

If possible, the closure activities will be scheduled during a period when the water table is expected to be low. This usually occurs between July and October in response to low rainfall during the summer. This period also correlates to climatic conditions (i.e., low rainfall) that are favorable for the earthwork involved in the stabilization process and cover system. The schedule is presented in Figure 4-6.

4.6.2 Time Allowed for Closure

The time allowed to implement closure specified in OAC 3745-66-13 is 180 days after approval of the Closure Plan. Depending on the date of OEPA's approval of the closure plan, a request for an extension of the time allowed for closure may be necessary. This extension is warranted to avoid construction during the winter. This request will be submitted based on the date of OEPA's approval of the closure plan or may be granted by OEPA as part of the approval process.

4.7 CLOSURE COST ESTIMATES

This subsection presents the estimated costs for closure of the EKCO facilities lagoon in accordance with the requirements of OAC 3745-66-20. The closure cost estimate presented in Table 4-5 is based on the following major assumptions:

- Clearing and grubbing of 2 acres and removing fence.
- In-situ stabilization of material.
- Excavation of stabilized material.
- Importing backfill and regrading remaining berm.
- Transportation and final disposal of stabilized material at solid waste facilities.

The estimate is based on standard construction cost estimating techniques and consultations with third party vendors of specific material and services.

The total estimated cost of closure is $1,363,600 in 1992 dollars.

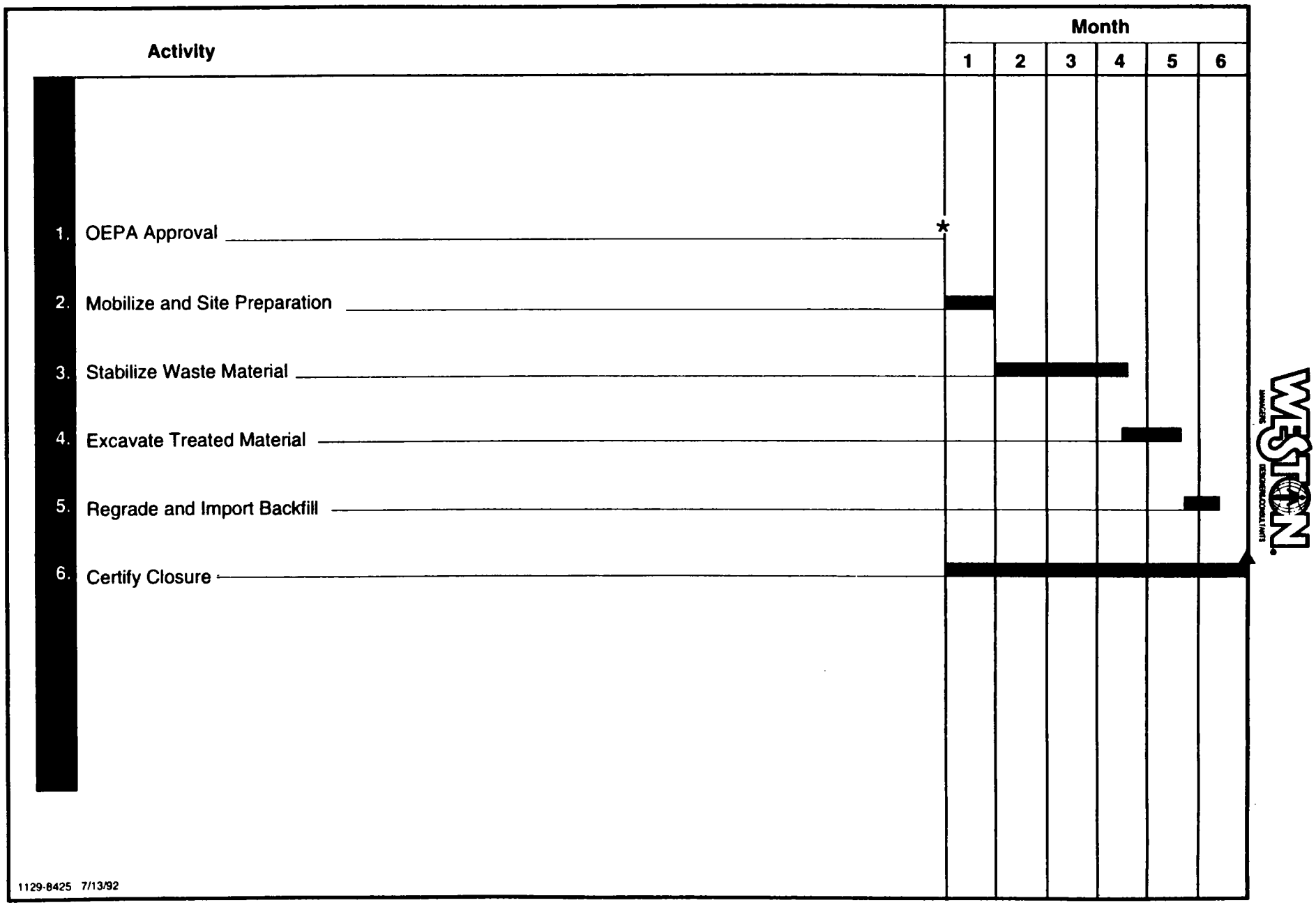

FIGURE 4-6 SCHEDULE OF CLOSURE

Table 4-5

Closure Cost Estimate
EKCO Housewares Inc.

Task	Unit	Rates($)	Quantity	Total ($)
Mobilization	Lump Sum			10,000
Clear and Dispose of Vegetation	Lump Sum			13,000
Excavation	Ton	3.50	17,080	59,780
Stabilization	Cubic Yard	22.60	11,000	248,600
Transportation	Ton	12.79	17,080	218,450
Disposal	Ton	31.38	17,080	535,970
Utility				
Piping	Lump Sum			2,500
Fencing	Lump Sum			2,500
Sampling and Analytical	Per Sample	300	110	33,000
Clean Soil Backfill	Cubic Yard	5.80	10,000	58,000
Regrading and Erosion Control	Lump Sum			38,300
Topsoil and Seeding	Cubic Yard	4.00	3,100	12,400
Construction Oversight				60,000
Project Administration				40,000
Travel & ODCs				24,600
Closure and Certification				6,500
				1,363,600

4.8 CERTIFICATION

4.8.1 Purpose and Scope

This subsection addresses the requirements of OAC 3745-66-15 regarding certification of closure.

4.8.2 Approach

Within 60 days of completion of closure for the EKCO lagoon (surface impoundment), a certification of closure, prepared by an independent registered professional engineer and by EKCO Housewares Inc., will be sent to OEPA via registered mail indicating that the lagoon has been closed in accordance with the specifications in this closure plan.

The independent engineer or representative will be present during all activities related to the closure of the lagoon. The independent engineer will be responsible for review of the data for certification of the closure.

The following information will be maintained as part of closure documentation:

- Approved closure plan.
- Date that closure activities begin.
- Contractors performing closure activities, including name, address, telephone number, and scope.
- Copies of manifests for all wastes removed during closure.
- Total volume of waste removed.
- Documentation of any deviation from the closure plan including any letters from OEPA approving changes to the plan.
- Daily inspection or field summary reports documenting closure events.
- Field notes of inspections, decontamination, and sample collection.
- Chain-of-custody records and analytical results for all samples collected during closure.

- Details of sampling and analysis methods.
- Laboratory records.
- Engineering drawings for all excavations.
- Confirmation sampling results showing that clean standards were met.

Any documentation supporting the independent registered professional engineer's certification will be furnished to OEPA or the EPA Regional Administrator upon request.

4.8.3 Certification Letter

When closure is completed, a certification letter will be submitted to OEPA indicating the fulfillment of requirements of OAC 3745-66-15. A copy of the form is shown in Figure 4-7.

4.8.4 Status of the Facility after Closure

Following final closure of the hazardous waste facility, the site will be operated as a "less-than-90-day-storage" facility. This closure will be complete.

The lagoon/surface impoundment at the EKCO Housewares, Inc., Massillon, Ohio facility has been closed in accordance with the Final Closure Plan dated _____.
(month/year)

I certify under penalty of law that the information contained in the accompanying closure certification documentation was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

FACILITY

Signature _____ Date _____

Name _____
Plant Manager
Massillon, Ohio, Facility
EKCO Housewares, Inc.

PROFESSIONAL ENGINEER

Signature _____ Date _____

Name _____

Address _____
_____
_____

Professional Seal

Telephone Number _____

FIGURE 4-7 CLOSURE CERTIFICATION

RCRA CLOSURE PLAN
FOR EKCO HOUSEWARES, INC.
MASSILLON, OHIO

July '92

VOLUME II
APPENDICES

WESTON SM

MANAGERS DESIGNERS/CONSULTANTS

RCRA CLOSURE PLAN
FOR EKCO HOUSEWARES, INC.
MASSILLON, OHIO

VOLUME II
APPENDICES

July 1992

APPENDIX A

HAZARDOUS SUBSTANCE LIST (HSL) AND CONTRACT REQUIRED DETECTION LIMITS (CRDL)

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Table A-1

Hazardous Substance List (HSL) and Contract Required Detection Limits (CRDL)[a]

	Compound	CAS Number	Detection Limits[b] Low Water[c] ug/L	Low Soil/Sediment[d,e] ug/Kg
Volatiles				
1.	Chloromethane	74-87-3	10	10
2.	Bromomethane	74-83-9	10	10
3.	Vinyl Chloride	75-01-4	10	10
4.	Chloroethane	75-00-3	10	10
5.	Methylene Chloride	75-09-2	5	5
6.	Acetone	67-64-1	10	10
7.	Carbon Disulfide	75-15-0	5	5
8.	1,1-Dichloroethene	75-35-4	5	5
9.	1,1-Dichloroethane	75-35-3	5	5
10.	trans-1,2-Dichloroethane	156-60-5	5	5
11.	Chloroform	67-66-3	5	5
12.	1,2-Dichloroethane	107-06-2	5	5
13.	2-Butanone	78-93-3	10	10
14.	1,1,1-Trichloroethane	71-55-6	5	5
15.	Carbon Tetrachloride	56-23-5	5	5
16.	Vinyl Acetate	108-05-4	10	10
17.	Bromodichloromethane	75-27-4	5	5
18.	1,1,2,2-Tetrachloroethane	79-34-5	5	5
19.	1,2-Dichloropropane	78-87-5	5	5
20.	trans-1,3-Dichloropropane	10061-02-6	5	5
21.	Trichloroethene	79-01-6	5	5
22.	Dibromochloromethane	124-48-1	5	5
23.	1,1,2-Trichloroethane	79-00-5	5	5
24.	Benzene	71-43-2	5	5
25.	cis-1,3-Dichloropropene	10061-01-5	5	5
26.	2-Chloroethyl Vinyl Ether	110-75-8	10	10
27.	Bromoform	75-25-2	5	5
28.	2-Hexanone	591-78-6	10	10
29.	4-Methyl-2-pentanone	108-10-1	10	10
30.	Tetrachloroethene	127-18-4	5	5
31.	Toluene	108-88-3	5	5
32.	Chlorobenzene	108-90-7	5	5

Table A-1

Hazardous Substance List (HSL) and Contract Required Detection Limits (CRDL)[a] (continued)

	Compound	CAS Number	Detection Limits[b] Low Water[c] ug/L	Low Soil/Sediment[d,e] ug/Kg
33.	Ethyl Benzene	100-41-4	5	5
34.	Styrene	100-42-5	5	5
35.	Total Xylenes	100-43-5	5	5
51.	Isophorone	78-59-1	10	330
52.	2-Nitrophenol	88-75-5	10	330
53.	2,4-Dimethylphenol	105-67-9	10	330
54.	Benzoic Acid	65-85-0	50	1,600
55.	bis(2-Chloroethoxy) methane	111-91-1	10	330
56.	2,4-Dichlorophenol	120-83-2	10	330
57.	1,2,4-Trichlorobenzene	120-82-1	10	330
58.	Naphthalene	91-20-3	10	330
59.	4-Chloroeniline	106-47-8	10	330
60.	Hexachlorobutadiene	87-68-3	10	330
61.	4-Chloro-3-methylphenol (para-chloro-mata-crasol)	59-50-7	10	330
62.	2-Methylnaphthalene	91-57-6	10	330
63.	Hexachlorocyclopentadiene	77-47-4	10	330
64.	2,4,6-Trichlorophenol	88-06-2	10	330
65.	2,4,5-Trichlorophenol	95-95-4	50	1,600
66.	2-Chloronaphthalene	91-58-7	10	330
67.	2-Nitroaniline	88-74-4	50	1,600
68.	Dimethyl Phthalate	131-11-3	10	330
69.	Acenaphthylene	208-96-8	10	330
70.	3-Nitroaniline	99-09-2	50	1,600
71.	Acenaphthene	83-32-9	10	330
72.	2,4-Dinitrophenol	51-28-5	50	1,600
73.	4-Nitrophenol	100-02-7	50	1,600
74.	Dibenzofuran	132-64-9	10	330
75.	2,4-Dinitrotoluene	121-14-2	10	330
76.	2,6-Dinitrotoluene	606-20-2	10	330
77.	Diethylphthalate	84-66-2	10	330
78.	4-Chlorophenyl Phenyl ether	7005-72-3	10	330
79.	Fluorene	86-73-7	10	330

Table A-1

Hazardous Substance List (HSL) and Contract Required Detection Limits (CRDL)[a] (continued)

	Compound	CAS Number	Detection Limits[b] Low Water[c] ug/L	Low Soil/Sediment[d,e] ug/Kg
80.	4-Nitroaniline	100-01-6	50	1,600
81.	4,6-Dinitro-2-methylphenol	534-52-1	50	1,600
82.	N-nitrosodiphenylamine	86-30-6	10	330
83.	4-Bromophenyl Phenyl ether	101-55-3	10	330
84.	Hexachlorobenzene	118-74-1	10	330
85.	Pentachlorophenol	87-86-5	50	1,600
86.	Phenanthrene	85-01-8	10	330
87	Anthracene	120-12-7	10	330
88.	Di-n-butylphthalate	84-74-2	10	330
89.	Fluoranthene	206-44-0	10	330
90.	Benzidine	92-87-5	50	1,600
91.	Pyrene	129-00-0	10	330
92.	Butyl Benzyl Phthalate	85-68-7	10	330
93.	3,3-Dichlorobenzidine	91-94-1	20	660
94.	Benzo(a)anthracene	56-55-3	10	330
95.	bis(2-ethylhexyl)phthalate	117-81-7	10	330
96.	Chrysene	218-01-9	10	330
97.	Di-n-octyl Phthalate	117-84-0	10	330
98.	Benzo(b)fluoranthene	205-99-2	10	330
99.	Benzo(k)fluoranthene	207-08-9	10	330
100.	Benzo(a)pyrene	50-32-8	10	330
101.	Indeno(1,2,3-cd)pyrene	193-39-5	10	330
102.	Dibenz(a,h)anthracene	53-70-3	10	330
103.	Benzo(g,h,i)perylene	191-24-2	10	330
104.	alpha-BHC	319-84-6	0.05	8
105.	beta-BHC	319-85-7	0.05	8
106.	delta-BHC	319-86-8	0.05	8
107.	gamma-BHC (Lindane)	58-89-9	0.05	8
108.	Beptachlor	76-44-8	0.05	8
109.	Aldrin	309-00-2	0.05	8
110.	Neptachlor Epoxide	1024-57-3	0.05	8
111.	Endosulfan I	959-98-8	0.05	8
112.	Dieldrin	60-57-1	0.10	16
113.	4,4'-DDE	72-55-9	0.10	16

Table A-1

Hazardous Substance List (HSL) and Contract Required Detection Limits (CRDL)[a] (continued)

	Compound	CAS Number	Detection Limits[b] Low Water[c] ug/L	Low Soil/Sediment[d,e] ug/Kg
Pesticides				
114.	Endrin	72-20-8	0.10	16
115.	Endosulfan II	33213-65-9	0.10	16
116.	4,4'-DDD	72-54-8	0.10	16
117.	Endrin Aldehyde	7421-93-4	0.10	16
118.	Endosulfan Sulfate	1031-07-8	0.10	16
119.	4,4'-DDT	50-29-3	0.10	16
120.	Endrin Ketone	53494-70-5	0.10	16
121.	Methoxychlor	72-43-5	0.5	80
122.	Chlordane	57-74-9	0.5	80
123.	Toxaphene	8001-35-2	1.0	160
124.	AROCLOR-1016	12674-11-2	0.5	80
125.	AROCLOR-1221	11104-28-2	0.5	80
126.	AROCLOR-1232	11141-16-5	0.5	80
127.	AROCLOR-1242	53469-21-9	0.5	80
128.	AROCLOR-1248	12672-29-6	0.5	80
129	AROCLOR-1254	11097-69-1	1.0	160
130.	AROCLOR-1260	11096-82-5	1.0	160

[a]Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the contract, will be higher.

[b]Specific Detection Limits are highly matrix-dependent. The detection limits listed herein are provided for guidance and may not always be achievable.

[c]Medium water contract required detection limits (CRDL) for volatile HSL compounds are 100 times the individual low water CRDL.

[d]Medium soil/sediment contract required detection limits (CRDL) for volatile HSL compounds are 100 times the individual low soil/sediment CRDL.

[e]Medium soil/sediment required detection limits (CRDL) for semivolatile HSL compounds are 60 times the individual low soil/sediment CRDL.

APPENDIX B

SUMMARY OF PREVIOUS INVESTIGATIONS AT EKCO HOUSEWARES, INC., MASSILLON, OHIO

Table B-1

Summary of Previous Investigations at EKCO Housewares, Inc., Massillon, Ohio

Date	Performed by Whom	Scope of Investigation	Results of Investigation
I. 1952-1987	EKCO	Ohio Department of Health discharge permit and NPDES permit.	Analyzed for pH, flow, copper, nickel, iron, oil and grease, and solids (see Table 2-3).
II. March/ April/May 1984	EKCO/ Wadsworth Labs	Routine testing for renewal of NPDES permit.	Revealed up to 23 ppm total VOCs in lagoon soils, 5 ppm VOCs in incoming well water, and 4 ppm VOCs in plant effluent, 0.5 ppm in downstream Newman Creek sample.
III. May 31, 1984	EKCO/ Wadsworth Labs	Testing soil in northern and western tank farms.	Analysis showed up to 225 ppm total VOCs.
IV. June 1984	EKCO/ Wadsworth	Testing NPDES sewer system for point sources of VOC contamination.	Total VOC analysis on samples from degreasing unit drainage pipes showed up to 6.3 ppm VOCs, degreaser refrigeration coils up to 1,400 ppm VOCs, manhole up to 11 ppm VOCs.
V. August 1984	EKCO/ Wadsworth	Further source area testing in plant.	Total VOC analysis on W-2 showed 3.4 ppm VOCs and on carbon absorption steam lines showed 0.7 ppm VOCs.

Table B-1

Summary of Previous Investigations at EKCO Housewares, Inc., Massillon, Ohio (continued)

Date	Performed by Whom	Scope of Investigation	Results of Investigation
VI. Sept. 1984	Ohio Drilling Company	Four test holes were drilled to study shallow soils down to 20 ft. Two holes were made into piezometers, other two were plugged.	VOC analysis showed up to 250 ppm total VOCs in soils at 0-4 ft depth and up to 26 ppm total VOCs at 15-to-20 ft depths.
		3 bedrock test wells were completed and sampled, R1 through R3, also W-10 and W-2.	VOC analysis showed contamination at each well, with W-10 showing up to 143 ppm VOCs.
VII. Dec. 1984	Ohio Drilling Company	Resampling of W-10.	Total VOC analysis showed 104 ppm VOCs.
VIII. June 1985	Ohio Drilling Company	Additional R-well (R-4) drilled to better define contamination plume to northeast of EKCO facility.	Total VOC analysis detected no VOCs.
IX. July 1985	EKCO/Wadsworth	Five 3-ft soil cores taken from lagoon.	Soils tested for total VOCs and metals (both total and EP toxicity analysis). Results showed up to 71 ppm VOCs in soils with two samples exhibiting EP toxicity characteristics. All five exceeded ROFS limits limits.
X. March 1986 to January 1988	EKCO	Groundwater reclamation project started. Production wells pump groundwater through aquifer for air-stripping, then to plant use and discharge.	Total VOC analysis from groundwater reclamation reports are summarized in Figures 3-5 and 3-6.

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Table B-1

Summary of Previous Investigations at EKCO Housewares, Inc., Massillon, Ohio (continued)

Date	Performed by Whom	Scope of Investigation	Results of Investigation
XI. July 1986	EKCO/Wadsworth	Six discrete samples taken from NPDES sewer system.	VOC analysis showed contamination in each sample up to 0.45 ppm VOCs. Plant outfall analysis showed 0.1 ppm VOCs.
XII. July 9-10/86	Floyd Brown Associates, Ltd. (FBA)	12 test borings - Purpose to obtain soil samples and determine geological characteristics Four in lagoon to 12 ft Four downgradient to 12 ft Four backgrounds to 3 ft	Lagoon and downgradient sample composited by depth and analyzed for total metals and VOCs. Background only for total metals. Exceed Range of Ohio Farm Soils (ROFS) limits for metals - cadmium (Cd), chromium (Cr), and lead (Pb) down to 4 feet and between 8 and 10 feet.
XIII. July 1986	FBA	Montioring Well R-1 and Production Wells W-1 and W-10 sampled.	Groundwater samples analyzed for total metals concentration of Cd and Pb. None detected.
XIV. Sept. 1986	FBA	18 soil samples taken at three locations in northern tank farm down to 11 ft.	VOC analysis - up to 370 ppm VOC at surface and up to 0.9 ppm at 11 feet.
		Eight groundwater samples taken from on-site wells and plant effluent outfall. Purpose: to determine if pumping aquifer and air stripping has reduced VOCs in soils.	VOCs were detected in every well but R-4. Maximum of 7.94 ppm were found in W-10 sample.

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Table B-1

Summary of Previous Investigations at EKCO Housewares, Inc., Massillon, Ohio (continued)

Date	Performed by Whom	Scope of Investigation	Results of Investigation
XV. Dec. 1986	EKCO/Wadsworth OEPA	Side-by-side testing performed on onsite EKCO wells for vinyl chloride.	OEPA detected 0.001 - 0.012 ppm levels of vinyl chloride in three out of four monitor wells (R-1, R-2, R-4). EKCO/Wadsworth analyses did not detect vinyl chloride.
XVI. Jan. 12-26/ 87	FBA-Phase II	To delineate extent of soil contamination beneath the lagoon. Evaluate impact of detected heavy metals on on groundwater quality. Six soil borings installed; Four of six completed as monitoring wells. Two of six background (i.e., outside lagoon). Nineteen test borings in lagoon to 12 ft, with samples from 1-ft intervals.	Based on noncomposited samples analyzed for Priority Pollutant volatile compounds. Six soil borings - up to 7.56 ppm VOCs outside lagoon. All lagoon samles analyzed for total Cd, Cr, and Pb. Some borings exceed ROFS limits at 12-ft intervals. Three outside soil borings that were completed as monitoring wells sampled for metals and purgeable organics. Found that groundwater complies with Safe Drinking Water Act standards. Groundwater concentrations of up to 1 ppb Cd, > ppb Cr, 8 ppb Pb, and 0.29 ppm VOCs were indicated.
XVII. April 1987	FBA	Four monitoring wells in bedrock (D-series) Phase II were resampled.	Analyzed for purgeable organics. All showed VOCs. D-4 showed the maximum concentration of 256 ppm VOCs.

Table B-1

Summary of Previous Investigations at EKCO Housewares, Inc., Massillon, Ohio (continued)

Date	Performed by Whom	Scope of Investigation	Results of Investigation
XVIII. June 1987	OEPA	NPDES sewer system retested. Four discrete samples taken.	VOC analylsis had results similar to July 1986 EKCO/Wadsworth testing.
XIX. Sept.- Dec. 1987	WESTON	Perform interim measures including collecting groundwater sample from abandoned Ohio Water Company Well No. 4	Analyzed for target compound list VOCs. Up to 2.9 ppb vinyl chloride and 4.7 ppb benzene.
		Sampling of on-site wells.	Analyzed for HSL compounds. VOCs found varying from nondetect to 780 ppm.
		Review area geology to determine regional and local groundwater flow conditions.	For unconsolidated materials groundwater flow is toward southeast. For bedrock, pumping of wells W-1 and W-10 is causing a cone of depression and obscuring gradient.

APPENDIX C

METALS DATA FOR
BACKGROUND AND DOWNGRADIENT SOIL SAMPLES
FBA PHASE II SOIL BORING PROGRAM
MARCH 1987

TABLE C-1

RESULTS OF CADMIUM, CHROMIUM AND LEAD ANALYSES IN SUBSURFACE SOIL SAMPLES

SOIL LOC.	TOTAL SOLID	CADMIUM MG/KG	CHROMIUM MG/KG	LEAD MG/KG
B-1-1	88.1	2	6	20
B-1-2	86.6	0.5	5	18
B-1-3	87	1	6	67
B-1-4	84	0.6	3	5
B-1-5	84.1	0.6	3	27
B-1-6	88.3	0.6	3	4
B-1-7	89.6	0.5	5	8
B-1-8	88.9	0.5	8	5
B-1-9	91	0.6	9	6
B-1-10	93.9	0.5	8	5
B-2-1	85.5	4	25	600
B-2-2	88.4	0.5	6	32
B-2-3	81.8	0.6	13	21
B-2-4	87.6	0.6	6	24
B-2-5	88	0.5	8	3
D-1-1	83.4	33	300	200
D-1-2	82.7	0.5	5	11
D-1-3	80.2	0.5	8	11
D-1-4	77.9	1	13	13
D-1-5	85.6	0.5	5	19
D-1-6	80.4	0.6	8	33
D-1-7	73.4	0.7	9	26
D-2-1	85.5	110	92	490
D-2-2	79.9	1600	340	4740
D-2-3	81.7	1300	210	2950
D-2-4	84.9	93	130	190
D-2-5	80.5	830	180	1570
D-2-6	90	1	24	400
D-2-7	82.2	0.5	22	290
D-2-8	80.7	0.8	7	420
D-2-9	76.8	1	34	480
D-2-10	76	0.6	9	80
D-2-11	79.2	0.6	6	10
D-2-12	79.7	0.5	5	8
D-3-1	86.5	0.6	6	16
D-3-2	89.5	0.5	5	13
D-3-3	89.4	0.6	7	13
D-3-4	81.5	0.6	5	5

Referenced from Floyd Brown Associates Closure Plan Presentation, Memorandum Draft, 13 March 1987.

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APPENDIX D

METALS DATA FOR LAGOON SOIL BORINGS
FBA PHASE II SOIL BORING PROGRAM
MARCH 1987

TABLE D-1

RESULTS OF CADMIUM, CHROMIUM AND LEAD ANALYSES IN SUBSURFACE SOIL SAMPLES

SOIL LOC.	TOTAL SOLID	CADMIUM MG/KG	CHROMIUM MG/KG	LEAD MG/KG
L-1-1	71	20	45	170
L-1-2	76.8	2	6	360
L-1-3	76.4	1	19	980
L-1-4	75.3	0.5	4	30
L-1-5	58.1	20	16	170
L-1-6	73	0.4	<0.80	11
L-1-7	80	2	3	30
L-1-8	66.1	0.5	<0.90	9
L-1-9	86	<0.30	<0.60	10
L-1-10	94	0.47	<0.90	7
L-2-1	63.9	180	130	940
L-2-2	74.4	2	10	400
L-2-3	73.1	<0.60	4	20
L-2-4	80.5	0.4	4	13
L-2-5	75.7	0.5	4	11
L-2-6	73.3	0.5	4	8
L-2-7	81.5	0.4	5	15
L-2-8	84.5	<0.50	2	8
L-2-9	88	0.5	2	5
L-2-10	88.6	<0.40	6	13
L-3-1	69.6	360	230	1200
L-3-2	80.6	<0.50	3	6
L-3-3	81.7	<0.50	4	6
L-3-4	83.9	0.5	2	3
L-3-5	85.7	0.4	2	4
L-3-6	87.6	<0.40	2	8
L-3-7	89.8	<0.40	1	10
L-3-8	85.4	<0.30	2	<1
L-4-1	40.7	1700	790	2800
L-4-2	75.4	0.6	6	13
L-4-3	77.6	0.8	6	8
L-4-4	77.3	<0.50	9	6
L-4-5	71.6	180	70	500
L-4-6	79	<0.30	5	6
L-4-7	74.9	0.4	6	12
L-4-8	87.8	<0.50	3	7
L-4-9	82	<0.20	2	3
L-4-10	85.3	<0.30	2	4
L-4-11	84.3	<0.40	5	3

Referenced from Floyd Brown Associates Closure Plan Presentation, Memorandum Draft, 13 March 1987.

TABLE D-1 (CONTINUED)

RESULTS OF CADMIUM, CHROMIUM AND LEAD ANALYSES
IN SUBSURFACE SOIL SAMPLES

SOIL LOC.	TOTAL SOLID	CADMIUM MG/KG	CHROMIUM MG/KG	LEAD MG/KG
L-5-1	51.4	1100	500	2400
L-5-2	79.8	2	8	70
L-5-3	72.9	58	12	230
L-5-4	73	0.5	6	19
L-5-5	56.4	2	8	27
L-5-6	50.2	1	13	50
L-5-7	48.4	80	50	380
L-5-8	90.9	1	5	30
L-5-9	91.2	0.5	4	15
L-5-10	87.3	1	3	17
L-5-11	88.7	1	3	13
L-6-1	80.3	660	120	1700
L-6-2	66.3	4	7	55
L-6-3	66.5	10	20	80
L-6-4	50	2	18	60
L-6-5	74.3	3	11	50
L-6-6	91.9	1	4	30
L-6-7	90	4	4	30
L-6-8	97	0.5	3	8
L-6-9	88.9	0.4	2	5
L-6-10	86.2	0.5	2	10
L-7-1	69.5	600	290	2800
L-7-2	81.7	1	60	560
L-7-3	71.7	3	110	20
L-7-4	71.7	50	80	430
L-7-5	81	1	1	9
L-7-6	73.6	4	10	40
L-7-7	78.9	10	20	110
L-7-8	81.7	23	40	250
L-7-9	88.2	1	3	10
L-7-10	89.4	0.4	<1	6
L-7-11	90.5	1	4	9
L-7-12	91.3	0.5	<1	6
L-8-1	68.5	30	290	1400
L-8-2	65.9	7	60	85
L-8-3	63.7	2	130	40
L-8-4	72.6	3	90	180
L-8-5	74.7	2	40	40

Referenced from Floyd Brown Associates Closure Plan Presentation, Memorandum Draft, 13 March 1987.

TABLE D-1 (CONTINUED)

RESULTS OF CADMIUM, CHROMIUM AND LEAD ANALYSES IN SUBSURFACE SOIL SAMPLES

SOIL LOC.	TOTAL SOLID	CADMIUM MG/KG	CHROMIUM MG/KG	LEAD MG/KG
L-8-6	67.1	2	6	60
L-8-7	89.4	1	2	20
L-8-8	59.9	1	<1	12
L-8-9	66.2	<1	3	7
L-8-10	86.2	1	3	7
L-8A	26.9	8400	510	13800
L-9-1	75.4	12	170	940
L-9-2	75.3	4	2	20
L-9-3	74.3	2	6	14
L-9-4	63	3	3	20
L-9-5	51.2	4	2	20
L-9-6	40.7	8	4	25
L-9-7	88.5	<0.4	3	5
L-9-8	91.2	<0.5	2	3
L-9-9	90.8	<0.5	2	6
L-9-10	86.6	<0.5	2	2
L-9-11	88.2	2	3	7
L-9-12	88.4	0.4	3	6
L-10-1	71.9	90	80	740
L-10-2	80	4	9	780
L-10-3	69	4	1200	70
L-10-4	71.1	<0.7	8	5
L-10-5	78.7	0.8	5	130
L-10-6	88.5	2	5	30
L-10-7	91.1	0.5	3	4
L-10-8	85.8	<0.5	2	2
L-10-9	90.4	0.4	5	6
L-10-10	87.9	0.8	5	6
L-10-11	83.4	0.5	5	3
L-11-1	56.9	300	280	1100
L-11-2	76	1	26	30
L-11-3	77	0.6	52	20
L-11-4	80.7	0.6	7	4
L-11-5	85.7	<0.5	2	2
L-11-6	83.8	0.4	3	64
L-11-7	88.6	<0.5	4	7
L-11-8	88.9	0.5	3	6
L-11-9	85	0.6	3	7

Referenced from Floyd Brown Associates Closure Plan Presentation, Memorandum Draft, 13 March 1987.

WESTON

TABLE D-1 (CONTINUED)

RESULTS OF CADMIUM, CHROMIUM AND LEAD ANALYSES
IN SUBSURFACE SOIL SAMPLES

SOIL LOC.	TOTAL SOLID	CADMIUM MG/KG	CHROMIUM MG/KG	LEAD MG/KG
L-12-1	66.7	240	330	810
L-12-2	67	6	36	50
L-12-3	72.1	4	8	25
L-12-4	73.8	<0.6	8	8
L-12-5	80.7	<0.5	6	12
L-12-6	75.2	<.6	<1	6
L-12-7	85.4	<.5	4	10
L-12-8	86.7	<0.5	3	3
L-12-9	89.3	<0.6	3	2
L-12-10	89.6	0.5	4	4
L-12-11	87.2	<0.6	4	8
L-13-1	27	1500	540	2300
L-13-2	81.3	9	70	970
L-13-3	71.3	1	5	10
L-13-4	85.7	<0.5	3	12
L-13-5	80.3	3	4	30
L-13-6	84.5	3	3	18
L-13-7	86.2	1	3	20
L-13-8	83	1	3	16
L-13-9	86	2	3	27
L-13-10	85.9	1	2	22
L-14-1	55.9	1250	1000	3100
L-14-2	85.8	4	49	380
L-14-3	75.3	3	7	43
L-14-4	73.9	1	5	19
L-14-5	78.6	3	5	7
L-14-6	75	2	5	45
L-14-7	74.5	1	9	84
L-14-8	84.3	<0.5	5	32
L-14-9	87.3	<0.5	3	29
L-14-10	91.4	0.5	4	24
L-14-11	91	<0.5	3	29
L-14-12	91.5	<0.5	4	22
L-15-1	72.9	510	580.	1200
L-15-2	76.2	0.6	20	140
L-15-3	72.9	5	44	94
L-15-4	71.3	2	58	45
L-15-5	71.7	3	.22	30
L-15-6	75.2	1	9	52
L-15-7	60.5	2	6	160
L-15-8	76.5	0.4	2	30
L-15-9	86.6	0.6	5	48

Referenced from Floyd Brown Associates Closure Plan Presentation, Memorandum Draft, 13 March 1987.

WESTON

TABLE D-1 (CONTINUED)

RESULTS OF CADMIUM, CHROMIUM AND LEAD ANALYSES

IN SUBSURFACE SOIL SAMPLES

SOIL LOC.	TOTAL SOLID	CADMIUM MG/KG	CHROMIUM MG/KG	LEAD MG/KG
L-15-10	88.7	0.5	6	18
L-15-11	89.8	3	5	27
L-15-12	91.3	2	9	12
L-16-1	60.4	770	2630	2700
L-16-2	57.1	9	340	620
L-16-3	73.9	2	7	60
L-16-4	73.5	4	64	120
L-16-5	87	1	61	34
L-16-6	86.3	<0.4	9	26
L-16-7	85.7	<0.4	3	18
L-16-8	86.5	0.5	15	23
L-16-9	86.3	0.5	<1	8
L-17-1	62.2	590	370	2100
L-17-2	70.6	9	76	1260
L-17-3	77	470	64	1850
L-17-4	71.7	2	12	20
L-17-5	69.7	3	18	22
L-17-6	96.4	2	6	15
L-17-7	90.1	0.7	4	2
L-17-8	89.9	0.9	9	22
L-17-9	90.5	1	6	5
L-18-1	74	6900	280	12000
L-18-2	73.8	27	1200	390
L-18-3	76.7	4	84	120
L-18-4	74.9	6	140	26
L-18-5	82	5	42	15
L-18-6	69.7	9	130	28
L-18-7	73.4	16	200	45
L-18-8	81.5	12	240	35
L-18-9	86	2	6	4
L-18-10	84.2	2	9	10
L-18-11	88.6	4	11	15
L-18-12	90.7	3	5	9
L-19-1	34.1	5100	1200	19500
L-19-2	76.9	1600	190	4200
L-19-3	74.6	11	120	9
L-19-4	73.4	7	230	3
L-19-5	76.4	3	54	8
L-19-6	77.5	2	10	7
L-19-7	84.5	15	70	7
L-19-8	89.5	3	51	6
L-19-9	85.1	3	150	7

Referenced from Floyd Brown Associates Closure Plan Presentation, Memorandum Draft, 13 March 1987.

APPENDIX E

GROUNDWATER QUALITY MONITORING PROGRAM

AMERICAN HOME PRODUCTS CORPORATION

INTERNAL CORRESPONDENCE

DATE: March 18, 1992

TO: G. Belardo
FROM: R. Zollner
SUBJECT: Ekco - Massillon, OH: Phone Conversation with OEPA re CME and Lagoon Closure

Karen Nesbitt, RCRA Inspector for Ohio EPA phoned today concerning the CME inspection and our proposed closure of the lagoon located at the Ekco facility in Massillon, OH.

Karen said that she and Rich Kurlich had just conducted a conference call with USEPA concerning the Corrective Action efforts and their concerns regarding the CME. She indicated that they were now satisfied that AHP/Ekco are meeting their concerns with respect to "rate and extent" under the federal corrective action program. She said that a letter would be forthcoming concerning our response to the CME, and that it would likely indicate general compliance has been attained. She said the "rate and extent" issue had been the greatest concern, and now we may well be in good standing on most if not all issues. She said the letter probably would not reach us until the end of April due to her heavy work load. I indicated that, as before, we would be happy to meet and keep them apprised of our activities at the site as appropriate.

Karen said the closure plan has been forwarded to Paul Vandermeer (Columbus, OH) with Karen and Rich's comments and that he is currently reviewing it. Based on her last conversation with Paul, Karen believes we should recieve a letter from him in 3-4 weeks. She said we will probably need to meet in the future to discuss the closure. The primary issue as far as she is concerned is that we have not selected a stabilization method (we provided three alternatives), nor have we provided the stabilization chemistry. I indicated that we would begin the process of contractor/method selection, and that we would be available to meet as necessary. I indicated it is our intention to complete closure this summer.

cc: H.J. Hintz
G. Moss
H.G. Byer

WESTON
MANAGERS DESIGNERS CONSULTANTS
1 WESTON WAY
WEST CHESTER, PA 19380-1449
PHONE: 215-692-3030
FAX: 215-430-3124

14 January 1992

Ms. Karen L. Nesbit
Environmental Scientist
Division of Hazardous Waste Management
Ohio Environmental Protection Agency
Northeast District Office
Twinsburg, OH 44087-1969

W.O. #2994-02-03

RE: Comprehensive Groundwater Monitoring Evaluation (CME)
EKCO Housewares, Massillon, Ohio (OHD 045 205 424)

Dear Ms. Nesbit:

At the direction of American Home Products (AHP) on behalf of EKCO Housewares, Roy F. Weston, Inc. (WESTON) is replying to the Ohio Environmental Protection Agency (OEPA) letter of 5 December 1991. The letter cited the EKCO Housewares response to and some of the violation issues associated with the 1991 CME.

As Bob Zollner (AHP) mentioned on the phone during your conversation of 6 January 1992, we would like to meet with you to bring you up to date on RCRA Investigation activities at the site. The additional work in progress at the site is extensive. We have also enclosed a brief response to each of the violations noted in the 5 December OEPA letter. Because of the substantial work in progress at the EKCO facility under RCRA Corrective Action (CA), we hope a brief response, as detailed in Attachment I, is in order at this time. We can use the attachment as a basis for a more detailed discussion at our meeting.

Thank you for your continued interest in the EKCO project. We will contact you soon to arrange a mutually agreeable meeting time. If there are any questions between now and the meeting date, please contact either Mr. Robert Zollner at (212) 878-5787 or me at (215) 344-3643.

Very truly yours,

ROY F. WESTON, INC.

Harold G. Byer

Harold G. Byer
Principal Project Manager

cc: M. N. Bhatla
R. Zollner
T. Shingleton
S. Schuyler
H. Hintz
G. Moss
T. Cornuet
S. Oster

ATTACHMENT 1

Comprehensive Groundwater Monitoring Evaluation
EKCO Housewares

Violation 1: The Sampling and Analysis Plan (SAP) fails to discuss the detection of immiscible layers in monitoring wells installed at the facility as required by rule 3745-65-92(A)(2) of the OAC. The revised SAP must be updated and submitted to the Ohio EPA for documentation in meeting the new requirements of rule 3745-65-92(A) of the OAC, which became effective April 1, 1990.

Response

The procedure was not included in the September 1988 SAP because OEPA rules did not become effective until April 1, 1990. We have enclosed (attachment 2) an addendum to the SAP to comply with this regulation. We can discuss any remaining questions you may have after your review of the addendum at our proposed meeting.

Violation 2: EKCO Housewares has not responded adequately to this issue. The 1989 annual report is incomplete and even states that the remainder of the quarterly groundwater data was to be submitted in April, 1990, however, the Ohio EPA has no record of receiving analytical results for the L-series wells for the 1989 quarterly sampling event. This data should be resubmitted to the Ohio EPA.

Response:

The data was submitted to Mr. Tom Crepeau of OEPA in Columbus, Ohio in a WESTON report dated August 1990. We are resubmitting the report (enclosed Attachment 3) and will also bring it to the upcoming meeting.

Violation 3: Rule 3745-65-93(D)(4)(a) of the OAC also requires the facility to determine the extent of contamination. EKCO Housewares shall submit a revised Groundwater Quality and Assessment Plan (GWQAP) that include an appropriate number of wells to fully define the full horizontal and vertical extent of contamination.

Response

A RFI Work Plan under RCRA CA (HSWA-3004(u)) authority, was submitted to USEPA and OEPA in May 1990 after extensive discussion, comment and approval by both agencies, EKCO and AHP. The RFI Work Plan discusses the well installations (pg 4-3) and all other activities which will be done to evaluate the horizontal and vertical extent of the contaminant migration associated with the entire EKCO site. We believe the existing GWQAP evaluates the extent of contamination

associated with the lagoon. We therefore believe a revised GWQAP is not necessary. However, we would like to discuss any specific concerns you may have with the existing plan during our proposed meeting.

The two groundwater quality assessment efforts, while in some cases are redundant, will fully characterize groundwater impacts throughout the site including the lagoon. Any impact on groundwater resulting from the unclosed lagoon may be monitored under the current GWQAP.

Violation 4: EKCO Housewares has failed to meet the minimum content requirements of the annual report as required by rule 3745-65-94 of the OAC, and should expand future reports to include the following described topics as a minimum report content. This report should make a determination of the rate and extent (see Ohio EPA response 3 above) of contaminant migration, discuss observed concentrations and, in general, discuss the results of the GWQAP, including remedial measures and any modifications to the monitoring program.

Response:

Site remedial measures are currently in place. A monitoring program designed to determine the rate and extent of contaminant migration is also currently being conducted pursuant to the RFI Work Plan. The data gathered as a result of this monitoring program and the evaluation of the data will be available when the RFI report is complete. We will be happy to discuss the existing remediation and monitoring program with you in greater detail at our upcoming meeting.

ATTACHMENT 2

Dense Nonaqueous Phase Liquids Sample Procedure

DNAPLE sampling was conducted during previous events using the procedure set forth below. As a result of previous DNAPL sampling in earlier events where no DNAPL's were detected, it is inappropriate to continue with this procedure. The OAC rule 3745-65-92(A)(2) states that the SAP "shall include procedures and techniques for detection of immiscible layers, where applicable".

A sample will be collected for dense, nonaqueous-phase liquids (DNAPLS) from the bottom of all onsite monitor wells which are being sampled for the RFI/CMS. A BAT Envitech Hydroprobe Sampler will be used for the DNAPLS sampling. If visual inspection of the sample in the vial indicates the presence of DNAPLS, then the groundwater will not be sampled in that well. The BAT sample vial will then be sent to the laboratory for volatile organic analysis. The hydroprobe will be decontaminated between samples in the same manner as other sampling apparatus with laboratory-grade detergent, potable water and reagent-grade methanol. The hypodermic needle and sampling vial will be replaced between wells. The DNAPLS sampling procedure is as follows:

a. With a firm grip on the activation tubing, carefully lower the assembled BAT sampler down into the monitor well.

b. When the sampler has been lowered to the desired depth, it should be secured to the well casing with the wooden support tool.

c. Activate the sampler by pressing the upper end of the activation tubing into the hand-pump connector, and then close the release valve.

d. Pump the hand-pump until a constant pressure of six bars has been reached, as indicated on the hand-pump pressure gauge. This pressure must be maintained during the entire sampling operation. The sampling apparatus should remain in place for approximately five minutes to ensure that the sampling vial is filled.

e. When the sampling is completed, deactivate the sampler by opening the release valve on the hand-pump connector.

f. After deactivation is complete, pull up the sampler and examine the sampling vial for the presence of DNAPLS.

ATTACHMENT 3

ANNUAL GROUNDWATER MONITORING REPORT
EKCO HOUSEWARES
1989

EKCO
HOUSEWARES, INC.

July 25, 1991

Mr. Monte Leek
American Home Products Corporation
685 Third Avenue
New York, New York 10017-4085

Mr. Harold Byer
Roy F. Weston, Inc.
Weston Way
West Chester, Pennsylvania 19380

Gentlemen:

We have received today a Comprehensive Groundwater Monitoring Evaluation (CME) conducted on February 7, 1991 at the Massillon, Ohio facility.

Ekco Housewares, Inc. personnel have begun sampling the R-series bedrock wells consistent to sampling and analysis procedures as specified in the approved Sampling And Analysis Plan effective June 1, 1991 - Reference: Paragraph VIII.C. of Check List A (Page A-29).

Written documentation demonstrating actions to be taken by Ekco Housewares, Inc. must be furnished to the Ohio EPA by August 23, 1991.

Sincerely,

EKCO HOUSEWARES, INC.

Thomas J. Shingleton
Plant Manager

TJS/lm

CC: Jeff Weinstein
Cam Kerry
Jeff Burman

P.O. Box 560 • Massillon, Ohio 44648-0560 • Telephone 216/832-5026

OhioEPA
State of Ohio Environmental Protection Agency

P.O. Box 1049, 1800 WaterMark Dr.
Columbus, Ohio 43266-0149
(614) 644-3020
FAX (614) 644-2329

George V. Voinovich
Governor

July 19, 1991

Re: **Ekco Housewares, Inc.**
OHD045205424
Stark County

Mr. Thomas Shingleton
Ekco Housewares, Inc.
359 State Avenue, N.W.
P.O. Box 560
Massillon, OH 44658

Dear Mr. Shingleton:

Enclosed is the final report for the Comprehensive Ground Water Monitoring Evaluation (CME) conducted on February 7, 1991, at the Ekco Housewares, Inc.'s facility located in Massillon, Ohio.

The CME was conducted to determine the Ekco Housewares, Inc.'s compliance with the interim status standards for owners and operators of hazardous waste treatment, storage and disposal facilities, specifically rules 3745-65-90 through 3745-65-94 of the Ohio Administrative Code (OAC). The above noted OAC regulations pertain to ground water monitoring. The CME was conducted by Rich Kurlich of the Division of Ground Water. Karen Nesbit, Division of Solid and Hazardous Waste Management, was also present.

The CME report consists of several sections including background information and data on the facility's history and operation, a discussion of the hydrogeology, a description of the groundwater monitoring activities at the facility and various checklists and comments developed from these checklists.

A review of the CME revealed violations and deficiencies that are occurring or have occurred at the facility which are explained in the Compliance Status Summary section on pages 15 through 17 of the enclosed report.

Please submit written documentation demonstrating what actions Ekco Housewares, Inc. has taken or intends to take to abate the violations and deficiencies explained in the enclosed report within thirty days of receipt of this letter to both me and Karen Nesbit of the Northeast District Office.

Printed on recycled paper

If you have any questions, please contact Keith Dimoff at (614)644-2934. Questions of technical nature should be directed to Rich Kurlich of the Division of Ground Water at (216)425-9171.

Sincerely,

C. David Strch, Supervisor
Enforcement Unit
Hazardous Waste Enforcement Section
Division of Solid and Hazardous Waste Management

Reviewed by:

Pamela S. Allen, Manager
Hazardous Waste Enforcement Section
Division of Solid and Hazardous Waste Management

Sp.DS.PA.kd/lcn

cc: Tom Allen, DGW
Harry Courtright, NEDO, RCRA Group Leader
Carolyn Reierson, HWES, DSHWM
Keith Dimoff, HWES, DSHWM
Chris Khourey/Rich Kurlich, DGW, NEDO
Sally Averill, USEPA

COMPREHENSIVE GROUND WATER MONITORING EVALUATION

OF

EKCO HOUSEWARES, INCORPORATED

STARK COUNTY

MASSILLON, OHIO

OHD045205424

OHIO ENVIRONMENTAL PROTECTION AGENCY

JUNE 7, 1991

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X. **APPENDICES** 30
A. Comprehensive Ground Water Monitoring Evaluation

Worksheet, with comment sheet

A-1 Facility Inspection Form for Compliance with Interim Status Standards Covering Ground Water Monitoring

A-2. Inspection Compliance Form for a Facility Which Has Determined It May Be Affecting Ground Water Quality, with comment sheet

I. GENERAL INFORMATION

Purpose

The purpose of this report is to document the results of a Comprehensive Ground Water Monitoring Evaluation (CME) conducted at the Ekco Housewares, Incorporated facility in Massillon, Ohio. The objective of a CME is to determine whether the owner/operator has, in place, a ground water monitoring system that is adequately designed, operated and maintained as required under the Ohio Administrative Code (OAC) rules 3745-65-90 through 3745-65-94.

As part of the CME, a site inspection was performed on February 7, 1991. The purpose of this inspection was to observe the adequacy of the sampling procedures, monitor well location verification, a surficial monitor well integrity inspection and to review the written records pertaining to the ground water monitoring system. Present during this evaluation were Rich Kurlich, Geologist, Ohio EPA, Northeast District Office (NEDO) - Division of Groundwater; Karen Nesbit, Environmental Specialist, Ohio EPA, NEDO - Division of Solid and Hazardous Waste Management (DSHWM); Tom Shingleton, Plant Manager, Ekco Housewares; Greg Flasinski, Technician, Weston; and Wayne Hoskings, Technician, Weston.

Information Sources

In addition to information acquired during the site inspection and review of correspondences contained in Ohio EPA files, the following documents provided information upon which this CME report is based:

Delong and White, 1963, Geology of Stark County: ODNR Bulletin No. 61.

Morningstar, H., 1922, Pottsville Fauna of Ohio: Ohio Division of Geological Survey Bulletin 25, Fourth Series.

Ohio EPA, 1988, Comprehensive Groundwater Monitoring Evaluation of Ekco Housewares, Incorporated, Massillon, Ohio: Ohio EPA, June 27, 1988.

Schmidt, J.J., 1962, Underground Water Resources of the Tuscarawas River and Sugar Creek Basins: ODNR Map.

Weston, R.F., 1988, Ground Water Quality Assessment Plan for Ekco Housewares, Inc., Massillon, Ohio: prepared for Ekco Housewares, March, 1988.

_____, 1988, RCRA Closure Plan for Ekco Housewares, Inc., Massillon, Ohio, Volume I (draft): prepared for Ekco

Housewares, August 1988.

_____, 1988, Quality Assurance Management Plan for Ekco Housewares, Inc., Massillon, Ohio: prepared for Ekco Housewares, September 1988.

_____, 1989, Groundwater Quality Assessment Report for Ekco Housewares, Inc., Massillon, Ohio: prepared for Ekco Housewares, May 1989.

_____, 1989, RFI/CMS Work Plan for Ekco Housewares, Inc., Massillon, Ohio: prepared for Ekco Housewares, June 1989.

_____, 1991, Annual Groundwater Monitoring Report for Ekco Housewares, Inc., Massillon, Ohio: prepared for Ekco Housewares, February 1991.

Inspection Checklists

Attached to this report are three checklists from the Interim Status Ground Water Monitoring Program Evaluation (SW954). The checklists deemed appropriate for this facility are: Appendix A: Comprehensive Ground Water Monitoring Evaluation; Appendix A-1: Facility Inspection Form for Compliance with Interim Status Standards Covering Ground Water Monitoring; and Appendix A-2: Inspection Compliance Form for a Facility which has Determined it may be affecting Ground Water Quality.

II. SITE HISTORY AND OPERATIONS

A considerable portion of the text dealing with site history, geology, and hydrogeology was taken from a CME prepared by the Ohio EPA (1988).

Facility Name

Ekco Housewares, Incorporated, Massillon, Ohio.

EPA I.D. Number

OHD 045 205 424

Facility Location

The Ekco Housewares, Inc. facility is located in the northwest portion of Massillon in Stark County at 359 State Avenue, N.W. The facility occupies 13 acres and is primarily surrounded by industrial and urban complexes. The Ekco property is triangular in shape and lies approximately 1,500 feet west of the Tuscarawas River. The facility is bordered to the north by Newman Creek, while the Penn Central and the Baltimore and Ohio

Railroads border the Ekco property to the south, west and east. Figure 1 depicts the regional and local location along with local business.

A variety of businesses operate adjacent to the Ekco plant. These include Ohio Packaging (paper) to the south, sand and gravel quarries to the west and northwest, Carter Lumber (retail) and American Drain Pipe (concrete pipe) to the north and the Ohio Water Service (public water supply waterworks) to the east. The Baltimore and Ohio Railroad has numerous spurs and sidetracks adjacent to the Ekco plant that are used for storage of rail cars and Conrail track maintenance vehicles.

Facility Description

The Ekco Housewares facility has been manufacturing primarily cookware/bakeware since 1945. In 1945, the Ekco Housewares facility was manufacturing aluminum and stainless steel cookware. By 1951, the plant was manufacturing 90 mm and 105 mm shell casings for the military. This process increased production and required the installation of two production wells (W-1 and W-2). In 1953 a surface impoundment was constructed along the northern property boundary adjacent to Newman Creek. Sludge from the waste treatment of the military production was discharged to the surface impoundment.

During 1954, Ekco Housewares began its electroplating operations. The primary function of these operations was to copper plate cookware manufactured at the facility. Solvents (primarily trichloroethylene [TCE] or 1,1,1 trichloroethane [TCA]) were used to clean the products prior to plating. However, TCA and TCE were never used at the same time. Ekco Housewares discontinued use of TCE sometime during the mid 1960's. When copper plating and printing operations were in use after 1954, all process water, including alkaline cleaning rinse waters, boiler blowdown, and deionizer water was piped to the lagoon.

By 1967, Ekco Housewares began to manufacture porcelain and teflon coated cookware. In 1969, Ekco Housewares was permitted under NPDES regulation to discharge the waste products associated with plant activities to the surface impoundment.

Ekco, however, discontinued the manufacturing of aluminum and porcelain cookware and use of the lagoon ceased in 1977. By the end of 1978, all copper plating operations had ended and the principal products manufactured at the facility became pressed and coated non-stick bakeware. The surface impoundment was reinstated in 1980 under the same NPDES permit to receive wastewater. The unit was permanently removed from operation in December 1985.

Ekco Housewares continues to manufacture pressed and coated non-stick bakeware. The operations that generated hazardous waste at the facility include degreasing (degreaser still bottom wastes - F001, D007, D009) and silicon coating of the bakeware (waste paint, F005 spent solvent).

Hazardous Waste Generated

Waste products generated at various intervals during the operational history of the Ekco Housewares facility and subsequently disposed in the lagoon include:

Trichloroethylene and 1,1,1 trichloroethane used as a degreasing solvent during electroplating operations starting 1954.

Process water, including alkaline cleaning rinse waters, boiler blowdown and deionizer water from copper plating and printing operations after 1954.

Deionizers from copper plating operations (hydrochloric acid and sodium hydroxide) and washings and waste material from manufacturing porcelain-teflon coated aluminum cookware (aluminum frit, various coloring inorganic oxides, lead, cadmium, selenium, cobalt and toluene) starting 1969.

Ekco discontinued use of the lagoon in 1977. Later, from 1980 until 1985, hazardous waste generated at the facility during degreasing (degreaser still bottom wastes - F001, D007, D009) and silicon coating of the bakeware (waste paint, F005 spent solvent) was again discharged to the lagoon. The lagoon was permanently decommissioned in 1985 (Weston, May, 1989). Since 1985, all hazardous waste generated at the site was drummed and shipped to Ross Incineration for disposal as of the time of the 1991 CME inspection.

Hazardous Waste Treatment, Storage and Disposal

In summary, the surface impoundment was used noncontinuously for approximately 28 years total. During that time period actual waste products and volume of liquid or sludge discharged to the impoundment is not well documented. Approximately 0.2 MGD of wastewater potentially containing heavy metals, solids and alkalines was discharged to the lagoon when the plating line (1954) was in operation until 1978. There was not any surface discharge from the lagoon.

In 1984, the company was informed that because hazardous waste was placed in the lagoon since the effective date of RCRA (1980) the lagoon is classified as a hazardous waste surface impoundment.

The facility currently is permitted (NPDES # 3IC00009001) to discharge cooling water to Newman Creek. The source of the cooling water is ground water that is pumped at the facility and only used in a non-contact cooling process and then treated through an air-stripper unit prior to discharge.

Regulatory History

Ekco Housewares notified U.S. EPA of its Generator Status in August, 1980. However, a Part A application was not submitted by November 19, 1980 as required by 40 CFR 270.10 and Interim Status was not achieved. Ground water contamination was discovered in 1984 by the facility after completing a volatile organic compounds (VOC) analysis on production well water as required by a NPDES permit renewal. A VOC analysis of the Newman Creek discharge under NPDES permit, outfall 001, indicated the presence of a number of volatile organic compounds, specifically TCE and TCA. A packed aeration treatment unit (air-stripper) was installed in 1985 to treat contaminated ground water. In 1984, the company was informed by the Ohio EPA that because hazardous waste was placed in the lagoon since the effective date of RCRA, the lagoon is classified as a hazardous waste surface impoundment.

In May 1986, Ekco Housewares was referred to U.S. EPA for enforcement of RCRA violations resulting from operation of a hazardous waste surface impoundment without a permit. In November 1986, U.S. EPA filed a Complaint, Findings of Violation and Compliance Order against Ekco Housewares that noted violations of RCRA regulations. These violations included all of 40 CFR 265 subpart F. In November 1987, a Partial Consent Agreement and Final Order was filed by U.S. EPA regarding the Ekco Housewares RCRA violations. A summary of ground water monitoring requirements contained in this document are as follows:

1. Ekco Housewares must develop and submit a plan for a groundwater quality assessment program pursuant to 40 CFR 265.93 within fifty-six days of the effective date of the order.

2. Upon approval and/or modification of the groundwater quality assessment plan by U.S. EPA, Ekco Housewares shall immediately initiate and complete, according to the schedule of implementation, the activities in the approved plan.

A draft Closure Plan for the surface impoundment and a draft Ground Water Quality Assessment Plan were submitted to U.S. EPA in January and February 1988, respectively. A draft of the Interim Measures Plan for Recommended Additional Interim Measures

was submitted to U.S. EPA in February, 1988. A revised Ground Water Quality Assessment Plan (GWQAP) was submitted to the U.S. EPA in March 1988 and subsequently was approved by the U.S. EPA with modifications on April 4, 1988. Ekco Housewares is currently implementing the procedures and additional site work as specified in the GWQAP.

On June 27, 1988, a Comprehensive Ground Water Monitoring Evaluation (CME) was completed by the Ohio EPA. As a result of this CME, Ekco Housewares was cited for several violations of the Ohio Administrative Code. These violations are listed below:

1. Ekco Housewares has failed to have at least one monitoring well hydraulically upgradient from the regulated unit (OAC 3745-65-91 (A)(1)).

2. Ekco Housewares has failed to develop and follow a ground water sampling and analysis plan (OAC 3745-65-92(A)).

3. Ekco Housewares has failed to determine the vertical extent of contaminant migration (OAC 3745-65-93(D)(4)(a)).

4. Ekco Housewares has failed to submit an annual report containing the results of the ground water quality program determining the calculated (or measured) rate of hazardous waste during the reporting period (OAC 3745-65-94(B)(2)).

The Ohio EPA notified Ekco Housewares, in a letter dated July 6, 1988, of the above findings in a Notice of Violations and indicated that these violations should be adequately addressed upon proper implementation of the Ground Water Quality Assessment Plan as conditionally approved by the U.S. EPA in April 1988.

A Closure Plan was submitted to the Ohio EPA on August 15, 1988. The plan was found to not meet OAC standards and was disapproved on January 4, 1989, with an effective date of February 6, 1989. An adjudication hearing was requested on February 2, 1989 by Wilkie, Farr, and Gallagher on behalf of Ekco Housewares, Inc. The Closure Unit of the RCRA Technical Assistance Section of DSHWM has indicated that the closure plan is still in adjudication.

A 3008 (h) Corrective Action Order was agreed to by Ekco Housewares, Inc. and the U.S. EPA on March 31, 1989 with an order date of April 14, 1989. In this, the facility was ordered to submit to the U.S. EPA a workplan for a RCRA facility investigation (RFI) and a corrective measures study (CMS). This work plan, dated June 1989, was designed to delineate the presence, magnitude, extent, direction and rate of movement of

any hazardous waste constituents emanating from the facility within and beyond its boundary. This document refers to the facility in general and not to the surface impoundment specifically.

III. REGIONAL AND SITE HYDROGEOLOGY

Regional Geologic Setting

Stark County lies in two subdivisions of the Appalachian Plateau province. The northern two-thirds of the county lies in the glaciated section of the Appalachian Plateau, and the southern one-third in the unglaciated section (White, 1963). The glacial drift thickness ranges from less than 25 feet to about 100 feet. In the areas of buried valleys however, the unconsolidated material can be as much as 270 feet thick (Schmidt, 1962). Underlying these glacial drift and outwash deposits are sedimentary rocks (sandstone, shale, limestone and coal) of the Pennsylvanian, Mississippian, and Devonian age. Pennsylvanian age deposits consist of the Homewood, Mercer, Massillon and Sharon members of the Pottsville Formation. Mississippian age deposits consist of the Cuyahoga Group and the Berea Sandstone. The Mississippian-Devonian deposits are described as pre-Berea rocks undifferentiated. These bedrock formations dip generally to the southeast at about 20 to 40 feet per mile.

The present drainage pattern of the glaciated section of Stark County is for the most part a direct result of the Wisconsin glaciation. The present Tuscarawas River occupies the valley of the old Dover (Teays Stage) and Newark (Deep Stage) Rivers. A significant erosional level at 900 to 950 feet elevation along the Tuscarawas River Valley represents the Parker Strath of Teays time. Deep entrenchment of the Teays valley is evident from drill records, but owing to the great thickness of the valley fill, few wells penetrate to bedrock, hence knowledge of the gradient of the entrenchment is unknown (White, 1963).

Site Geology

The Ekco Housewares facility is located on a western terrace of the Tuscarawas River Valley. Flood control levees now separate the site from the Tuscarawas river and Newman Creek. In 1987, 25 soil borings were advanced across the facility in order to better characterize site geology. This information, supplemented by additional water well and monitor well drilling logs, indicates that the site directly overlies glacial outwash deposits of interbedded and interlensing clay, silt, silty sand, sand and gravel. These unconsolidated materials appear to thicken to the east and northeast with thicknesses ranging from a thin veneer near the western property boundary of the plant to 92

feet northeast of the plant. Thick sand and gravel outwash deposits (greater than 250 feet) also are present immediately east of the site. The top-of-bedrock contour map of Stark County indicates that the bedrock surface lies at approximately 950 feet mean sea level southwest of the plant and dips to 900 feet m.s.l. east and northeast of the site. Wells drilled to the bedrock on Ekco Housewares property indicate that the depth to bedrock under the site ranges from a few feet along the western property boundary to approximately 72.5 feet along the eastern property boundary. Adjacent to the site, the depth to bedrock increases to 132 feet at well I-6, located immediately east of the facility, and 108 feet at well P-4, located north of the facility.

The bedrock beneath the outwash deposits consists of interbedded sandstone with shale lenses of 1 to 5 foot thickness belonging to the Pennsylvanian Pottsville Group, probably the Sharon Sandstone member. The thickness of the Sharon Sandstone is reported to be approximately 255 feet (Morningstar, 1922). Available well logs indicate that the shale layers are discontinuous from well to well.

Local Hydrogeology

The buried valley deposits of sand and gravel and the underlying Pottsville Group are the principle aquifers utilized in the Massillon area. Within a one mile radius of the site, approximately 50 domestic and 5 commercial wells (including W-1, W-2 and W-10 on the Ekco Housewares property) are completed in the Pottsville Group and approximately 6 municipal wells tap the highly permeable sand and gravel deposits within the buried valley. The average depth of the commercial and municipal wells is approximately 225 and 150 feet, respectively.

Although the literature has reported groundwater yields from individual wells installed in the Pottsville Group of only 25 to 100 gallons per minute, Ekco's two on-site production wells collectively withdraw over 400 gallons per minute. However, drilling logs for wells W-1 and W-2 indicate that the sandstone formation was shot with up to 200 pounds of 60% dynamite to fracture the formation and increase well yield. Yields of over 2,000 gallons per minute have been obtained from the local municipal wells completed in the sand and gravel outwash deposits located east and northeast of the site. Calculated values for transmissivity and storativity in the bedrock zone ranged from 12,000 gpd/foot and 0.0001 to 68,000 gpd/foot and 0.002, respectively (Weston, May, 1989).

The existing on-site monitoring wells are completed in both bedrock and unconsolidated glacial material (Figure 2). Water levels in the bedrock monitoring wells range from 22 to 52 feet below the ground surface. The water levels in these wells are

affected by the pumping of wells W-1 and W-10. The wells near the lagoon, to the north of the facility, are completed in fill and unconsolidated outwash deposits and appear to have a water table closer to the surface. Water levels from these wells are reported to be from 9 to 26 feet below the ground surface. It is unclear if the shallow monitoring wells north of the facility are also affected by the on-site pumping wells.

Ground water elevation data from August 10, 1988 was used to generate a potentiometric surface map (Figure 3). Ground water elevation data obtained during the 1991 CME inspection was also used to generate a potentiometric surface map (Figure 4). A comparison of these two figures indicates significant changes in ground water flow direction, possibly due to pumping and non-pumping conditions of nearby water production wells or seasonal fluctuations related to significant amounts of rainfall that fell previous to the CME inspection date. Potentiometric surface maps generated from quarterly data obtained in 1990 also exhibit flow directions that are similar to the August 10, 1988 map, but with some variation.

Local Surface Water

The northern property boundary of Ekco lies along Newman Creek, an eastward flowing tributary to the Tuscarawas River. The Tuscarawas River lies approximately 1500 feet east of the facility and flows southward through Massillon. Flood control levees are visible along both water bodies. During the CME inspection Newman Creek was in flood stage. Considerable debris deposited by high water around monitoring wells L-4 and L-5 shows that Newman Creek at times experiences very high water levels.

IV. GROUND WATER MONITORING WELL SYSTEM

Ground Water Monitoring History

Several "series" of production and monitoring wells have been installed at the Ekco facility over the years (Figure 2). The W-series are production wells of which two are currently being used by the facility to recover contaminated ground water. Well W-10 is currently being used as a production and recovery well and was installed during the 1940's, however, actual construction details are unknown. Wells W-1 and W-2 were installed in April 1951 to facilitate increased production. Well W-1 is currently being used as a recovery well for ground water contamination. Well W-2 is an out-of-service production well that is currently being used to monitor for ground water contamination. All of the production wells are constructed of 12-inch steel casing and are installed in the Pottsville sandstone. Increased yields for wells W-1 and W-2 were accomplished by fracturing the sandstone with up to 200 pounds of

60% dynamite between 115 and 165 feet below the ground surface. The production wells are not screened and are open boreholes below the unconsolidated outwash deposits.

The R-series bedrock monitoring wells were installed in October 1984 by Ohio Drilling Company to evaluate on-site ground water contamination migration. The wells are installed into the Pottsville sandstone and are cased with six-inch diameter steel pipe through the unconsolidated outwash deposits and left open for the entire length of the borings in the sandstone formation. The cased portions of the wells are not grouted or sealed above the sampling position within the well. All R-series wells have dedicated pumps that are placed in the upper portion of the water table permanently.

Also in October 1984, four test boring holes were completed at the facility to determine potential sources of contamination. Two test borings (P-1-84 and P-2-84) were converted to 1-1/4 inch diameter piezometers with either three or five feet of slotted screen. The piezometers were backfilled with clean gravel, then sealed with bentonite to the surface.

In January 1987 the D-series wells were completed and constructed of 1-1/2 inch PVC casing with 10 or 15 feet of PVC screen. All D-series wells were installed using hollow stem auger drilling methods and continuous soil samples were taken in an 18 or 24 inch split-spoon sampler driven ahead of the auger. All wells were sand packed to two feet above the screen and filled with bentonite pellets and grouted to the surface. Protective outside steel casings with locking caps were placed over the well casings.

During the summer of 1988, 16 new monitoring wells were installed and incorporated into the monitoring network (Weston, May, 1989). These wells are discussed below.

Monitoring Well Installation and Construction

Monitoring wells installed since the May 16, 1988 CME inspection date were constructed of either two-inch PVC screens and risers (P-3, P-5), two-inch low carbon steel risers and wire wound type 304 stainless steel screens (P-4), or four-inch wire wound type 304 stainless steel screens and low carbon steel risers (S-7, I- and L-series). Well R-5 has a six-inch low carbon steel riser with no screen. The screen lengths for the remaining wells are 10 feet except for P-5 which has a 5 foot screen. Figure 2 indicates the locations of all well installed at the site.

The borehole annular space is filled with a silica sand pack to approximately two feet above the top of the screen followed by a two foot plug of sodium bentonite and a grout mixture of

bentonite/portland cement to the surface. A protective casing with locking cap was placed over each well and cemented in place.

Adequacy of Monitoring Well Network

During the November 1990 ground water sampling event, upgradient well L-3 indicated significant levels of trichloroethene (130 ug/l), vinyl chloride (5 ug/l) etc. Ekco Houseware's consultant has identified this data as being inadvertently switched with the data belonging to well L-1. However, ground water elevation data collected during the February 1991 CME inspection, after several days of heavy rainfall, suggests that radical changes in flow directions can occur at the facility due to temporal events. For this reason, it appears that well L-3 may not consistently monitor background water quality near the lagoon. Available ground water elevation data should be evaluated and the need for a new upgradient well location should be evaluated. Rule 3745-65-91 (A)(1) of the OAC requires that a facility install at least one hydraulically upgradient well that is representative of background water quality and not affected by the facility.

Since all downgradient wells included in the assessment monitoring network have shown ground water contamination including the shallow L-series wells (L-1, L-2, L-4 and L-5) and the deeper well R-5, the assessment monitoring network should be expanded to define the vertical and horizontal extent of contamination. This can be accomplished by drilling additional wells and/or including already existing site wells in the monitoring system.

An inspection of the L-series wells noted a few maintenance deficiencies.

a. No survey marks for measuring water level elevations were present on the well casings.

b. Well identification numbers were not present on wells L-5, L-2 and L-1 and barely visible on well L-4.

c. The cement apron surrounding wells L-3 and L-1 are starting to crack and will need repaired in the near future.

d. The locking mechanism on well L-1 is broken and does not prevent unauthorized access to this well. The protective casing should be repaired and locked. This well is also located in an area of potential traffic and therefore, should have guard posts installed to further protect the wellcasing.

e. During the CME inspection Newman Creek was in bank full stage and showed evidence of having recently overflowed its

banks. Wells L-4 and L-5 are located on the flood plain of Newman Creek and potentially may become submerged during periods of high water flow. This is evidenced by the presence of water-deposited trash and organic debris around the bases of wells L-4 and L-5. Furthermore, L-4 has no end cap covering the inner casing and the end cap covering L-5 is broken into two pieces, therefore, river waters are free to enter the wells. Water-tight end caps should be installed on wells L-4 and L-5.

V. SAMPLING AND ANALYSIS PLAN AND PROCEDURES

Sampling and Analysis Plan

The Sampling and Analysis Plan currently used at the facility is based on two documents prepared by Weston. These documents consist of the Quality Assurance Management Plan for Ekco Housewares, Inc. Massillon, Ohio (Weston, 1988) and the Groundwater Quality Assessment Report for Ekco Housewares, Inc., Massillon, Ohio (Weston, 1989). The Groundwater Quality Assessment Report addresses the sampling of additional monitoring wells installed since preparation of the first SAP. The Sampling and Analysis Plan as reviewed for this CME, will meet adequately the requirements of rule 3745-65-92 (A) of the Ohio Administrative Code if properly implemented after the following modification is made:

> The SAP does not discuss the detection of immiscible layers as required by Rule 3745-65-92(A)(2) of the OAC. A discussion of detecting for immiscible layers should be added to the SAP. If detecting for immiscible layers is not applicable to the site, this should be stated in the SAP.

Currently, Ekco Housewares personnel sample the R-Series wells on a quarterly basis in March, June, September and December of each year. These wells are not sampled according to the protocol described in the Sampling and Analysis Plan. In order to maintain consistency of analytical results, all sampling of monitoring wells should be performed according to the SAP. Rule 3745-65-92(A) of the OAC requires the owner\operator to develop and follow a ground water SAP.

Field Evaluation of Sampling and Analysis Procedures

As part of the CME inspection, the procedures for sampling the L-series wells were evaluated. The L-series wells are sampled on a quarterly basis in February, May, August and November of each year. Dedicated bottom filling bailers were used to both purge and collect samples from each well. The bailers were wrapped in aluminum foil between use and lowered into the wells using dedicated rope. A sheet of plastic was placed on the ground to prevent contamination of the sampling

equipment or the ground. The VOA bottles were filled first and followed by the field filtration of the samples destined for dissolved metals analysis. Ekco's consultant Weston used disposable, dedicated filtering equipment. Ground water samples were placed in coolers after collection.

VI. ASSESSMENT MONITORING

Assessment Sampling Events

Assessment sampling events are conducted quarterly on the L-series wells in February, May, August and November of each year. The Ohio EPA has received analytical results for the initial sampling of these wells in November 1988 and results from the 1990 sampling events. Ekco Housewares did not sample these wells during 1989 and therefore has failed to maintain the quarterly sampling frequency required by rule 3745-65-93(D)(7)(a) of the OAC. Table 1 includes the dates of known sampling events at the facility.

No data was supplied for well R-5 in 1990. The annual report for 1990 does not include a summary of the analytical data nor does it include analysis of the rate and extent of contaminant migration. Ekco Housewares has failed to meet annual reporting requirements of rule 3745-65-94 (B)(2) of the Ohio Administrative Code (OAC).

Analytical Results

Table 2 lists analyzed parameters that exceed the Primary and Secondary Drinking Water Standards for each well for the November 1988 and the 1990 sampling events. Quarterly ground water data were not collected for the interim status monitoring network during 1989 and is a violation of rule 3745-65-93(D)(7)(a) of the OAC. Arsenic and barium were the only parameters to exceed the primary standards for the November 1988 sampling event. Ekco Housewares states that arsenic and barium were detected in the field blanks, however, a review of the November 1988 blank data suggests that the field and trip blanks were either not analyzed or did not detect these parameters. These two elements were commonly detected but at below primary drinking water standards during the 1990 sampling year. No analytical parameters exceeded the primary or secondary drinking water standards during 1990.

Chlorinated solvents such as trichloroethene and various decay products (such as vinyl chloride) were detected in several of the wells including L-1, L-2, L-5 and R-5 in November 1988. The greatest concentrations of these contaminants were detected in wells L-1 and L-5, and in L-2 and R-5 to a lesser quantity. Methylene chloride also was detected in all five L-series wells

and in R-5, however, this detection in some cases may be the result of laboratory contamination due to its presence in the field blanks. Only samples L-3 and L-4 contain methylene chloride concentrations less than the concentrations observed in the field blanks. Wells L-1, L-2 and L-5 contain methylene chloride concentrations several times the field blank levels and, therefore, may not be entirely the result of laboratory contamination. Acetone was also detected in the field blank at a low concentration. Wells L-1 and L-2 contain acetone concentrations of 11 ug/l and 10 ug/l, respectively, and may be the result of laboratory contamination. Well L-5 contains 74 ug/l of acetone and may not be entirely the result of laboratory contamination. The presence of methylene chloride and acetone should be evaluated in future sampling events to determine whether these compounds can be attributed to the facility or to laboratory contamination.

During the 1990 sampling events chlorinated solvents were detected in wells L-1, L-2, L-4 and L-5 for all four quarters. The greatest contamination is found in wells L-1, L-2 and L-5. Well L-4 consistently shows ground water contamination but at lesser concentrations relative to the other downgradient wells. Levels of trichloroethene ranged from non-detected to 320 ug/l (L-2). During August 1990, carbon disulfide was identified for the first and only time in wells L-4 and L-5. This compound was not identified in blank analyses. Ekco did not discuss the presence of this compound in their 1990 annual report.

The results of these volatile organic compound analyses conducted on samples obtained in November 1988 and during the quarterly 1990 sampling year are listed in Table 3.

The ground water flow map generated from measurements made during February 1991 suggests that well L-3 may not be located upgradient of the lagoon at all times during the year. The analytical results for future quarters should be examined closely to determine whether ground water contamination detected in well L-3 is due to this change in ground water flow direction.

Annual Reporting Requirements

Ekco Housewares is required to submit by March 1 of each year an annual report detailing the results of the assessment monitoring program. This report should include presentation of analytical data and a discussion of the rate and extent of contamination. Ekco has not met minimum content requirements of rule 3745-65-94(B)(2) of the Ohio Administrative Code for the 1989 and 1990 annual report submittals. The L-series and R-5 wells were not sampled during 1989. During 1990, four quarters of ground water data were collected but no data was supplied for well R-5. It is unclear whether well R-5 was sampled during the quarterly assessment sampling events. Furthermore, the annual

report for 1990 failed to make a determination of the rate and extent of migration of hazardous waste or hazardous waste constituent in the ground water.

VII. COMPLIANCE STATUS SUMMARY

As a result of this CME, several violations and deficiencies in regards to state interim status ground water monitoring regulations, rules 3745-65-90 through 3745-65-94 of the Ohio Administrative Code, have been identified. Each violation and deficiency is listed below, and a brief corresponding explanation of the nature of the problem is given.

Violations

Violation 1 OAC Rule 3745-65-92(A)(2)

The Sampling and Analysis Plan fails to discuss the detection of immiscible layers in monitoring wells installed at the facility.

The Sampling and Analysis Plan does not discuss the detection of immiscible layers as required by Rule 3745-65-92(A)(2) of the OAC. If detecting for immiscible layers is not applicable to the site, this should be stated in the SAP.

Violation 2 OAC Rule 3745-65-93(D)(7)(a)

Ekco Housewares has failed to determine the rate and extent of migration and the concentrations of hazardous waste or hazardous waste constituents in ground water on a quarterly basis.

No analytical ground water data was collected during 1989. Quarterly ground water data must be collected until final closure.

Violation 3 OAC Rule 3745-65-93(D)(4)

Ekco Housewares has failed to determine the rate and extent of migration and concentrations of hazardous waste or hazardous waste constituents in the ground water associated with the management of the hazardous waste surface impoundment.

An evaluation of the rate and extent of migration of contamination should be performed by expanding the assessment monitoring network both vertically and horizontally downgradient of known contamination. This can be accomplished by either drilling new wells and/or using already existing wells on site. The ground water flow direction observed in Figure 4 suggests a need for the installation of a monitoring well across Newman

Creek and located downgradient of the surface impoundment. Additional wells that may be useful in expanding the quarterly assessment monitoring network include wells I-2, R-2, R-4 and I-4. Additionally, the Ground Water Quality Assessment Plan should be modified to indicate what existing and proposed wells will be used in the revised ground water monitoring well network for quarterly analyses.

The presence of methylene chloride, acetone and carbon disulfide should be evaluated in future sampling events to determine whether these compounds can be attributed to the facility or to laboratory contamination.

Violation 4 OAC Rule 3745-65-94(B)(2)

Ekco Housewares has failed to annually, until final closure of the facility, submit to the director a report containing the results of the ground water quality assessment program which includes the concentrations, extent and calculated rate of migration of hazardous waste or hazardous waste constituents in the ground water.

The annual reports submitted for 1988 and 1989 quarterly ground water monitoring did not meet minimum content requirements of the OAC. An annual report was submitted in 1991 for data collected during the preceding year but this report failed to make a determination of the rate and extent of hazardous waste or hazardous waste constituents in the ground water nor did it discuss the concentrations observed. Well R-5 is considered to be part of the assessment monitoring network by the Ohio EPA and therefore, analytical data for this well needs to be submitted in the annual report.

Deficiencies

Deficiency 1. An inspection of the L-series wells noted a few maintenance deficiencies.

a. Survey marks for measuring water level elevations should be permanently installed on the well casings.

b. Well identification numbers should be clearly labeled on all wells. Wells L-5, L-2 and L-1 have no visible identification numbers and the number is barely visible on well L-4.

c. The cement apron surrounding wells L-3 and L-1 are starting to crack and will need repaired in the near future.

d. The locking mechanism on well L-1 is broken and does not prevent unauthorized access to this well. The protective casing should be repaired and locked. This well is also

Creek and located downgradient of the surface impoundment. Additional wells that may be useful in expanding the quarterly assessment monitoring network include wells I-2, R-2, R-4 and I-4. Additionally, the Ground Water Quality Assessment Plan should be modified to indicate what existing and proposed wells will be used in the revised ground water monitoring well network for quarterly analyses.

The presence of methylene chloride, acetone and carbon disulfide should be evaluated in future sampling events to determine whether these compounds can be attributed to the facility or to laboratory contamination.

Violation 4 OAC Rule 3745-65-94(B)(2)

Ekco Housewares has failed to annually, until final closure of the facility, submit to the director a report containing the results of the ground water quality assessment program which includes the concentrations, extent and calculated rate of migration of hazardous waste or hazardous waste constituents in the ground water.

The annual reports submitted for 1988 and 1989 quarterly ground water monitoring did not meet minimum content requirements of the OAC. An annual report was submitted in 1991 for data collected during the preceding year but this report failed to make a determination of the rate and extent of hazardous waste or hazardous waste constituents in the ground water nor did it discuss the concentrations observed. Well R-5 is considered to be part of the assessment monitoring network by the Ohio EPA and therefore, analytical data for this well needs to be submitted in the annual report.

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d. The locking mechanism on well L-1 is broken and does not prevent unauthorized access to this well. The protective casing should be repaired and locked. This well is also

VIII. TABLES

Table 1. Dates of Known Sampling Events at the Facility Since the 1988 CME Inspection

Well	Date
L-Series	2-7-91
	11-9-90
	8-9/10-90
	5-8-90
	2-9-90
	12-?-88
Ohio Water Service (wells 1,2,3 & 5)	3-9-90
	2-9-90
	1-12-90
	12-13-89
	11-11-89
	10-10-89
	9-12-89
	8-11-89
	7-12-89
	6-8-89
	5-11-89
	4-13-89
	3-10-89
South Well (W-1)	12-4-90
	9-5-90
	6-4-90
	3-5-90
	12-?-88
Well W-10	12-4-90
	9-5-90
	6-4-90
	3-5-90
	12-?-88
R-Series (Wells 1,2,3 & 4)	12-4-90
	9-5-90
	6-4-90
	3-5-90
Well R-5	12-?-88
I-Series	12-?-88
S-7	12-?-88
OWS-4	12-?-88
D-4-30	12-?-88

Table 2. Parameters Exceeding Primary and Secondary Drinking Water Standards during Assessment Sampling Events

Well	Date	Compound	Concentration mg/l	EPA Standard mg/l
L-1	11-88	iron	1120	0.03(s)
		manganese	5590	0.05(s)
L-2	11-88	barium*	54.0	1.0(p)
		manganese	854	0.05(s)
L-3	11-88	iron	23500	0.03(s)
		manganese	4230	0.05(s)
		zinc*	17.0	5.0(s)
L-4	11-88	arsenic*	13	0.05(p)
		barium*	148	1.0(p)
		iron	808	0.03(s)
		manganese	3530	0.05(s)
L-5	11-88	arsenic*	7.0	0.05(p)
		barium*	62.0	1.0(p)
		iron	1040	0.03(s)
		lead	6.0	0.05(p)
		manganese	268	0.05(s)
R-5	11-88	arsenic*	7.0	0.05(p)
		iron	3520	0.03(s)
		manganese	734	0.05(s)

(p) = Primary Standard
(s) = Secondary Standard
* = Ekco states that these parameters are present in the field blank, however, a review of the available field and trip blank data suggests that theses blanks either were not analyzed or showed non-detection of the parameters

Table 3. Volatile Organic Compounds Detected During Assessment Sampling Events

Well	Date	Compound	Concentration ug/l	Trip Blank
L-1	11-88	Vinyl Chloride	48.0	----
		Methylene Chloride	30.0	10
		Acetone	11.0	6
		1,1-Dichloroethene	3.0j	----
		1,1-Dichloroethane	67.0	----
		1,2-Dichloroethene	61.0	----
		1,1,1-Trichloroethane	49.0	----
		Trichloroethene	210	----
	2-90	Vinyl Chloride	24	----
		1,1-Dichloroethene	2	----
		1,1,1-Trichloroethane	16	----
		1,1-Dichloroethane	68	----
		1,2-Dichloroethene	58	----
		Trichloroethene	130	----
	5-90	Vinyl Chloride	10	----
		Methylene Chloride	2	5
		1,1,1-Trichloroethane	10	----
		1,1-Dichloroethane	28	----
		1,2-Dichloroethene	22	----
		Trichloroethene	47	----
	8-90	Vinyl Chloride	13	----
		Methylene Chloride	2	----
		1,1,1-Trichloroethane	12	----
		1,1-Dichloroethane	29	----
		1,2-Dichloroethene	25	----
		Trichloroethene	41	----
	11-90	Vinyl Chloride	5	----
		1,1-Dichloroethene	0.7	----
		1,1-Dichloroethane	12	----
		1,2-Dichloroethene	8	----
		1,1,1-Trichloroethane	11	----
		Trichloroethene	130	----
		Vinyl Chloride	4 dup.	----
		1,1-Dichloroethane	10 dup.	----
		1,2-Dichloroethene	6 dup.	----
		1,1,1-Trichloroethane	2 dup.	----
		Trichloroethene	13 dup.	----
L-2	11-88	Methylene Chloride	31.0	10
		Acetone	10.0	6
		1,1,1-Trichloroethane	26.0	----

		Trichloroethane	130	----
	2-90	1,1-Dichloroethane	11	----
		Vinyl Chloride	83	----
		1,2-Dichloroethene	82	----
		1,1-Dichloroethane	1 dup.	----
		1,2-Dichloroethene	2 dup.	----
		1,1,1-Trichloroethane	17 dup.	----
		Trichloroethene	180 dup.	----
	5-90	1,1-Dichloroethane	1	----
		1,2-Dichloroethene	2	----
		1,1,1-Trichloroethane	10	----
		Trichloroethene	320	----
	8-90	Methylene Chloride	2	----
		1,1-Dichloroethane	1	----
		1,2-Dichloroethene	10	----
		1,1,1-Trichloroethane	12	----
		Trichloroethene	180	----
	11-90	Vinyl Chloride	26	----
		1,1-Dichloroethene	2	----
		1,1-Dichloroethane	53	----
		1,2-Dichloroethene	27	----
		1,1,1-Trichloroethane	6	----
		Trichloroethene	37	----
L-3	11-88	Methylene Chloride	6.0	10
	2-90	Methylene Chloride	1	0.4
	8-90	Methylene Chloride	2	----
L-4	11-88	Methylene Chloride	5.0	10
	2-90	Vinyl Chloride	2	----
		Methylene Chloride	1	0.4
		1,1-Dichloroethane	9	----
		1,2-Dichloroethene	17	---
	5-90	Vinyl Chloride	2	----
		Methylene Chloride	2	5
		1,1-Dichloroethane	10	----
		1,2-Dichloroethene	19	----
	8-90	Vinyl Chloride	7	----
		Methylene Chloride	2	----
		Carbon Disulfide	2	----
		1,1-Dichloroethane	19	----
		1,2-Dichloroethene	48	----
		Vinyl Chloride	6 dup.	----

		Carbon Disulfide	10 dup.	----
		1,1-Dichloroethane	20 dup.	----
		1,2-Dichloroethene	47 dup.	----
	11-90	1,1,1-Trichloroethane	4	----
		Trichloroethene	75	----
L-5	11-88	Vinyl Chloride	110	----
		Methylene Chloride	62.0	10
		Acetone	74.0	6
		1,1-Dichloroethane	4.0j	----
		1,2-Dichloroethene	92.0	----
	2-90	Methylene Chloride	2	0.4
		1,1-Dichloroethane	1	----
		1,2-Dichloroethene	2	----
		1,1,1-Trichloroethane	17	----
		Trichloroethene	180	----
	5-90	1,1-Dichloroethane	14	----
		Vinyl Chloride	71	----
		1,2-Dichloroethene	70	----
		Methylene Chloride	2 dup.	5
		1,1-Dichloroethane	14 dup.	----
		Vinyl Chloride	47 dup.	----
		1,2-Dichloroethene	64 dup.	----
	8-90	Carbon Disulfide	43	----
		1,1-Dichloroethane	19	----
		Vinyl Chloride	110	----
		1,2-Dichloroethene	64	----
	11-90	Vinyl Chloride	150	----
		Chloroethane	2	----
		Acetone	3	----
		1,1-Dichloroethane	18	----
		1,2-Dichloroethene	68	----
R-5	11-88	Methylene Chloride	0.97	10
		1,1-Dichloroethene	0.84	----
		1,1-Dichloroethane	4.9	----
		1,2-Dichloroethene	100	----
		Chloroform	0.55	----
		Trichloroethene	40	----
	2-90	No data provided		
	5-90	No data provided		
	8-90	No data provided		

11-90 No data provided

j = Present at less than detection limit with estimated concentration

dup. = Duplicate sample

IX. FIGURES

WESTON

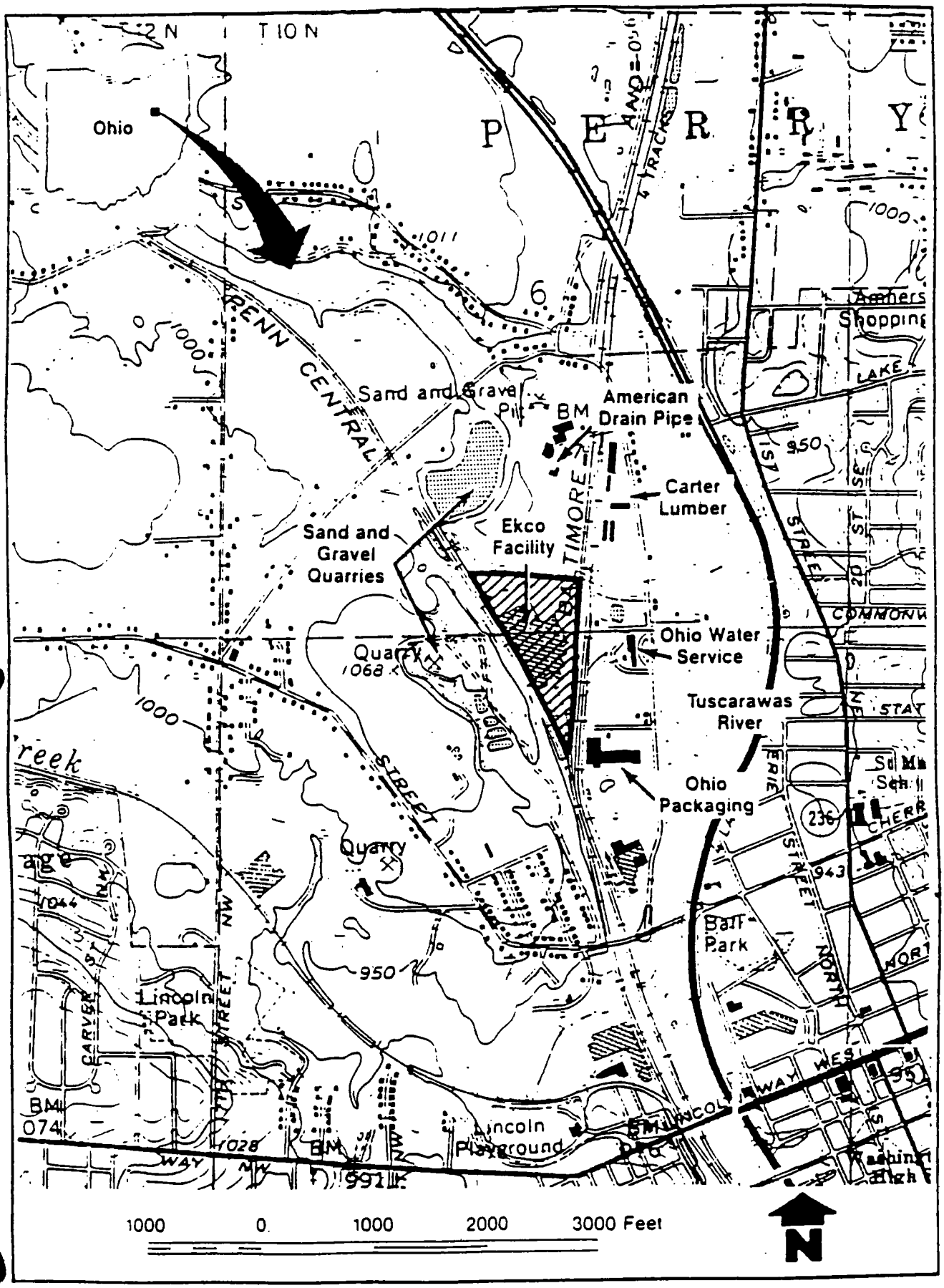


FIGURE 1 SITE LOCATION MAP
EKCO HOUSEWARES, INC., MASSILLON, OHIO
(Ref. 7.5 Minute Massillon Quad. Ohio. 1978)

WESTON

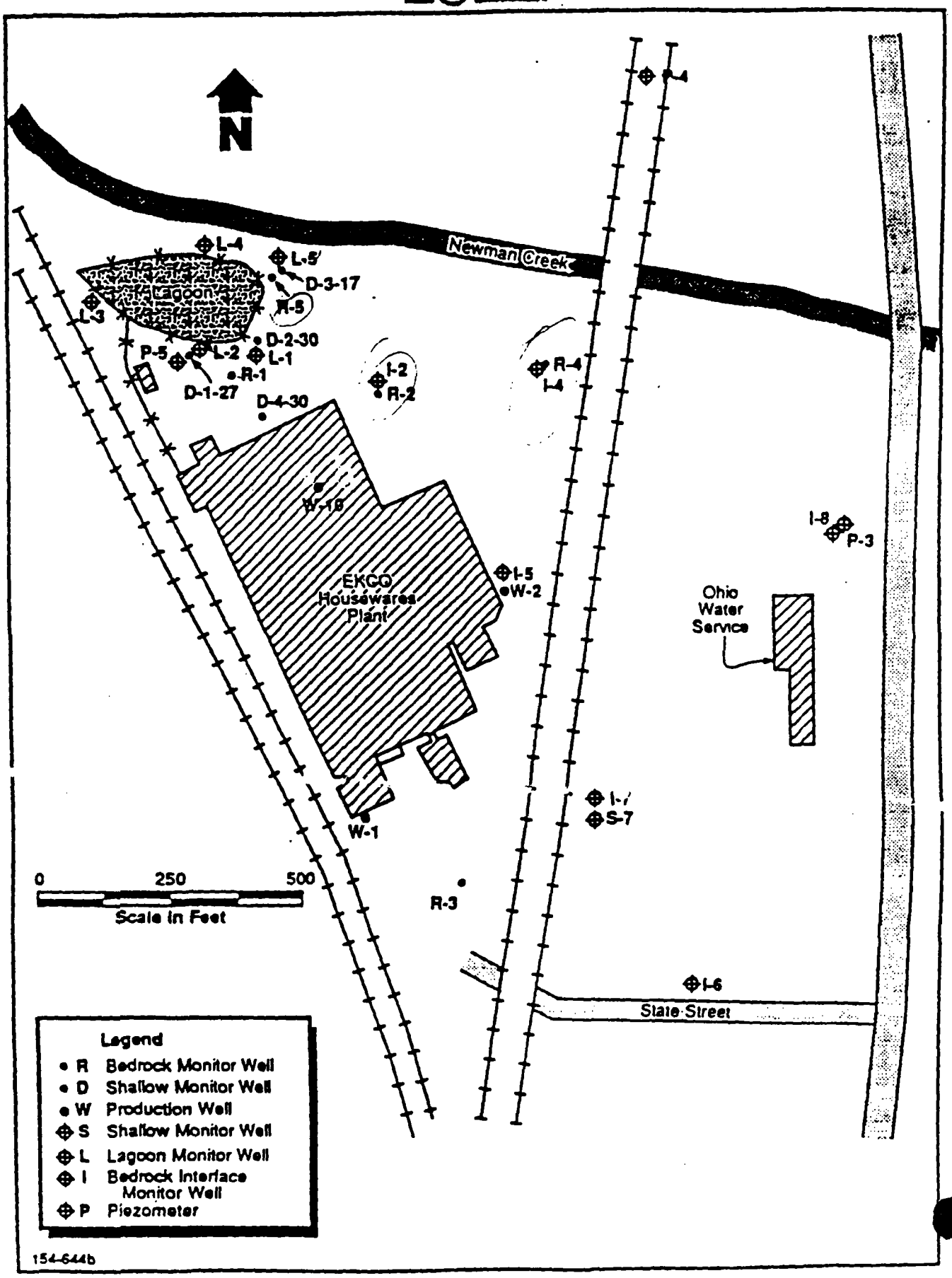
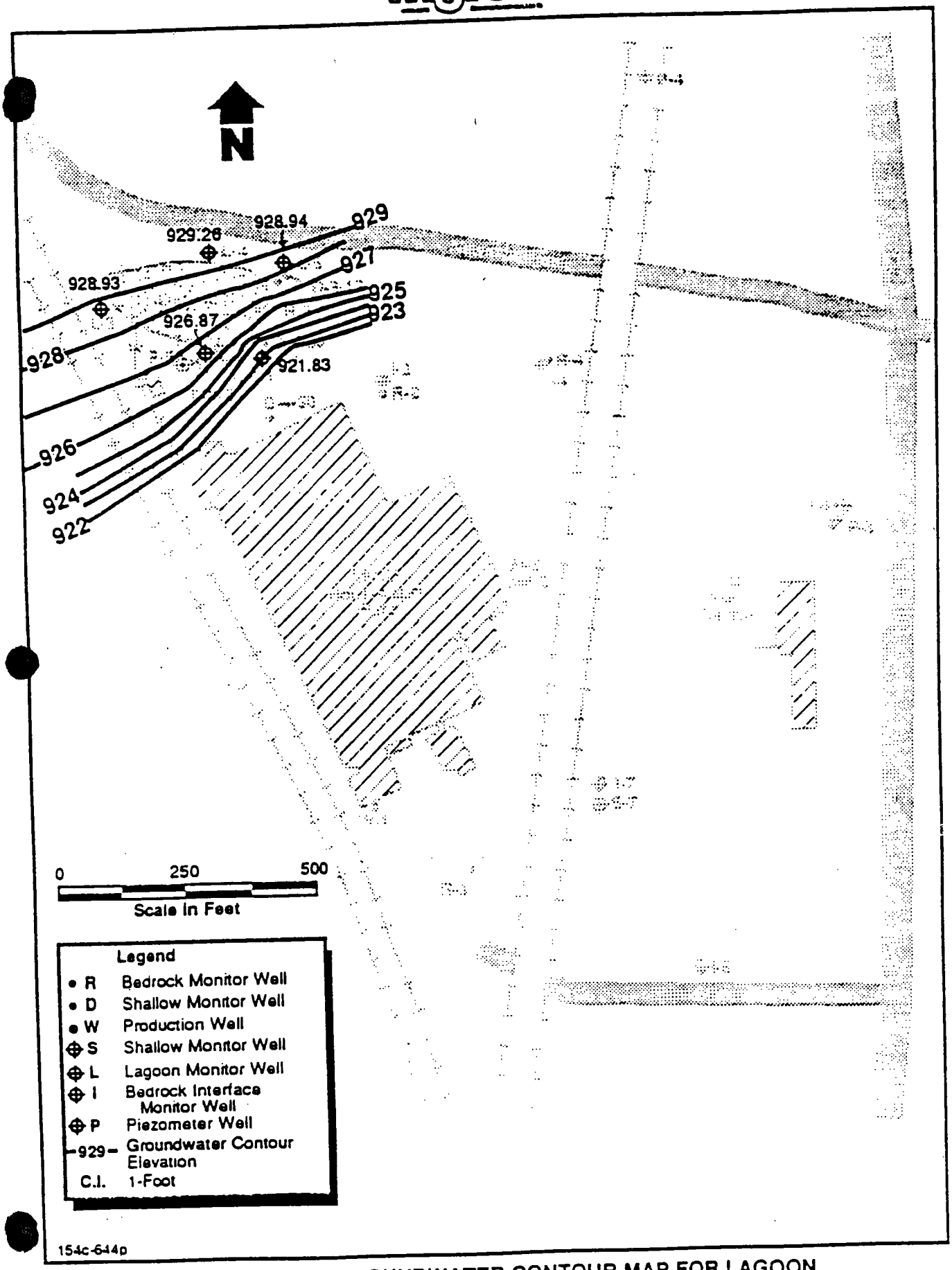


FIGURE 2 WELL LOCATION MAP FOR EKCO HOUSEWARES FACILITY

WESTON



154c-644p

FIGURE 3 GROUNDWATER CONTOUR MAP FOR LAGOON WELLS. WATER LEVELS MEASURED 8-10-88.

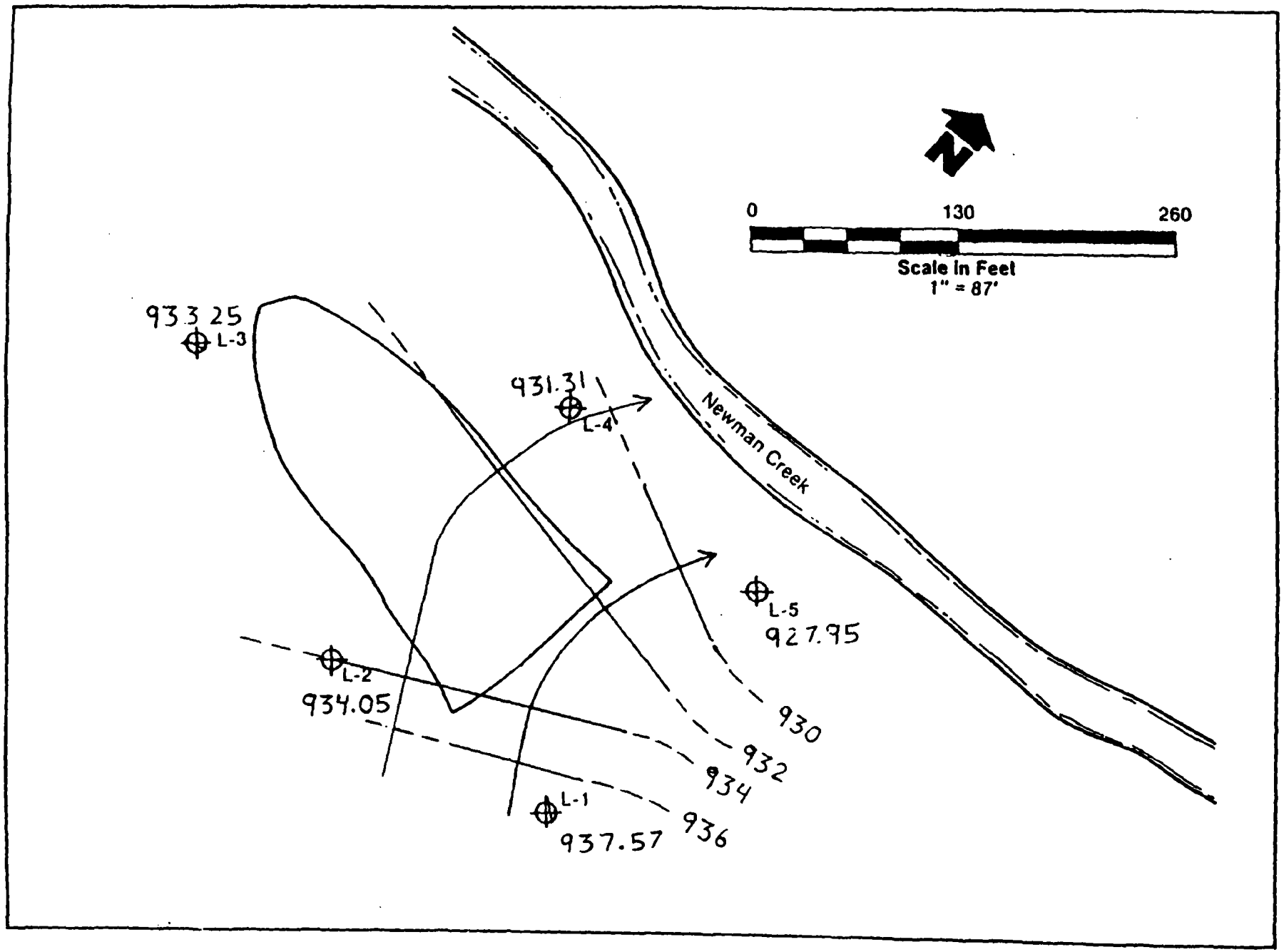


Figure 4. Ground water flow map for Elco Homewates, Massillon, Ohio. Water elevations measured on February [illegible], 1991. Prepared for Ohio EPA.

X. APPENDICES

APPENDIX A

COMPREHENSIVE GROUND-WATER MONITORING EVALUATION WORKSHEET

The following worksheets have been designed to assist the enforcement officer/ technical reviewer in evaluating the ground-water monitoring system an owner/operator uses to collect and analyze samples of ground water. The focus of the worksheets is technical adequacy as it relates to obtaining and analyzing representative samples of ground water. The basis of the worksheets is the final RCRA Ground Water Monitoring Technical Enforcement Guidance Document which describes in detail the aspects of ground-water monitoring which EPA deems essential to meet the goals of RCRA. Appendix A is not a regulatory checklist. Specific technical deficiencies in the monitoring system can, however, be related to the regulations as illustrated in Figure 4.3 taken from the RCRA Ground-Water Monitoring Compliance Order Guide (COG) included at the end of the appendix). The enforcement officer, in developing an enforcement order, should relate the technical assessment from the worksheets to the regulations using Figure 4.3 from the COG as a guide.

Comprehensive Ground-Water Monitoring Evaluation	Y/N
I. Office Evaluation Technical Evaluation of the Design of the Ground-Water Monitoring System	
A. Review of Relevant Documents	
1. What documents were obtained prior to conducting the inspection:	
a. RCRA Part A permit application?	N
b. RCRA Part B permit application?	N
c. Correspondence between the owner/operator and appropriate agencies or citizen's groups?	Y
d. Previously conducted facility inspection reports?	Y
e. Facility's contractor reports?	Y
f. Regional hydrogeologic, geologic, or soil reports?	Y
g. The facility's Sampling and Analysis Plan?	
h. Ground-water Assessment Program Outline (or Plan, if the facility is in assessment monitoring)?	Y
i. Other (specify) EKCO RFI/CMS Work Plan, June 1989 Closure Plan, August 1988	

Y = YES
N = NO

N S = NOT SPECIFIED
* = COMMENT NUMBER

	Y/N
B. Evaluation of the Owner/Operator's Hydrogeologic Assessment	
1. Did the owner/operator use the following direct techniques in the hydrogeologic assessment:	
a. Logs of the soil borings/rock corings (documented by a professional geologist, soil scientist, or geotechnical engineer)?	Y
b. Materials tests (e.g., grain-size analyses, standard penetration tests, etc.)?	N
c. Piezometer installation for water level measurements at different depths?	Y
d. Slug tests?	N
e. Pump tests?	Y
f. Geochemical analyses of soil samples?	Y
g. Other (specify) (e.g., hydrochemical diagrams and wash analysis)	—
2. Did the owner/operator use the following indirect techniques to supplement direct technique data:	
a. Geophysical well logs?	N
b. Tracer studies?	N
c. Resistivity and/or electromagnetic conductance?	N
d. Seismic Survey?	N
e. Hydraulic conductivity measurements of cores?	N
f. Aerial photography?	N
g. Ground penetrating radar?	N
h. Other (specify)	N
3. Did the owner/operator document and present the raw data from the site hydrogeologic assessment?	Y*
4. Did the owner/operator document methods (criteria) used to correlate and analyze the information?	Y
5. Did the owner/operator prepare the following:	
a. Narrative description of geology?	Y
b. Geologic cross sections?	Y
c. Geologic and soil maps?	Y
d. Boring/coring logs?	Y
e. Structure contour maps of the differing water bearing zone and confining layers?	Y
f. Narrative description and calculation of ground-water flows?	Y

	Y/N
g. Water table/potentiometric map?	Y
h. Hydrologic cross sections?	Y
6. Did the owner/operator obtain a regional map of the area and delineate the facility?	Y
If yes, does this map illustrate:	
a. Surficial geology features?	Y
b. Streams, rivers, lakes, or wetlands near the facility?	Y
c. Discharging or recharging wells near the facility?	Y
7. Did the owner/operator obtain a regional hydrogeologic map?	Y
If yes, does this hydrogeologic map indicate:	
a. Major areas of recharge/discharge?	N
b. Regional ground-water flow direction?	N
c. Potentiometric contours which are consistent with observed water level elevations?	N
8. Did the owner/operator prepare a facility site map?	Y
If yes, does the site map show:	
a. Regulated units of the facility (e.g., landfill areas, impoundments)?	Y
b. Any seeps, springs, streams, ponds, or wetlands?	Y
c. Location of monitoring wells, soil borings, or test pits?	Y
d. How many regulated units does the facility have? one	
If more than one regulated unit then,	
• Does the waste management area encompass all regulated units?	Y
• Is a waste management area delineated for each regulated unit?	Y
C. Characterization of Subsurface Geology of Site	
1. Soil boring/test pit program:	
a. Were the soil borings/test pits performed under the supervision of a qualified professional?	Y
b. Did the owner/operator provide documentation for selecting the spacing for borings?	Y
c. Were the borings drilled to the depth of the first confining unit below the uppermost zone of saturation or ten feet into bedrock?	N/A*
d. Indicate the method(s) of drilling:	

	Y/N
Auger (hollow or solid stem) X Mud rotary ___ Reverse rotary ___ Cable tool X Jetting ___ Other (specify) ___	
e. Were continuous sample corings taken?	Y
f. How were the samples obtained (check method[s]) • Split spoon X • Shelby tube, or similar ___ • Rock coring ___ • Ditch sampling ___ • Other (explain) ___	
g. Were the continuous sample corings logged by a qualified professional in geology?	Y
h. Does the field boring log include the following information:	
• Hole name/number?	Y
• Date started and finished?	Y
• Driller's name?	Y
• Hole location (i.e., map and elevation)?	Y
• Drill rig type and bit/auger size?	Y
• Gross petrography (e.g., rock type) of each geologic unit?	Y
• Gross mineralogy of each geologic unit?	N
• Gross structural interpretation of each geologic unit and structural features (e.g., fractures, gouge material, solution channels, buried streams or valleys, identification of depositional material)?	N
• Development of soil zones and vertical extent and description of soil type?	Y
• Depth of water bearing unit(s) and vertical extent of each?	Y
• Depth and reason for termination of borehole? Reason not given	Y
• Depth and location of any contaminant encountered in borehole?	Y
• Sample location/number?	Y
• Percent sample recovery?	N
• Narrative descriptions of: —Geologic observations?	Y
—Drilling observations?	Y
i. Were the following analytical tests performed on the core samples: • Mineralogy (e.g., microscopic tests and x-ray diffraction)?	N
• Petrographic analysis: —degree of crystallinity and cementation of matrix?	N
—degree of sorting, size fraction (i.e., sieving), textural variations?	N
—rock type(s)?	N

	Y/N
—soil type?	N
—approximate bulk geochemistry?	N
—existence of microstructures that may effect or indicate fluid flow?	N
• Falling head tests?	N
• Static head tests?	N
• Settling measurements?	N
• Centrifuge tests?	N
• Column drawings?	N
D. Verification of Subsurface Geological Data	
1. Has the owner/operator used indirect geophysical methods to supplement geological conditions between borehole locations?	N
2. Do the number of borings and analytical data indicate that the confining layer displays a low enough permeability to impede the migration of contaminants to any stratigraphically lower water-bearing units?	N
3. Is the confining layer laterally continuous across the entire site?	N/A*
4. Did the owner/operator consider the chemical compatibility of the site-specific waste types and the geologic materials of the confining layer?	N
5. Did the geologic assessment address or provide means for resolution of any information gaps of geologic data?	Y*
6. Do the laboratory data corroborate the field data for petrography?	N/A
7. Do the laboratory data corroborate the field data for mineralogy and subsurface geochemistry?	N/A
E. Presentation of Geologic Data	
1. Did the owner/operator present geologic cross sections of the site?	Y
2. Do cross sections:	
a. identify the types and characteristics of the geologic materials present?	Y
b. define the contact zones between different geologic materials?	Y
c. note the zones of high permeability or fracture?	N
d. give detailed borehole information including:	

	Y/N
• location of borehole?	Y
• depth of termination?	Y
• location of screen (if applicable)?	Y
• depth of zone(s) of saturation?	Y
• backfill procedure?	Y
3. Did the owner/operator provide a topographic map which was constructed by a licensed surveyor?	N
4. Does the topographic map provide:	
a. contours at a maximum interval of two-feet?	N
b. locations and illustrations of man-made features (e.g., parking lots, factory buildings, drainage ditches, storm drain, pipelines, etc.)?	Y *
c. descriptions of nearby water bodies?	Y *
d. descriptions of off-site wells?	Y *
e. site boundaries?	Y *
f. individual RCRA units?	Y *
g. delineation of the waste management area(s)?	Y *
h. well and boring locations?	Y *
5. Did the owner/operator provide an aerial photograph depicting the site and adjacent off-site features?	N
6. Does the photograph clearly show surface water bodies, adjacent municipalities, and residences and are these clearly labelled?	N/A
F. Identification of Ground-Water Flowpaths	
1. Ground-water flow direction	
a. Was the well casing height measured by a licensed surveyor to the nearest 0.01 foot?	Y
b. Were the well water level measurements taken within a 24 hour period?	Y
c. Were the well water level measurements taken to the nearest 0.01 foot?	Y
d. Were the well water levels allowed to stabilize after construction and development for a minimum of 24 hours prior to measurements?	Y
e. Was the water level information obtained from (check appropriate one):	
• multiple piezometers placed in single borehole? ___	
• vertically nested piezometers in closely spaced separate boreholes? ___	
• monitoring wells? X	

	Y/N
f. Did the owner/operator provide construction details for the piezometers?	Y
g. How were the static water levels measured (check method[s]).	
• Electric water sounder ___X___	
• Wetted tape ___	
• Air line ___	
• Other (explain) ___	
h. Was the well water level measured in wells with equivalent screened intervals at an equivalent depth below the saturated zone?	Y
i. Has the owner/operator provided a site water table (potentiometric) contour map?	Y
If yes,	
• Do the potentiometric contours appear logical and accurate based on topography and presented data? (Consult water level data)	Y
• Are ground-water flow-lines indicated?	N
• Are static water levels shown?	Y
• Can hydraulic gradients be estimated?	Y
j. Did the owner/operator develop hydrologic cross sections of the vertical flow component across the site using measurements from all wells?	N
k. Do the owner/operator's flow nets include:	
• piezometer locations?	Y
• depth of screening?	N
• width of screening?	N
• measurements of water levels from all wells and piezometers?	Y
2. Seasonal and temporal fluctuations in ground-water	
a. Do fluctuations in static water levels occur? If yes, are the fluctuations caused by any of the following:	Y
—Off-site well pumping	NS*
—Tidal processes or other intermittent natural variations (e.g., river stage, etc.)	Y
—On-site well pumping	Y
—Off-site, on-site construction or changing land use patterns	NS
—Deep well injection	N
—Seasonal variations	Y
—Other (specify) ___	
b. Has the owner/operator documented sources and patterns that contribute to or affect the ground-water patterns below the waste management area?	Y
c. Do water level fluctuations alter the general ground-water gradients and flow directions?	Y
d. Based on water level data, do any head differentials occur that may indicate a vertical flow component in the saturated zone?	NS*

	Y/N
e. Did the owner/operator implement means for gauging long term effects on water movement that may result from on-site or off-site construction or changes in land-use patterns?	Y
3. Hydraulic conductivity	
a. How were hydraulic conductivities of the subsurface materials determined?	
• Single-well tests (slug tests)?	N
• Multiple-well tests (pump tests)	Y
• Other (specify) _____	
b. If single-well tests were conducted, were they done by:	
• Adding or removing a known volume of water?	N/A
• Pressurizing well casing?	N/A
c. If single well tests were conducted in a highly permeable formation, were pressure transducers and high-speed recording equipment used to record the rapidly changing water levels?	N/A
d. Since single well tests only measure hydraulic conductivity in a limited area, were enough tests run to ensure a representative measure of conductivity in each hydrogeologic unit?	N/A
e. Are the owner/operator's slug test data (if applicable) consistent with existing geologic information (e.g., boring logs)?	N/A
f. Were other hydraulic conductivity properties determined?	N
g. If yes, provide any of the following data, if available:	
• Transmissivity 12,000 to 68,000 gpd/ft (R-wells)	
• Storage coefficient 0.0001 to 0.002 (R-wells)	
• Leakage ____	
• Permeability ____	
• Porosity ____	
• Specific capacity ____	
• Other (specify) _____	
4. Identification of the uppermost aquifer	
a. Has the extent of the uppermost saturated zone (aquifer) in the facility area been defined? If yes,	N *
• Are soil boring/test pit logs included?	Y
• Are geologic cross-sections included?	Y
b. Is there evidence of confining (competent, unfractured, continuous, and low permeability) layers beneath the site? If yes,	N
• how was continuity demonstrated? _____	
c. What is the hydraulic conductivity of the confining unit? (cm/sec.)	N/A
d. How was it determined?	N/A

	Y/N
e. Does potential for other hydraulic communication exist (e.g., lateral discontinuity between geologic units, facies changes, fracture zones, cross cutting structures, or chemical corrosion/alteration of geologic units by leachate)? If yes or no, what is the rationale? Interbedding of fill material, sand and gravel, silt and sandstone bedrock.	Y
G. Office Evaluation of the Facility's Ground-Water Monitoring System—Monitoring Well Design and Construction:	
These questions should be answered for each different well design present at the facility.	
1. Drilling Methods a. What drilling method was used for the well? • Hollow-stem auger ☒ • Solid-stem auger ☐ • Mud rotary (water) ☐ • Air rotary ☐ • Reverse rotary ☐ • Cable tool ☒ • Jetting ☐ • Air drill w/ casing hammer ☐ • Other (specify) _____	
b. Were any cutting fluids (including water) or additives used during drilling? If yes, specify: • Type of drilling fluid _____ • Source of water used Formation water • Foam _____ • Polymers _____ • Other _____	N
c. Was the cutting fluid, or additive, identified?	N/A
d. Was the drilling equipment steam-cleaned prior to drilling the well? • Other methods _____	Y
e. Was compressed air used during drilling? If yes, • was the air filtered to remove oil?	N
f. Did the owner/operator document procedure for establishing the potentiometric surface? If yes, • how was the location established?	Y *
g. Formation samples	

	Y/N
• Were formation samples collected initially during drilling?	Y
• Were any cores taken continuously ?	Y*
• If not, at what interval were samples taken?	*
• How were the samples obtained? X Split spoon — Shelby tube — Core drill — Other (specify)	
• Identify if any physical and/or chemical tests were performed on the formation samples (specify) HNU organic vapor meter, Blow counts, field determination of grain size, color, texture and any contamination	
2. Monitoring Well Construction Materials a. Identify construction materials (by number) and diameters (ID/OD) Material / Diameter • Primary Casing: low Carbon Steel / 6" & 4" I.D. or 2" PVC • Secondary or outside casing (double construction): ___ / ___ • Screen: Stainless Steel / 4" I.D. or 2" PVC	
b. How are the sections of casing and screen connected?	
• Pipe sections threaded	Threaded
• Couplings (friction) with adhesive or solvent	
• Couplings (friction) with retainer screws	
• Other (specify)	
c. Were the materials steam-cleaned prior to installation?	
• If no, how were the materials cleaned? ___	Y
3. Well Intake Design and Well Development	
a. Was a well intake screen installed?	Y
• What is the length of the screen for the well?	10 ft.
• Is the screen manufactured?	Y
b. Was a filter pack installed?	Y
• What kind of filter pack was employed? no. 2 sand	
• Is the filter pack compatible with formation materials ?	Y
• How was the filter pack installed? poured in	

	Y/N
• What are the dimensions of the filter pack? 8 inch by approximately 12 feet depending on well	
• Has a turbidity measurement of the well water ever been made?	N
• Have the filter pack and screen been designed for the in-situ materials?	Y
c. Well development • Was the well developed?	Y
• What technique was used for well development? —Surge block X Bailer X Air surging X Water pumping —Other (specify)	
4. Annular Space Seals a. What is the annular space in the saturated zone directly above the filter pack filled with: X Sodium bentonite (specify type and grit) (Pellets) —Cement (specify neat or concrete) —Other (specify)	
b. Was the seal installed by: —Dropping material down the hole and tamping —Dropping material down the inside of hollow-stem auger —Tremie pipe method —Other (specify)	NS
c. Was a different seal used in the unsaturated zone? If yes,	Y
• Was this seal made with? X Sodium bentonite (specify type and grit) Grout mixture of Bentenite and X Cement (specify neat or concrete)- Other (specify) Portland Cement	
• Was this seal installed by? —Dropping material down the hole and tamping —Dropping material down the inside of hollow stem auger —Other (specify)	NS
d. Is the upper portion of the borehole sealed with a concrete cap to prevent infiltration from the surface?	Y
e. Is the well fitted with an above-ground protective device and bumper guards?	Y*
f. Has the protective cover been installed with locks to prevent tampering?	Y

	Y/N
H. Evaluation of the Facility's Detection Monitoring Program	
1. Placement of Downgradient Detection Monitoring Wells	
a. Are the ground-water monitoring wells or clusters located immediately adjacent to the waste management area?	Y
b. How far apart are the detection monitoring wells?	*
c. Does the owner/operator provide a rationale for the location of each monitoring well or cluster?	Y
d. Does the owner/operator identify the well screen lengths of each monitoring well or cluster?	Y
e. Does the owner/operator provide an explanation for the well screen lengths of each monitoring well or cluster?	N
f. Do the actual locations of monitoring wells or clusters correspond to those identified by the owner/operator?	Y
2. Placement of Upgradient Monitoring Wells	
a. Has the owner/operator documented the location of each upgradient monitoring well or cluster?	Y
b. Does the owner/operator provide an explanation for the location(s) of the upgradient monitoring wells?	Y
c. What length screen has the owner/operator employed in the background monitoring well(s)?	10 feet
d. Does the owner/operator provide an explanation for the screen length(s) chosen?	No
e. Does the actual location of each background monitoring well or cluster correspond to that identified by the owner/operator?	Y
I. Office Evaluation of the Facility's Assessment Monitoring Program	
1. Does the assessment plan specify:	
a. The number, location, and depth of wells?	Y
b. The rationale for their placement and identify the basis that will be used to select subsequent sampling locations and depths in later assessment phases?	Y
2. Does the list of monitoring parameters include all hazardous waste constituents from the facility?	Y

	Y/N
a. Does the water quality parameter list include other important indicators not classified as hazardous waste constituents?	Y
b. Does the owner/operator provide documentation for the listed wastes which are not included?	N/A
3. Does the owner/operator's assessment plan specify the procedures to be used to determine the rate of constituent migration in the ground-water?	Y
4. Has the owner/operator specified a schedule of implementation in the assessment plan?	Y
5. Have the assessment monitoring objectives been clearly defined in the assessment plan?	Y
a. Does the plan include analysis and/or re-evaluation to determine if significant contamination has occurred in any of the detection monitoring wells?	N/A
b. Does the plan provide for a comprehensive program of investigation to fully characterize the rate and extent of contaminant migration from the facility?	Y
c. Does the plan call for determining the concentrations of hazardous wastes and hazardous waste constituents in the ground water?	Y
d. Does the plan employ a quarterly monitoring program?	Y
6. Does the assessment plan identify the investigatory methods that will be used in the assessment phase?	Y
a. Is the role of each method in the evaluation fully described?	Y
b. Does the plan provide sufficient descriptions of the direct methods to be used?	Y
c. Does the plan provide sufficient descriptions of the indirect methods to be used?	N
d. Will the method contribute to the further characterization of the contaminant movement?	Y
7. Are the investigatory techniques utilized in the assessment program based on direct methods?	Y
a. Does the assessment approach incorporate indirect methods to further support direct methods?	N
b. Will the planned methods called for in the assessment approach ultimately meet performance standards for assessment monitoring?	Y
c. Are the procedures well defined?	Y
d. Does the approach provide for monitoring wells similar in design and construction as the detection monitoring wells?	Y

	Y/N
e. Does the approach employ taking samples during drilling or collecting core samples for further analysis?	Y
8. Are the indirect methods to be used based on reliable and accepted geophysical techniques?	N/A
a. Are they capable of detecting subsurface changes resulting from contaminant migration at the site?	N/A
b. Is the measurement at an appropriate level of sensitivity to detect ground-water quality changes at the site?	N/A
c. Is the method appropriate considering the nature of the subsurface materials?	N/A
d. Does the approach consider the limitations of these methods?	N/A
e. Will the extent of contamination and constituent concentration be based on direct methods and sound engineering judgment? (Using indirect methods to substantiate the findings.)	N/A
9. Does the assessment approach incorporate any mathematical modeling to predict contaminant movement?	Y
a. Will site specific measurements be utilized to accurately portray the subsurface?	Y
b. Will the derived data be reliable?	Y*
c. Have the assumptions been identified?	Y
d. Have the physical and chemical properties of the site specific wastes and hazardous waste constituents been identified?	Y
J. Conclusions	
1. Subsurface geology	
a. Have sufficient data been collected to adequately define petrography and petrographic variation?	Y
b. Has the subsurface geochemistry been adequately defined?	N
c. Was the boring/coring program adequate to define subsurface geologic variation?	Y
d. Was the owner/operator's narrative description complete and accurate in its interpretation of the data?	Y
e. Does the geologic assessment address or provide means to resolve any information gaps?	Y
2. Ground-water flowpaths	
a. Did the owner/operator adequately establish the horizontal and vertical components of ground water flow?	Y

	Y/N
b. Were appropriate methods used to establish ground-water flowpaths?	Y
c. Did the owner/operator provide accurate documentation?	Y
d. Are the potentiometric surface measurements valid?	Y
e. Did the owner/operator adequately consider the seasonal and temporal effects on the ground-water?	N
f. Were sufficient hydraulic conductivity tests performed to document lateral and vertical variation in hydraulic conductivity in the entire hydrogeologic subsurface below the site?	Y
3. Uppermost Aquifer a. Did the owner/operator adequately define the upper-most aquifer?	Y
4. Monitoring Well Construction and Design a. Do the design and construction of the owner/operator's ground-water monitoring wells permit depth discrete ground-water samples to be taken?	Y
b. Are the samples representative of ground-water quality?	Y
c. Are the ground-water monitoring wells structurally stable?	Y
d. Does the ground-water monitoring well's design and construction permit an accurate assessment of aquifer characteristics?	Y
5. Detection Monitoring a. Downgradient Wells • Do the location, and screen lengths of the ground-water monitoring wells or clusters in the detection monitoring system allow the immediate detection of a release of hazardous waste or constituents from the hazardous waste management area to the uppermost aquifer?	Y
b. Upgradient Wells • Do the location and screen lengths of the upgradient (background) ground-water monitoring wells ensure the capability of collecting ground-water samples representative of upgradient (background) ground-water quality including any ambient heterogenous chemical characteristics?	Y
6. Assessment Monitoring a. Has the owner/operator adequately characterized site hydrogeology to determine contaminant migration?	Y
b. Is the detection monitoring system adequately designed and constructed to immediately detect any contaminant release?	Y

	Y/N
c. Are the procedures used to make a first determination of contamination adequate?	Y
d. Is the assessment plan adequate to detect, characterize, and track contaminant migration?	Y
e. Will the assessment monitoring wells, given site hydrogeologic conditions, define the extent and concentration of contamination in the horizontal and vertical planes?	N*
f. Are the assessment monitoring wells adequately designed and constructed?	Y
g. Are the sampling and analysis procedures adequate to provide a true measurement of contamination?	Y
h. Do the procedures used for evaluation of assessment monitoring data result in determinations of the rate of migration, extent of migration, and hazardous constituent composition of the contaminant plume?	N*
i. Are the data collected at sufficient frequency and duration to adequately determine the rate of migration?	Y
j. Is the schedule of implementation adequate?	Y
k. Is the owner/operator's assessment monitoring plan adequate?	Y
• If the owner/operator had to implement his assessment monitoring plan was it implemented satisfactorily?	Y
II. Field Evaluation	
A. Ground-Water Monitoring System	
1. Are the numbers, depths, and locations of monitoring wells in agreement with those reported in the facility's monitoring plan? (See Section 3.2.3.)	Y
B. Monitoring Well Construction	
1. Identify construction material material diameter a. Primary Casing 4" ID Low carbon Steel b. Secondary or outside casing _____	
2. Is the upper portion of the borehole sealed with concrete to prevent infiltration from the surface?	Y*
3. Is the well fitted with an above-ground protective device?	Y
4. Is the protective cover fitted with locks to prevent tampering? If a facility utilizes more than a single well design, answer the above questions for each well design?	Y*

	Y/N
II. Review of Sample Collection Procedures	
A. Measurement of Well Depths /Elevation	
1. Are measurements of both depth to standing water and depth to the bottom of the well made?	Y
2. Are measurements taken to the 0.01 foot?	Y
3. What device is used? Electric Sounding Device	
4. Is there a reference point established by a licensed surveyor?	N
5. Is the measuring equipment properly cleaned between well locations to prevent cross contamination?	Y *
B. Detection of Immiscible Layers	
1. Are procedures used which will detect light phase immiscible layers?	Y *
2. Are procedures used which will detect heavy phase immiscible layers?	N
C. Sampling of Immiscible Layers	
1. Are the immiscible layers sampled separately prior to well evacuation?	N
2. Do the procedures used minimize mixing with water soluble phases?	N
D. Well Evacuation	
1. Are low yielding wells evacuated to dryness?	Y
2. Are high yielding wells evacuated so that at least three casing volumes are removed?	Y
3. What device is used to evacuate the wells? Teflon bailer	
4. If any problems are encountered (e.g., equipment malfunction) are they noted in a field logbook?	Y

	Y/N
2. **Sample Withdrawal**	
1. For low yielding wells, are samples for volatiles, pH, and oxidation/reduction potential drawn first after the well recovers?	Y
2. Are samples withdrawn with either flurocarbon/resins or stainless steel (316, 304 or 2205) sampling devices?	Y
3. Are sampling devices either bottom valve bailers or positive gas displacement bladder pumps?	Y
4. If bailers are used, is fluorocarbon/resin coated wire, single strand stainless steel wire, or monofilament used to raise and lower the bailer?	N *
5. If bladder pumps are used, are they operated in a continuous manner to prevent aeration of the sample?	N/A
6. If bailers are used, are they lowered slowly to prevent degassing of the water?	Y
7. If bailers are used, are the contents transferred to the sample container in a way that minimizes agitation and aeration?	Y
8. Is care taken to avoid placing clean sampling equipment on the ground or other contaminated surfaces prior to insertion into the well?	Y
9. If dedicated sampling equipment is not used, is equipment disassembled and thoroughly cleaned between samples?	N/A *
10. If samples are for inorganic analysis, does the cleaning procedure include the following sequential steps: a. Nonphosphate detergent wash? b. Dilute acid rinse (HNO_3 or HCl)? c. Tap water rinse? d. Type II reagent grade water?	N *
11. If samples are for organic analysis, does the cleaning procedure include the following sequential steps:	
a. Nonphosphate detergent wash?	N *
b. Tap water rinse?	N *
c. Distilled/deionized water rinse?	N *
d. Acetone rinse?	N *
e. Pesticide-grade hexane rinse?	N *

	Y/N
12. Sampling equipment thoroughly dry before use?	Y
13. Are equipment blanks taken to ensure that sample cross-contamination has not occurred?	N *
14. If volatile samples are taken with a positive gas displacement bladder pump, are pumping rates below 100 ml/min?	N/A
In-situ or Field Analyses	
Are the following labile (chemically unstable) parameters determined in the field:	
a. pH?	Y
b. Temperature?	Y
c. Specific conductivity?	Y
d. Redox potential?	N
e. Chlorine?	N
f. Dissolved oxygen?	N
g. Turbidity?	N
h. Other (specify) _____	N
For in-situ determinations, are they made after well evacuation and sample removal?	N/A
If sample is withdrawn from the well, is parameter measured from a split portion?	N *
4. Are monitoring equipment calibrated according to manufacturer's specifications and consistent with SW-846?	Y
5. Are the date, procedure, and maintenance for equipment calibration documented in the field logbook?	Y
IV. Review of Sample Preservation and Handling Procedures	
A. Sample Containers	
Are samples transferred from the sampling device directly to their compatible containers?	Y *

	Y/N
2. Are sample containers for metals (inorganics) analyses polyethylene with polypropylene caps?	Y
3. Are sample containers for organics analysis glass bottles with fluorocarbonresin-lined caps?	Y
4. If glass bottles are used for metals samples are the caps fluorocarbonresin-lined?	N/A
5. Are the sample containers for metal analyses cleaned using these sequential steps:	
a. Nonphosphate detergent wash?	N/A *
b. 1:1 nitric acid rinse?	N/A *
c. Tap water rinse?	N/A *
d. 1:1 hydrochloric acid rinse?	N/A *
e. Tap water rinse?	N/A *
f. Distilled/deionized water rinse?	N/A *
6. Are the sample containers for organic analyses cleaned using these sequential steps:	
a. Nonphosphate detergent/hot water wash?	N S
b. Tap water rinse?	N S *
c. Distilled/deionized water rinse?	N S *
d. Acetone rinse?	N S *
e. Pesticide-grade hexane rinse?	N S *
7. Are trip blanks used for each sample container type to verify cleanliness?	N
B. Sample Preservation Procedures	
1. Are samples for the following analyses cooled to 4°C:	
a. TOC?	N/A
b. TOX?	N/A
c. Chloride?	N/A
d. Phenols?	N/A
e. Sulfate?	N/A
f. Nitrate?	N/A
g. Coliform bacteria?	N/A
h. Cyanide?	N
i. Oil and grease?	N/A
j. Hazardous constituents (261, Appendix VIII)	N *

	Y/N
2. Are samples for the following analyses field acidified to pH <2 with HNO_3:	
a. Iron?	Y
b. Manganese?	Y
c. Sodium?	Y
d. Total metals?	N/A
e. Dissolved metals?	Y
f. Fluoride?	N/A
g. Endrin?	N/A
h. Lindane?	N/A
i. Methoxychlor?	N/A
j. Toxaphene?	N/A
k. 2,4, D?	N/A
l. 2,4,5 TP Silvex?	N/A
m. Radium?	N/A
n. Gross alpha?	N/A
o. Gross beta?	N/A
3. Are samples for the following analyses field acidified to pH <2 with H_2SO_4:	
a. Phenols?	N/A
b. Oil and grease?	N/A
4. Is the sample for TOC analysis field acidified to pH <2 with HCl?	N/A
5. Is the sample for TOX analysis preserved with 1 ml of 1.1 M sodium sulfite?	N/A
6. Is the sample for cyanide analysis preserved with NaOH to pH >12?	Y
C. Special Handling Considerations	
1. Are organic samples handled without filtering?	Y
2. Are samples for volatile organics transfered to the appropriate vials to eliminate headspace over the sample?	Y
3. Are samples for metal analysis split into two portions?	N
4. Is the sample for dissolved metals filtered through a 0.45 micron filter?	Y
5. Is the second portion not filtered and analyzed for total metals?	N/A
6. Is one equipment blank prepared each day of ground-water sampling?	N

	Y/N
2. Documentation of analytical results for:	
a. Blanks?	Y
b. Standards?	Y
c. Duplicates?	Y
d. Spiked samples?	Y
e. Detectable limits for each parameter being analyzed?	Y
C. Are approved statistical methods used?	Y
D. Are QC samples used to correct data?	Y
E. Is all data critically examined to ensure it has been properly calculated and reported?	Y
VII. Surficial Well Inspection and Field Observation	
A. Are the wells adequately maintained?	N*
B. Are the monitoring wells protected and secure?	Y*
C. Do the wells have surveyed casing elevations?	Y*
D. Are the ground-water samples turbid?	N
E. Have all physical characteristics of the site been noted in the inspector's field notes (i.e., surface waters, topography, surface features)?	Y
F. Has a site sketch been prepared by the field inspector with scale, north arrow, location(s) of buildings, location(s) of regulated units, locations of monitoring wells, and a rough depiction of the site drainage pattern?	N*

	Y/N
VI. Conclusions	
A. Is the facility currently operating under the correct monitoring program according to the statistical analyses performed by the current operator?	N/A
B. Does the ground-water monitoring system, as designed and operated, allow for detection or assessment of any possible ground-water contamination caused by the facility?	N *
Does the sampling and analysis procedure permit the owner/operator to detect and, where possible, assess the nature and extent of a release of hazardous constituents to ground water from the monitored hazardous waste management facility?	N *

CHECKLIST A - ADDENDUM AND COMMENTS

I.B.3. The raw data is available through an exhaustive document search because it is not presented in a single concise report.

I.C.1.c. A confining unit has not been identified below the site.

I.D.3. A confining unit has not been identified below the site.

I.D.5. The Ground Water Quality Assessment Report suggests that additional shallow and interface wells are needed to further evaluate ground water quality. This report further suggests that a screened recovery well be used in the unconsolidated sediments to completely contain contaminants.

I.E.4.b.-h. Various site maps prepared by the consultant provide all this information except for topographic contour lines at a two-foot maximum interval.

I.F.2.a. City water supply production wells are operating near the facility and may have an effect on the elevation of the water table under the site.

I.F.2.d. Although some nested wells have been installed at the site, they are in different stratigraphic units and have not been analyzed through pumping tests as of the date of the CME inspection.

I.F.4.a. No confining layer has been identified at the site. The surficial sediments and the bedrock aquifers appear to be in communication.

I.G.1.f. Wells were developed by bailing, air lifting and pumping. The water levels were measured after the wells recovered.

I.G.1.g. Split spoon samples were collected at five-foot intervals from wells drilled by hollow stem augers. Cable tool drilling methods do not allow for this type of sample collection.

I.G.4.e. All the L-series wells are fitted with locking protective casings. However, no bumper guards have been installed. Well L-1 is located in an area of potential traffic and should, therefore, have protective bumper guard posts installed nearby.

I.H.1.b. The L-series wells surrounding the lagoon are located from approximately 145 feet apart up to a maximum distance of approximately 365 feet apart.

I.I.9.b. The modflow ground water model is based on several assumptions and calibration. Additional model input parameters must be collected and evaluated to properly use the proposed model. If properly followed, modflow yields acceptable results. The U.S. EPA is coordinating the completion and use of the ground water flow model during the RFI/CMS process.

I.J.6.e. The assessment monitoring network consists of all the L-series wells and well R-5. All downgradient wells have yielded analytical results indicating ground water contamination. Therefore, the assessment monitoring network should be expanded to include additional wells as needed to adequately determine the rate and extent of contamination.

I.J.6.h. See comment I.J.6.e. above.

II.B.2. Concrete aprons have been installed at all of the L-series wells, however, the cement at wells L-3 and L-1 has started to deteriorate and will need repaired in the near future.

II.B.4. All of the L-series wells have protective casings fitted with locks to prevent tampering. However, the hinge on the locking outer casing at well L-1 is broken thus allowing access to the well.

III.A.5. The water elevation measuring equipment is rinsed with distilled deionized water between use. No detergent solution is used, nor is the probe wiped off.

III.B.1. The wells were purged with a three inch diameter teflon bailer. The bail water was then examined for signs of immiscible layers.

III.B.2. An oil water interface probe is not used at the facility, therefore, it is not possible to detect heavy phase immiscible layers.

III.E.4. Dedicated bailers and rope are used to purge and sample each well.

III.E.9. Dedicated and disposable sampling equipment is used.

III.E.10. Samples destined for metals analyses are filtered with dedicated, disposable filters after first being withdrawn using dedicated bailers.

III.E.11.a.-e. Dedicated sample withdrawal equipment is used to obtain samples for organic analyses.

III.E.13. Equipment blanks are not needed because dedicated bailers and disposable filters are used.

III.F.3. The consultant used purge water from the well to obtain measurements of pH and specific conductivity.

IV.A.1. Samples destined for metals analyses first are transfered to a disposable container for filtering.

IV.A.5. Disposable filters and containers are used to hold samples destined for metals analyses.

IV.A.6. The VOA bottles used to collect samples for organic analyses are provided by the laboratory. The decontamination process used by the laboratory is unknown.

IV.B.1.h.&j. No ice was used during sampling to immediately cool samples to 4 degrees celsius. The consultant said that ice would be added to the coolers before shipping to the laboratory.

V.D.2.c. The time of sample collection appears to not be included on the chain-of-custody form.

V.E.1. The requested analyses are included on the chain-of-custody form.

VII.A. Monitoring wells L-1 and L-3 have cracked cement aprons that will require repair in the near future. Wells L-4, L-5 L-2 and L-1 need visible Identification numbers on their casings. Wells L-4 and L-5 are located in a flood prone area and should have water tight end caps installed on the well casings.

VII.B. All of the L-series monitoring wells are protected and secure except for L-1 which has a broken hinge on the locking protective casing thus allowing entrance to the well. Also L-1 is located in potential traffic area and should have a bumper guard post installed.

VII.C. The elevations of the well casings have been surveyed, but no survey location mark has been placed on the casings.

VII.F. During the CME inspection, a site map prepared by the consultant was used for monitor well location verification.

VIII.B. Ekco Housewares needs to expand the monitoring well network to define the full rate and extent of contaminant migration associated with the facility. Additionally,

the Groundwater Quality Assessment Plan should be modified to indicate what existing and proposed wells will be used in the revised ground water monitoring well network for quarterly analyses.

VIII.C. The sampling of the R-series bedrock wells must be consistent with the sampling and analysis procedures as specified in the approved Sampling and Analysis Plan, and not as collected by the Ekco Housewares company staff. This will insure

APPENDIX A-1

FACILITY INSPECTION FORM FOR COMPLIANCE WITH INTERIM STATUS STANDARDS COVERING GROUND-WATER MONITORING

ompany Name: EKco Housewares, Inc.: EPA I.D. Number: OHD 045205424

Company Address: 359 State Ave, NW : Inspector's Name: R. Kurlich

P.O. Box 560

Massillon, OH 44648

ompany Contact/Official: Tom Shingleton : Branch/Organization: Massillon Works

itle: Plant Manager : Date of Inspection: 7 Feb. 91

	Yes	No	Unknown	Comments
ype of facility: (check appropriately)				
a) surface impoundment	X			
b) landfill		X		
c) land treatment facility		X		
d) storage facility		X		
ground Water Monitoring Plan				
1. Has a ground water monitoring plan been submitted to the Regional Administrator for facilities containing a surface impoundment, landfill, land treatment process, or storage facility?	X			
2. Was the ground water monitoring plan reviewed prior to site visit? If "No," explain.	X			
a) Was the ground water plan reviewed at the facility prior to actual site inspection? If "No," explain.		X		X
3. Has a ground water monitoring program (capable of determining the facility's impact on the quality of ground water in the uppermost aquifer underlying the facility) been implemented? 3745-65-90(A)	X			

	Yes	No	Unknown	Comments
4. Has at least one monitoring well been installed in the uppermost aquifer hydraulically upgradient from the limit of the waste management area? 3745-65-91(A)(1)			X	X
a) Are sufficient ground water samples from the uppermost aquifer, representative of background ground water quality and not affected by the facility, ensured by proper well				
1) Number(s)?		X		*
2) Location?		X		
3) Depth?	X			
5. Have at least three monitoring wells been installed hydraulically downgradient at the limit of the waste handling or management area? 3745-65-91(A)(2)	X			
6. Have the locations of the waste handling, storage, or disposal areas been verified to conform with information in the ground water monitoring plan?	X			
7. Do the numbers, locations, and depths of the ground water monitoring wells agree with the data in the ground water monitoring system program? If "No," explain discrepancies.	X			
8. Have all monitoring wells been cased in a manner that:				
a) maintains the integrity of the bore hole?	X			
b) is screened and packed to enable sample collection at depths where appropriate aquifer flow exists?	X			
c) prevents contamination of samples and ground water by sealing the annular space above the sampling depth with a suitable material? 3745-65-91(C)	X			

	Yes	No	Unknown	Comments
9. Has a ground water sampling and analysis plan been developed? 3745-65-92(A)	X			
a) Has it been followed?	X			
b) Is the plan kept at the facility?	X			
c) Does the plan include procedures and techniques for:				
1) Measuring ground water elevations;	X			
2) Detection of immiscible layers, where applicable;		X		
3) Collecting ground water samples including:				
a) Well evacuation;	X			
b) Sample withdrawal;	X			
c) Sample equipment;	X			
d) Sample containers and handling; and	X			
e) Sample preservation;	X			
4) Performing field analysis, including:				
a) Procedures and forms for recording raw data and the exact location, time, and facility specific considerations associated with the data acquisitions;	X			
b) Calibration of field instruments; and	X			
c) Procedures for sample filtration;	X			
5) Decontamination of equipment;	X			
6) Disposal of purge water;	X			
7) Ground water sample analysis of all applicable constituents associated with the facility including:				
a) Constituents;	X			

	Yes	No	Unknown	Comments
b) Analytical method and detection limit; and	X			
c) Sample holding time;	X			
8) Quality assurance/quality control:				
a) Samples for field/lab/equipment blanks;	X			
b) Duplicate samples; and	X			
c) Potential interferences; and	X			
9) Chain of custody procedures:				
a) Standardized field tracking reporting forms to establish sample custody for the field prior to and during shipping; and	X			
b) Sample labels containing all information necessary for effective sample tracking.	X			
10. Are the required parameters in ground water samples planned to be tested quarterly for the first year? 3745-65-92(B) and (C)(1)		X		X
a) Are the ground water samples analyzed for the following:				
1) Parameters characterizing the suitability of the ground water as a drinking supply? 3745-65-92 B(1)		X		
2) Parameters establishing ground water quality? 3745-65-92 B(2)		X		
3) Parameters used as indicators of ground water contamination? 3745-65-92 B(3)		X		
a) Are at least four replicate measurements obtained for each sample? 3745-65-92 (C)(2)		X		

	Yes	No	Unknown	Comments
b) Are provisions made to calculate the initial background arithmetic mean and variance of the respective parameter concentrations or values obtained from well(s) during the first year?3745-65-92(C)(2)		X		
b) For facilities which have complied with first year ground water sampling and analysis requirements:				
1) Have samples been obtained and analyzed for the indicators of ground water quality at least annually? 3745-65-92(D)(1)		X		
2) Have samples been obtained and analyzed for the indicators of ground water contamination at least semi-annually? 3745-65-92(D)(2)		X		
c) Were ground water surface elevations determined at each monitoring well each time a sample was taken? 3745-65-92(E)	X			
d) Were the ground water surface elevations evaluated to determine whether the monitoring wells are properly placed? 3745-65-93(F)	X			
e) If it was determined that modification of the number, location or depth of monitoring wells was necessary, was the system brought into compliance with 3745-65-91(A)? 3745-65-93(F)	X			X
11. Has an outline of a ground water quality assessment program been prepared? 3745-65-93(A)	X			
a) Does it describe a program capable of determining:				

	Yes	No	Unknown	Comments
1) Whether hazardous waste or hazardous waste constituents have entered the ground water?	X			
2) The rate and extent of migration of hazardous waste or hazardous waste constituents?	X			
3) Concentrations of hazardous waste or hazardous waste constituents in ground water?	X			
b) Have at least four replicate measurements of each indicator parameter been obtained for samples taken for each well? 3745-65-93(B)		Y		
1) Were the results compared with the initial background mean?		X		
a) Was each well considered individually?		X		
b) Was the Student's t-test used (at the 0.01 level of significance)?		X		
2) Was a significant increase (or pH decrease) found in the:				
a) Upgradient wells		X		
b) Downgradient wells		X		
If "Yes," Compliance Checklist A-2 must also be completed.				
12. Have records been kept of analyses for parameters establishing ground water quality and indicators of ground water contamination? 3745-65-94(A)(1)		X		
13. Have records been kept of ground water surface elevations taken at the time of sampling for each well? 3745-65-94(A)(1)	X			
14. Have the following been submitted to the Regional Administrator:3745-65-94(A)(2)		X		

	Yes	No	Unknown	Comments
a) Initial background concentrations of parameters listed in 3745-65-92(B) within 15 days after completing each quarterly analysis required during the first year?		X		
b) For each well, any parameters whose concentrations or values have exceeded the maximum contaminant levels allowed in drinking water supplies?		X		
c) Annual reports including:				
1) Concentrations or values of parameters used as indicators of ground water contamination for each well?		X		
2) Results of the evaluation of ground water surface elevations?		X		

CHECKLIST A-1 - ADDENDUM AND COMMENTS

2.a. The plan was reviewed in the EPA office prior to the actual site visit.

4. The ground water flow map generated from measurements made during the CME inspection in February, 1991, suggests that well L-3 may not be located upgradient of the lagoon at all times during the year. Laboratory results are not yet available from this sampling event to determine whether well L-3 has been influenced by leachate from the surface impoundment. Water elevation and analytical data collected prior to the date of the CME inspection have indicated that well L-3 lies upgradient of the impoundment.

4.a.2. See above.

9.c.2. The Sampling and Analysis Plan does not discuss the detection of immiscible layers.

10. The facility has gone directly into assessment monitoring since contamination was discovered in 1984. A detection monitoring system was never implemented at the facility.

10.e. The facility is currently implementing a U.S. EPA approved Ground Water Quality Assessment Plan to determine the rate and extent of contaminaiton migration. However, Ekco Housewares needs to expand the monitoring well network to define the full rate and extent of contaminant migration associated with the facility. Additionally, the Groundwater Quality Assessment Plan should be modified to indicate what existing and proposed wells will be used in the revised ground water monitoring well network for quarterly analyses.

14. See issue 10. above.

APPENDIX A-2

INSPECTION COMPLIANCE FORM FOR A FACILITY WHICH HAS DETERMINED IT MAY BE AFFECTING GROUND WATER QUALITY

Company Name: Ekco Housewares Inc.: EPA I.D. Number: OHD 045205424

Company Address: 359 State Ave NW: Inspector's Name: R. Kurlich

P.O. Box 560

Massillon, OH 44648

Company Contact/Official: Tom Shingleton: Branch/Organization: Massillon Works

Title: Plant Manager: Date of Inspection: 7 Feb. 91

	Yes	No	Unknown	Comments
Type of facility: (check appropriately)				
a) surface impoundment	X			
b) landfill		X		
c) land treatment facility		X		
d) storage facility		X		
Ground Water Monitoring Plan				
1. Has (Have) comparison(s) of ground water contamination indicator parameters for the upgradient well(s) 3745-65-93(B) shown a significant increase (or pH decrease) over initial background?		X		X
a) If "Yes," has(have) the increase(s) been submitted to the Regional Administrator as part of the annual report? 3745-65-94(A)(2)			N/A	
2. Have comparisons of indicator parameters for the downgradient wells 3745-65-93(B) shown a significant increase (or decrease) over initial background?		X		X

	Yes	No	Unknown	Comments
a) If "Yes," were additional ground water samples taken for those downgradient wells where the significant difference was determined? 3745-65-93 (C)(2)			N/A	
1) Were samples split in two?			N/A	
2) Was the significant difference due to laboratory error?			N/A	
(If "Yes," do not continue.)			N/A	
3. If significant differences were not due to laboratory error, was a written notice sent to the Regional Administrator within 7 days of (laboratory) confirmation? 3745-65-93(D)(1)			N/A	
4. Within 15 days of notification of the Regional Administrator was a ground water quality assessment program submitted? 3745-65-93(D)(2)	X			
a) Does the plan specify 3745-65-93(D)(3):				
1) Hydrogeologic conditions at the facility;	X			
2) The detection monitoring program implemented by the facility, including, but not limited to:				
a) The number, location, depth, and construction of detection monitoring wells with written documentation:			N/A	
b) A summary of detection monitoring analytical data with written documentation of the of the results; and			N/A	
c) A summary of statistical analyses applied to the data;			N/A	
3) The investigative approach to be followed during the assessment, including, but not limited to:				
a) The proposed number, location, depth, installation method, and construction of monitoring wells;	X			

	Yes	No	Unknown	Comments
b) The proposed methods for gathering additional hydrogeologic information;	X			
c) The proposed use of supporting methodology (e.g., soil gas analysis, geophysics); and	X			
d) The proposed methodology for determining contaminant migration rates;	X			
4) Sampling and analysis procedures as specified under paragraph (A) of rule 3745-65-92 of the administrative code;	X			
5) Proposed data evaluation procedures, including, but not limited to:	X			
a) Utilization of statistical data evaluation;	X			
b) Utilization of computer models; and	X			
c) Criteria that will be utilized to determine if additional assessment activities are warranted; and	X			
6) A schedule of implementation.	X			
b) Does the plan allow for determination of: 3745-65-93(D)(4)				
1) Rate and extent of migration of hazardous waste constituents?		X		*
2) Concentrations of the hazardous waste or hazardous waste constituents?	X			
c) Is it indicated that the 1st determination was made as soon as technically feasible? 3745-65-93(D)(5)	X			*
1) Within 15 days after determination, was a written report containing the assessment of ground water quality submitted to the Regional Administrator?			X	*

	Yes	No	Unknown	Comments
d) Has it determined that hazardous waste or hazardous waste constituents from the facility have entered the ground water?	X			*
1) If "No," was the original indication evaluation program, required by (3745-65-92) reinstated?		N/A		
a) Was the Regional Administrator notified of the reinstatement of the program within 15 days of the determination? 3745-65-93(D)(6)		N/A		
e) If it was determined that hazardous waste or hazardous waste constituents have entered the ground water 3745-65-93(D)(7)				
1) For facilities where the program was implemented prior to final closure, have determinations of hazardous waste or hazardous waste constituents continued on a quarterly basis? (If the program was implemented during the post-closure care period, determinations made in accordance with the ground water quality assessment plan may cease.)		X		*
2) Were(are) records kept of the analyses and evaluations specified in the ground water quality assessment plan throughout the active life of the facility? 3745-65-94(B)(1)	X			
a) If a disposal facility, were (are) records kept throughout the post-closure period as well?	N/A			
f) Are annual reports submitted to the Regional Administrator containing the results of the ground water quality assessment program? 3745-65-94(B)(2)	X			
1) Do the reports include the calculated or measured rate of migration of hazardous waste or hazardous waste constituents?		X		

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RCRA CLOSURE PLAN
FOR EKCO HOUSEWARES, INC.
MASILLON, OHIO

VOLUME I

December 1991

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RCRA CLOSURE PLAN
FOR EKCO HOUSEWARES, INC.
MASSILLON, OHIO

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WESTON

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SECTION 1
INTRODUCTION

1.1 OBJECTIVES

The purpose of this Resource Conservation and Recovery Act (RCRA) Closure Plan is to provide a closure methodology for the lagoon/surface impoundment at the EKCO Housewares, Inc. (EKCO) facility in Massillon, Ohio. The lagoon had received characteristic hazardous waste (based on cadmium) in the past. This plan provides for the treatment and removal of sludges and oils in the lagoon to the water table. The intent of this plan is to provide for a clean closure of the lagoon.

1.2 BACKGROUND

A RCRA Closure Plan was originally prepared for the lagoon/surface impoundment pursuant to the Consent Agreement dated 4 November 1987 and submitted to U.S. Environmental Protection Agency (EPA) Region V in January 1988. As delineated in the Closure Plan submitted in January 1988, an assessment of the nature and extent of releases from the lagoon was performed by Roy F. Weston, Inc. (WESTON) in late March and early April 1988. A Draft RCRA Closure Plan for the EKCO facility in Massillon, Ohio, was then submitted in August 1988. In June 1990 a treatability study of stabilization options was performed. The Ohio Environmental Protection Agency (OEPA) disapproved the original closure plan in May 1991, and the matter was subsequently appealed by American Home Products Corporation (AHPC), the former parent corporation of EKCO. This closure plan is generated as a result of numerous discussions with and comments received from OEPA. At this point, AHPC decided to submit a new closure plan for OEPA approval.

1.2.1 Scope

This RCRA Closure Plan presents a closure method based on an evaluation of pertinent site information obtained during the lagoon investigation and the RCRA Corrective Action

investigation at the site during the past 2 years. A summary of financial assurance mechanisms that may be required will be forwarded separately by AHPC as an addendum to this submittal.

1.2.2 Applicable Regulations

This RCRA Closure Plan is written to fulfill the requirements of Ohio Hazardous Waste Management Regulations, Ohio Administrative Code (OAC) 3745-67-28. The plan, in accordance with the standards and requirements of these sections, contains information for interim status facilities have received a RCRA-defined hazardous waste, and have met the definition for surface impoundment.

Ohio Hazardous Waste Management Regulations, OAC contains the general closure requirements for all hazardous waste management facilities (OAC 3745-66-10 through 3745-66-15). The major provisions of closure and post-closure specify the following:

- Closure performance standard.
- Closure Plan.
- Time allowed for closure.
- Certification of closure.

Section OAC 3745-67-28 contains regulations specific to surface impoundments and addresses the applicable closure requirements.

1.3 GOALS

1.3.1 Regulatory Compliance

In accordance with OAC 3745-66-11, the methodology in this RCRA Closure Plan provides for closure of the lagoon/surface impoundment in a manner that minimizes the need for further maintenance, while controlling, minimizing, or eliminating, to the extent necessary to protect human health and the environment, the post-closure migration of hazardous

waste, hazardous waste constituents, leachate, contaminated rainfall, or waste to the groundwater, surface waters, or atmosphere.

1.3.2 Applicable Standards

The applicable closure standards for the closure of this surface impoundment are defined in OAC 3745-56-28. This section of the regulation basically allows for two general standards of closure:

- "Clean Closure," as defined by OAC 3745-56-11 and 3745-66-11, is the removal or decontamination of all waste residues, contaminated containment system components (i.e., liners), contaminated subsoils, and structures contaminated with waste and leachate.
- "Landfill Closure," as defined by OAC 3745-67-28, requires the surface impoundment to be closed in accordance with the landfill closure and post-closure requirements (OAC 3745-68-10).

The "clean closure" of a surface impoundment is based on removal of the hazardous waste and contaminated liners, soil, appurtenances, and groundwater once contained in the facility. Therefore, it is very important to determine the constituents of concern and the spatial distribution of these constituents when deciding on the appropriate closure method.

In May 1991, OEPA developed a guidance document entitled *Closure Plan Review Guidance*, which defines a "clean closure" and addresses organic and inorganic constituents separately. For the organics (or those constituents that do not occur naturally), the level for "clean closure" is the analytical detection limit. The detection limit may be higher than stated in Appendix A. Also, the inorganic constituents (i.e., naturally occurring) of the hazardous waste must be reduced to a statistically calculated background concentration, as determined by several methods, or to the upper limit of the Rural Ohio Farm Soils (ROFS) concentrations.

1.4 APPROACH

The approach developed for the closure of the lagoon/surface impoundment at EKCO is as follows:

- Evaluate the information on the plant and lagoon operations.
- Evaluate the information available in previous investigations/studies and identify additional data requirements.
- Select an appropriate closure method based on available information.
- Prepare and submit for OEPA approval a new Closure Plan delineating the proposed closure method.

The background information of the plant and lagoon operations is summarized in Section 2 of this document. The assessment of available information, a summary of the WESTON investigation, and an assessment of the distribution of contaminants in the lagoon are contained in Section 3 of this document. A groundwater assessment under RCRA Corrective Action is being performed separately from the lagoon assessment.

Section 4 presents the proposed closure method based on available information and recent discussions with OEPA. Section 4 also includes the other appropriate parts of a closure plan, including a discussion of schedule, closure period, and cost estimates.

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SECTION 2
BACKGROUND

2.1 SITE DESCRIPTION

2.1.1 Plant Description and History

The EKCO Housewares Inc. (EKCO) facility is located at 359 State Avenue Extension N.W., Massillon, Ohio. This facility is located on approximately 13 acres, 500 ft north of State Avenue Extension and 1,500 ft west of the Tuscarawas River in the northwestern portion of Massillon, Stark County, Ohio. Figure 2-1 shows the location of the facility on a 7.5-minute USGS Massillon quadrangle map of Stark County. The area surrounding the site is largely urban and industrial. Newman Creek, which flows eastward into the Tuscarawas River, borders the northern and northwestern boundaries of the facility. The Penn Central and Baltimore and Ohio Railroads border the facility to the east and west, respectively. Figure 2-2 shows the layout of the EKCO facility. The plant consists of several buildings comprising a total area of approximately 240,000 ft^2. The buildings are subdivided into office space, warehouses, machine shops, coating process lines, and packaging and shipping areas.

The plant was built circa 1900 and in 1945 began producing aluminum cookware. In 1946 the plant started manufacturing pressure cookers and stainless steel cookware. In 1951, during the Korean conflict, the plant produced 90-mm and 105-mm cartridge cases for the U.S. Government. AHPC acquired EKCO Housewares in 1965 and sold the division and the facility to the EKCO Group in 1984. At present, the plant is engaged in the manufacture of cooking utensils from metal pressing and coating operations, producing nearly 26 million pans per year and employing about 350 people in a 24-hours-per-day, 5-days-per-week operation. Further information can be found in the Groundwater Assessment Report (WESTON, 1989).

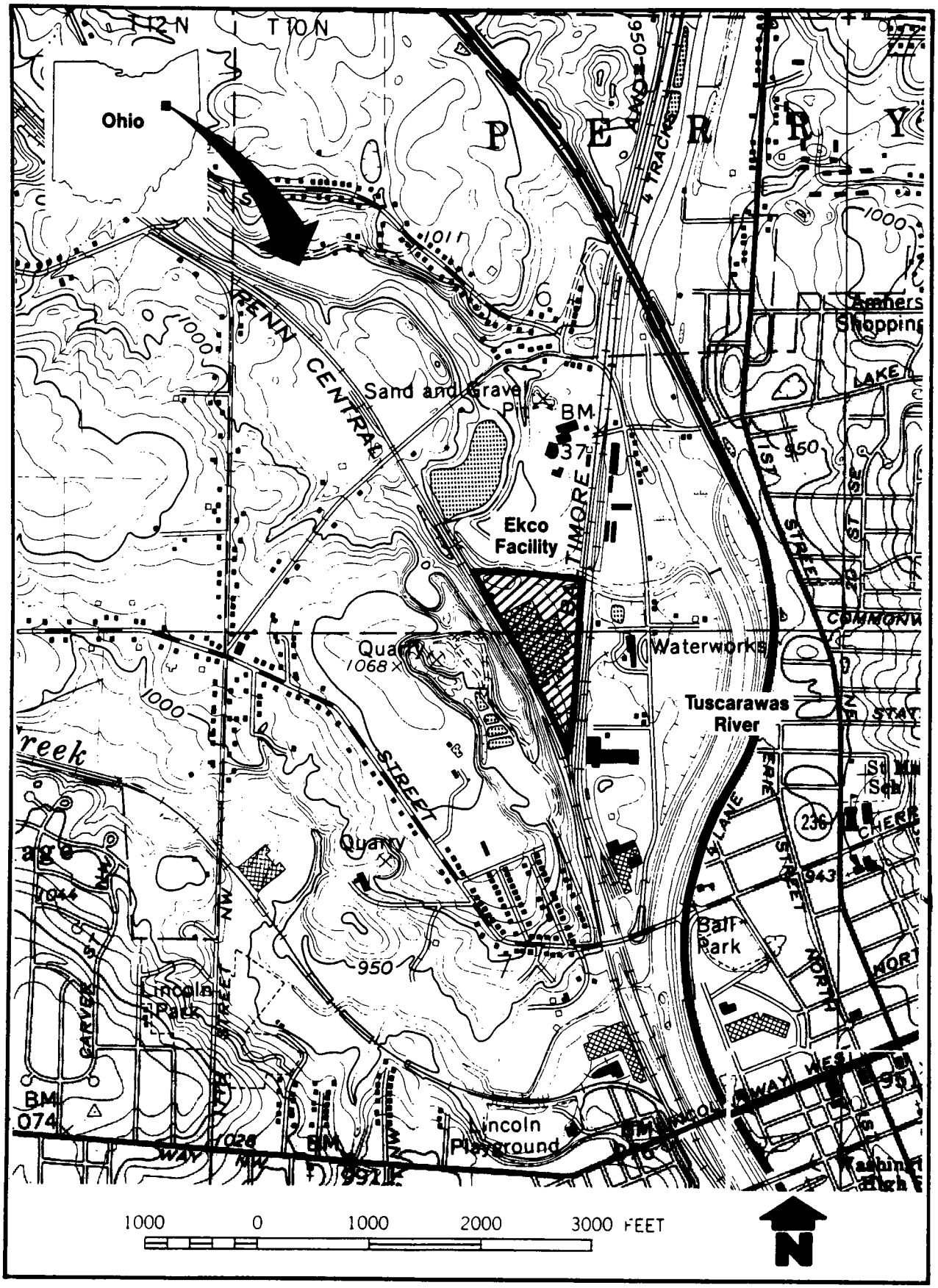

FIGURE 2-1 SITE LOCATION MAP
EKCO HOUSEWARES, INC., MASSILLON, OHIO
(Ref. 7.5 Minute Massillon Quad, Ohio, 1978)

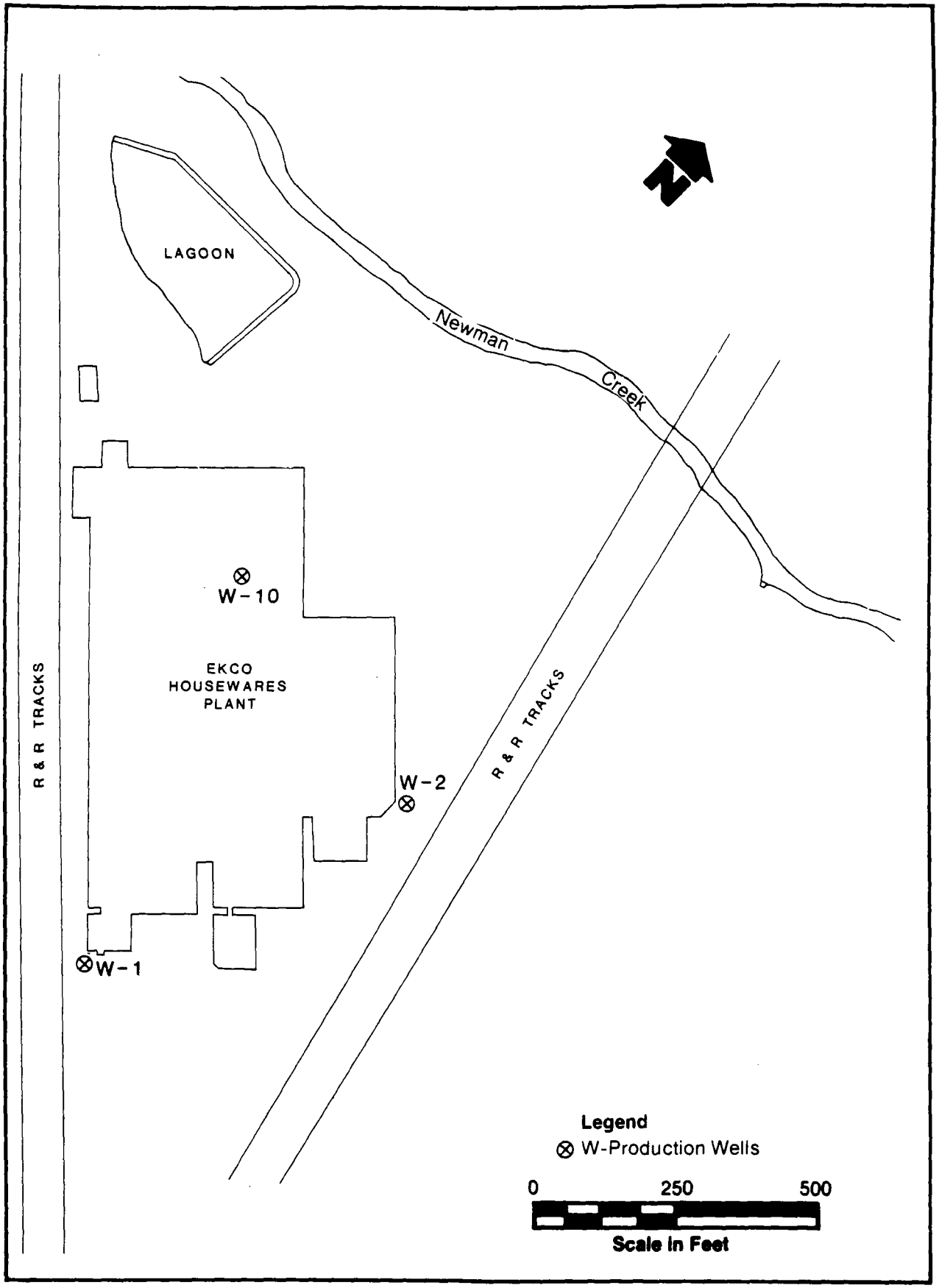

FIGURE 2-2 SITE DIAGRAM OF EKCO HOUSEWARES, INC., MASSILLON, OHIO

2.1.2 Waste Management Description and History

There is no effluent wastewater treatment handling at this facility. Only noncontact process cooling water is currently discharged to an NPDES permitted outfall (001) at Newman Creek. Figure 2-3 details the effluent flow from the plant through the storm sewers to the sanitary sewer system and to the Newman Creek outfall. This discharge is sampled and analyzed every month, and results of the analysis are furnished to the EPA and to the OEPA under the NPDES Permit requirements. Currently, all hazardous wastes, such as spent trichloroethylene (TCE), silicone wastes, and used oil wastes, are accumulated in labeled 55-gallon drums on a concrete apron along the property fence at the northwestern end of the plant (see Figure 2-3). The plant processes include several large commercial-type spray degreasers that generate a substantial amount of spent trichloroethylene and concentrated trichloroethylene stillbottoms. A total of 15,730 gallons (191,174 pounds) of waste materials was generated in 1985. Prior to 1985, this waste material was sent to an authorized facility for incineration every 2 months (EPA I.D. Number OHDO 48415665). Starting in 1985, the spent concentrated degreaser stillbottoms were sent to a reclamation service (EPA I.D. Number OHD 980587364) for reconstitution and reuse.

When copper coating and printing operations were in use after 1954, all process water, including alkaline cleaning rinse waters, boiler blowdown, and deionizer water (hydrochloric acid and sodium hydroxide), was piped to the lagoon. Approximately 0.2 mgd of wastewater, potentially containing heavy metals, solids, and alkalines, was discharged to the lagoon when the coating line was in operation until November 1978. In 1971 an application was presented to the Ohio Water Pollution Control Board for a wastewater discharge permit. Production procedures and waste abatement practices were outlined in the application. The application stated that waste abatement was practiced in the plant by segregating specific wastes and directing those wastestreams to a nonoverflowing evaporation lagoon. The lagoon also received cooling water and stormwater, which were eventually discharged into Newman Creek. Plant discharge reports from February 1972 to November 1978 indicate that the pH of the discharge to the lagoon was in the range of 6.0 to 9.5.

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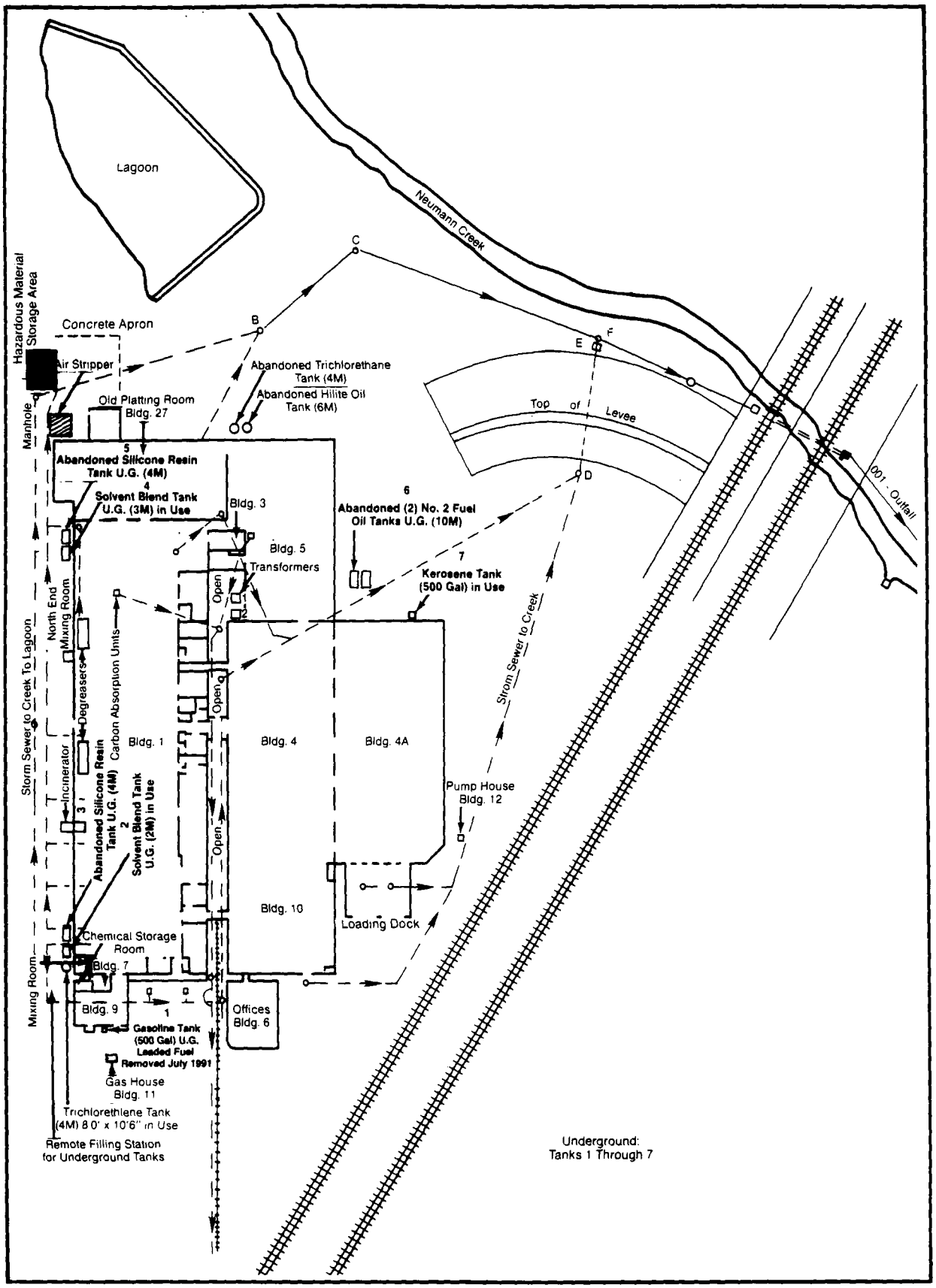

FIGURE 2-3 FACILITY DESCRIPTION AND LOCATION EKCO HOUSEWARES, INC., MASSILLON, OHIO

A spill of trichloroethylene occurred in the late 1970s near well W-10.

2.1.3 Lagoon Surface Impoundment

2.1.3.1 History

This subsection describes the use of the lagoon/surface impoundment. A chronology of the lagoon is presented in Table 2-1. In the 1950s EKCO constructed a lagoon to receive wastewater from processes at the plant. It was constructed to be an evaporation lagoon without discharge to surface waters. In 1969, with the development of new regulations and permit requirements by the State of Ohio, the lagoon was approved and permitted to receive discharge of regenerated deionizer from coating operations that contained copper, hydrochloric acid, and sodium hydroxide. In 1971 and 1972 manufacturing process waters, waste rinsate, and residues from chemical oxides in multicolored aluminum porcelain cookware cleaning were discharged to the lagoon. The discharge may have contained cadmium, cobalt, lead, and selenium. This discharge was permitted by the State of Ohio. Also, in the early 1970s washing and waste materials from a porcelain/teflon coating process consisting of aluminum frit and alkaline washers, which were approved and permitted for discharge by OEPA. Approximately 0.2 mgd of this process wastewater was discharged to the lagoon when the line was in operation.

With the exception of occasional alkaline wash degreaser filter water discharged in 1980 to mid-1984, the lagoon was not used after 1977 due to the discontinued manufacturing of aluminum porcelain cookware. All discharge to the lagoon was diverted in January 1985 through NPDES outfall 001. Any waters currently present in the lagoon are the result of rainwater ponding. Because analyses of sludge from the lagoon exhibit hazardous characteristics as defined in 40 CFR 261.24 and discharge to the lagoon continued after the effective date of RCRA, the lagoon has been classified as a hazardous waste surface impoundment by OEPA.

Table 2-1

Chronology of Lagoon
EKCO Housewares, Inc.
Massillon, Ohio

1950s	Lagoon constructed.
1965	AHPC acquired EKCO Housewares.
1969	Lagoon permitted to receive regenerated deionizer discharge containing copper, hydrochloric acid, and sodium hydroxide from coating operations.
Early 1970s	Lagoon received discharges of oxides used in cookware cleaning. Discharge also contained cadmium, cobalt, lead, and selenium. Lagoon also received washing from porcelain/teflon coating process under permit. Discharge contained aluminum frit and alkaline washer fluids.
1977 to 1978	Lagoon taken out of service due to discontinuing of aluminum porcelain cookware manufacturing and ceasing of all copper plating.
1980 to mid 1984	Lagoon reinstated and received occasional alkaline degreaser filter water discharges.
1984	AHPC sold EKCO Housewares to the EKCO Group.
January 1985	Lagoon influent stream was diverted to Newman Creek via NPDES discharge permit.
December 1985	Lagoon decommissioned.

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2.1.3.2 Construction

The lagoon is approximately 250 ft north of the plant in a fenced-in area. The lagoon is roughly triangular in plan view, with a maximum northeast-southwest dimension measuring 95 ft and a maximum northwest-southeast dimension measuring approximately 260 ft. The total surface area of the lagoon bottom is approximately 20,150 ft^2. The lagoon is surrounded on the north and east by a berm, which is approximately 8 to 11 ft high. A 10-ft embankment forms the southwestern boundary. Figure 2-4 is an illustration of the layout for the lagoon.

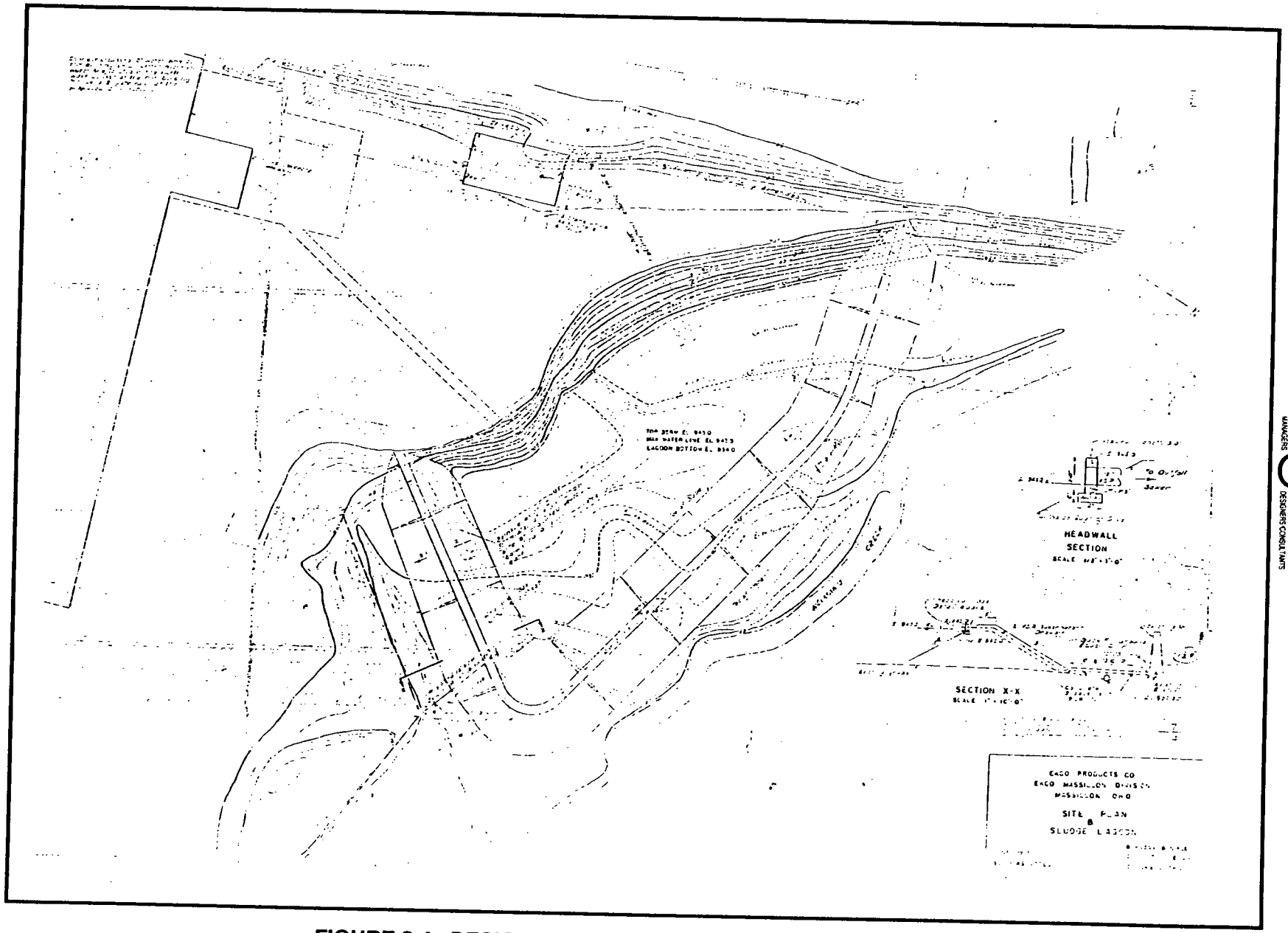
2.1.3.3 Lagoon Stratigraphy Indicated by Previous Investigations

From previous site work performed by Floyd Brown Associates (FBA) in 1986 and 1987, material within the lagoon was described as green to gray sludge varying in thickness from 0.5 ft to 6 ft, with an average thickness of 1 ft. A pictorial representation of this information is illustrated in Figures 2-5 and 2-6. Cross sections A-A′, B-B′, and C-C′ (lines shown in Figure 2-5) are illustrated in Figure 2-6. The sludge is underlain by fill consisting of brown to black cinders, ash, and gravel. The fill averages 1.5 ft in thickness, with a range of 1 to 3 ft thick. A clay layer varying in composition from clay to sandy gravely clay overlies permeable sand and gravels. This clay layer varies in thickness from 1 to 7 ft. WESTON's pictorial representation of the lagoon stratigraphy, based on additional information, is presented in Section 3.

2.2 PLANT PROCESSES

2.2.1 Manufacturing Processes

Since 1945 the EKCO Massillon plant has manufactured cookware. As summarized in Table 2-2, the products have been fabricated from metal coil or metal sheet stock, cleaned, stamped, drawn and frequently coated or enameled, then labeled and packaged for retail distribution.



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DESIGNERS CONSULTANTS

FIGURE 2-4 DESIGN SPECIFICATIONS OF LAGOON - EKCO HOUSEWARES, INC., MASSILLON, OHIO

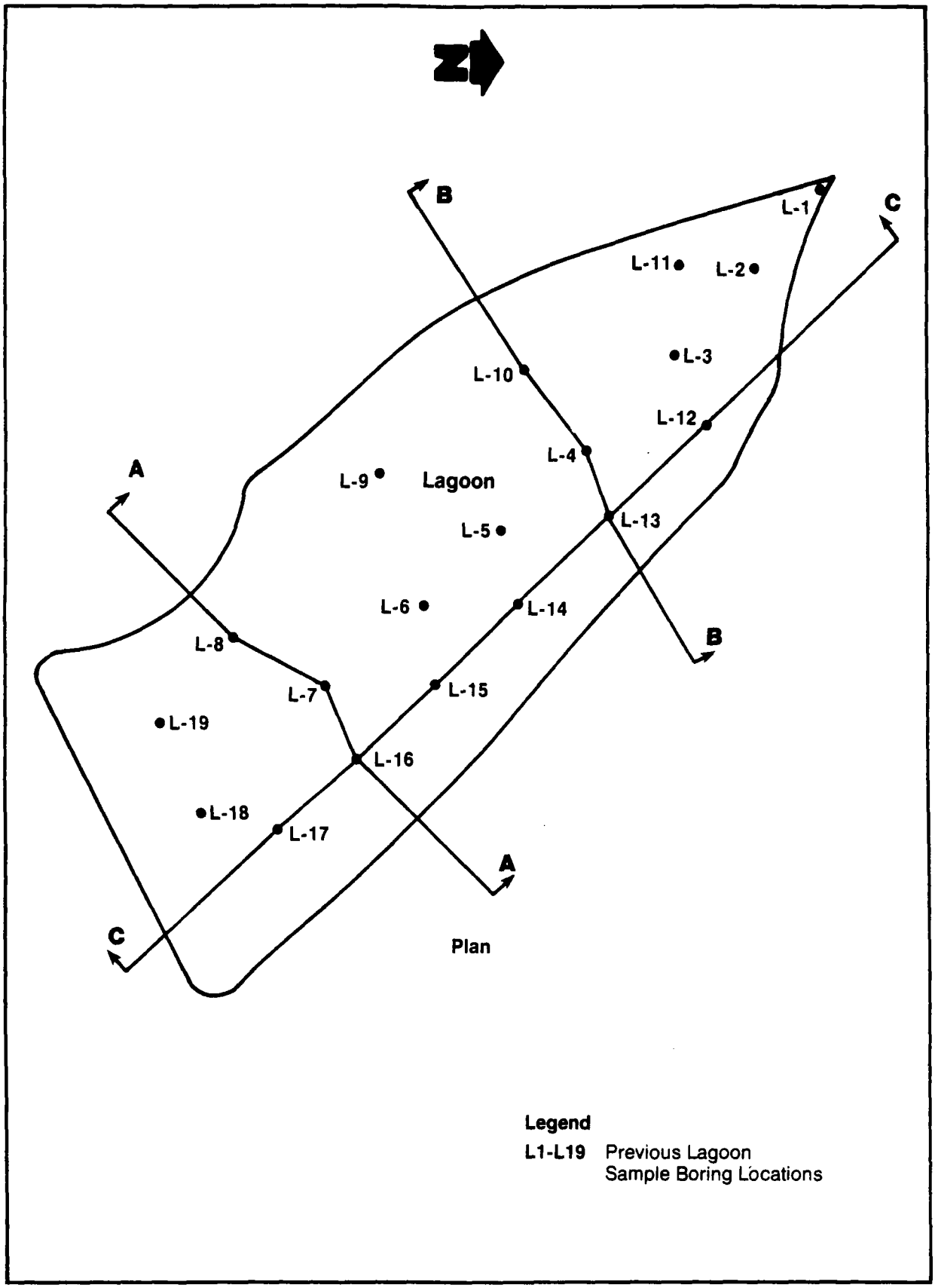

FIGURE 2-5 PREVIOUS LAGOON SUBSURFACE CHARACTERIZATION
EKCO HOUSEWARES, INC., MASSILLON, OHIO

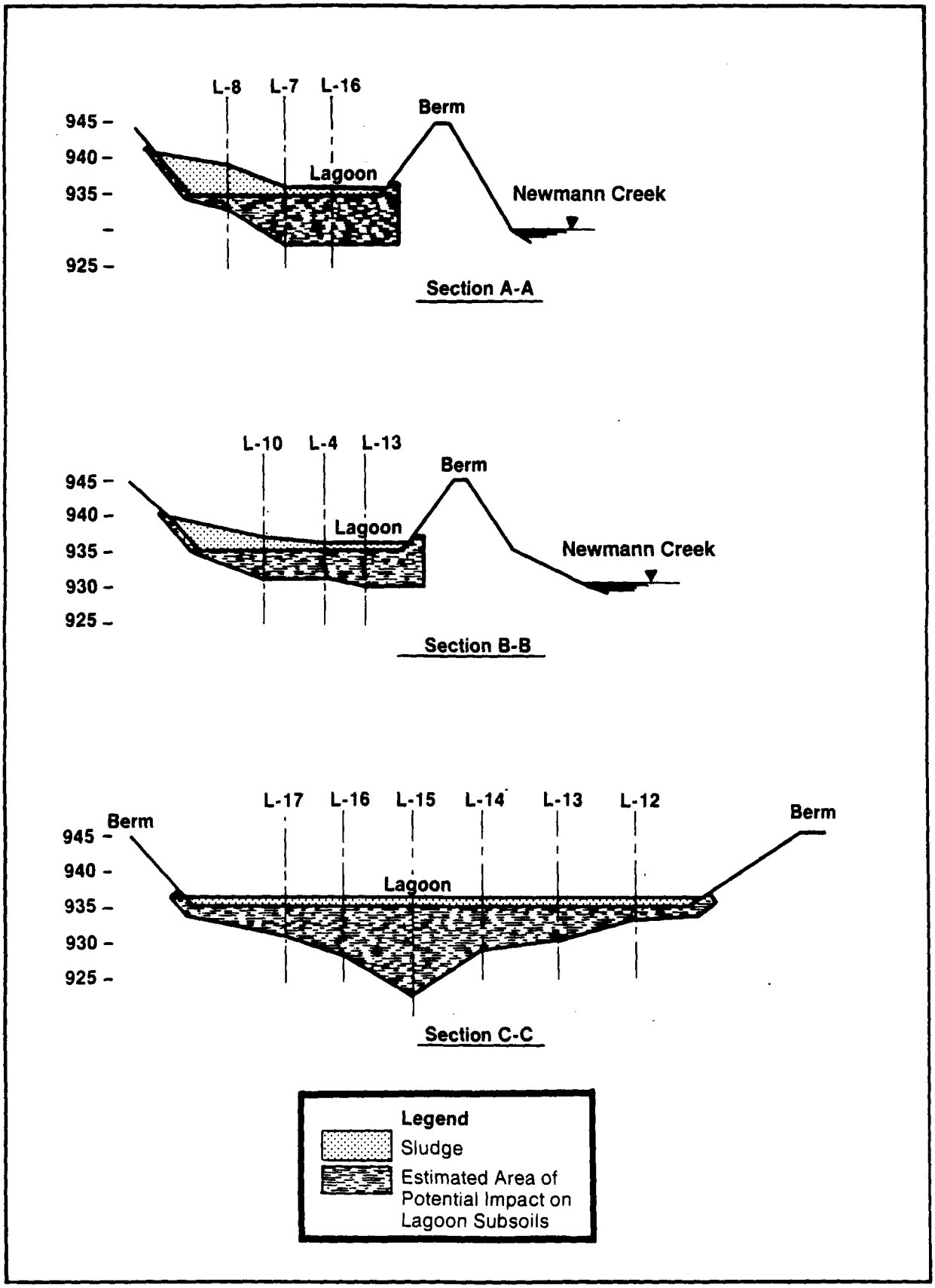

FIGURE 2-6 PREVIOUS LAGOON SUBSURFACE CHARACTERIZATION EKCO HOUSEWARES, INC., MASSILLON, OHIO

Table 2-2

Chronology of Manufacturing Processes at EKCO Housewares, Inc., Massillon, Ohio

1945	Aluminum cookware manufacturing in line operation.
1946	Pressure cooker manufacturing and stainless steel cookware lines added.
1951	Military production line installed to manufacture 90-mm and 105-mm cartridge cases.
1954	Coating line installed.
1967	Porcelain/teflon coating line installed.
1971	Production lines operational consisting of stamping and drawing stainless steel and tinplated iron material lines; stamping, drawing, and aluminum porcelain enameling line; stamping, drawing, and copper coating stainless steel line.
1978	All coating operations ceased and aluminum porcelain enameling line was discontinued.
1987	Tin-plated iron material stamping, drawing, and coating with silicone resin line in operation.

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Operations producing aluminum cookware began in 1945, and in 1946 pressure cookers and stainless steel cookware were added. In 1951, during the Korean conflict, 90-mm and 105-mm cartridge cases were produced for the U.S. Government. This military manufacturing line consisted of acid pickling operations, washing with soap solutions and with chromic and phosphoric acid baths, and painting. In 1954 the civilian manufacturing line consisted of sulfuric acid pickling operations and nickel and copper coating.

In late 1967 a porcelain coating line and a teflon coating line were installed, and in the early 1970s metal oxides were ground and sprayed onto cookware. During this period production of copper bottom pans was approximately 3% of total production. By 1971 the plant was primarily engaged in the manufacture of cookware by the use of tools, jigs, and fixtures to punch, draw, form, or modify material under pressure. The following processes and materials were used:

- Fabrication and finishing of stainless steel cookware - stamped and drawn.
- Fabrication of aluminum cookware - stamped, drawn, porcelain enameled.
- Fabrication of purchased tin-plated iron material (tinware as pre-electroplated material) - stamped and drawn.
- Fabrication and coating of stainless steel cookware - stamped, drawn, and copper coated.

Up until the mid-1970s, the plant manufacturing processes included semiautomatic copper coating and printing. As of November 1978, this facility ceased all copper coating. The current process involves an electrostatic spray application of silicone with a solvent blend mixture using water wash spray booths to capture the overspray. Vapor degreasers using trichloroethylene (TCE) are used to clean the product prior to coating. Vapors are captured in a carbon absorption system. The carbon is subsequently steam stripped to remove the TCE. The only wastewater effluent discharged is noncontact cooling water.

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2.2.2 Waste Treatment

2.2.2.1 Waste Recovery

The plant distills the solvents to keep oil out of the degreaser units. Still bottoms are reclaimed and final spent solvents consisting of a paraffin/oil mixture and trichloroethylene are accumulated in drums and transported to an authorized disposal facility on a bimonthly basis.

2.2.2.2 Wastewater Treatment

Information obtained from permit applications for plant wastewater discharge states that effluent discharge began in January 1946. Permit No. 815.20 was issued in May 1952 to discharge industrial wastes into the waters of Newman Creek by the Water Pollution Control Board of the Ohio Department of Health. In the early 1950s a sewer and inverted siphon structure was constructed to carry the effluent from the plant to a point below that of the Ohio Water Company's intake on Newman Creek. The Ohio Water Company intake was abandoned and dismantled in 1983.

Rinse waters from various plant operations were combined with approximately 800,000 gallons per day of noncontact cooling water flow and discharged to Newman Creek. In July 1974 NPDES Permit No. C-3094BD was issued to the EKCO Housewares facility. Table 2-3 (a and b) summarizes effluent quality reports submitted to the OEPA and EPA and formerly to the Ohio Department of Health. This table contains the range for each parameter tested.

The effluent discharged is primarily noncontact cooling water. However, a packed column air stripper was put into full operation in early March 1986 to remove the contaminants in the groundwater prior to use in the facility. This groundwater reclamation project requires VOC analysis to be performed monthly on the outfall. The analyses from March 1986 to September 1991 have shown concentrations ranging from 0.02 ppm to 0.86 ppm total VOCs. In mid 1987 the wastewater discharge to the Newman Creek outfall was 380 gallons per

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Table 2-3a

Plant Effluent Quality Ranges
EKCO Housewares, Inc., Massillon, Ohio
February 1972 - July 1975

Period	pH (S.U.)	Conduit Flow (MGD)	Copper (mg/L)	Nickel (mg/L)	Total Iron (mg/L)	Suspended Solids (mg/L)	Total Phosphate[a] (mg/L)	COD[a] (mg/L)	Total Solids[a] (mg/L)	Oil and Grease[b] (mg/L)
Prior to 1973	7.0-7.5	0.16-0.22	100-1,500	25-900	10-600	1-65	0.013-5.02	28-33	395-527	—
1973 to July 1975	7-8	0.14-0.18	0-800	0-450	25-200	1-20	0.001-0.017	26-67	505-717	2.5-10.0

[a]Analysis required once every 6 months.
[b]Started July 1974.

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Table 2-3b

Plant Effluent Quality Ranges
EKCO Housewares, Inc., Massillon, Ohio
August 1975 - January 1987

Period	pH (S.U.)	Conduit Flow (MGD)	Copper (ug/L)	Nickel (ug/L)	Iron Fe, Dis (ug/L)	Residue T. NFLT (mg/L)	Oil and Grease (mg/L)
August 1975 to January 1987	5.9-10.0	0.14-0.55	0-550	0-250	50-520	0-20	0-20

minute including groundwater after the stripping of VOCs. Currently, only a TCE/water waste stream from the degreaser units is collected and sent through the packed column air stripper which discharges through NPDES outfall 001.

2.3 WASTE CHARACTERIZATION

2.3.1 General

In March 1984, as part of the standard procedure for reapplying for a NPDES permit, water sampling and analysis were performed. The results revealed total VOC concentrations as high as 29 ppm in the lagoon water and 4.5 ppm in the incoming well water. Major contaminants were 1,1,1-trichloroethane and trichloroethylene, and to a lesser extent, 1,1-dichloroethane and 1,1-dichloroethene. When the lagoon water level was sampled in May 1984, it was estimated to be 4 ft to 6 ft deep with approximately 1 ft of sludge/sediment at the bottom. Water samples taken from the bottom of the lagoon at this time showed VOC concentrations up to 4.3 ppm. In July 1985 soil borings were installed in the lagoon and analytical results indicated the presence of VOCs ranging from 14 ppm to 71 ppm. Dichlorobenzene appeared to be the dominant volatile compound detected, ranging in concentration from nondetectable to 50 ppm. Two of five samples analyzed using EP toxicity procedures exceeded the maximum concentration levels for cadmium of 1 ppm with concentrations of 1.8 ppm and 2.0 ppm. These results indicated that the lagoon contains sludges that exhibit the characteristics of hazardous waste based on cadmium as defined in OAC 3745-51-24.

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2.4 GEOLOGY

2.4.1 Regional Geology

Most of Stark County, Ohio, has been covered by at least two continental ice sheets, resulting in variable surficial geologic conditions. The glaciers covered the land surface with a veneer of glacial drift deposits, which range from fine clay particles to huge boulders. The glacial drift thickness ranges from less than 25 ft to about 100 ft. In the areas of buried

valleys, however, this unconsolidated material can exceed 500 ft in thickness (Ohio Department of Natural Resources, 1972).

Melting ice from the receding glaciers produced large quantities of water carrying outwash material. This outwash material, deposited in broadly spread outwash plains and in restricted valleys in the form of kames, eskers, and valley fill, is generally composed of well sorted, cross-bedded, and horizontally layered sands and gravels.

Underlying these glacial drift and outwash deposits are sedimentary rocks of the Pennsylvanian, Mississippian, and Devonian geologic systems. These bedrock formations dip generally to the southeast at about 20 to 40 ft per mile and consist of sandstone and shale with some interbedded coal and occasional thin limestone units (Cross, 1959).

2.4.2 Local Geology

The site directly overlies glacial outwash deposits of interbedded and interlensing clay, sand, and gravel. These unconsolidated materials appear to thicken to the northeast with thicknesses ranging from 24 ft near the southwestern corner of the plant to 92 ft at the northeastern corner. Thick (greater than 250 ft) sand and gravel outwash deposits, comprising a deep buried valley, are present immediately east of the site.

The bedrock beneath the site consists of interbedded sandstone and shale belonging to the Pottsville group of Pennsylvanian age. The thickness of this formation is reported to be approximately 255 ft (Morningstar, 1922).

Two cross sections were generated using the driller's stratigraphic logs for the site wells installed during previous site work. Sections A-A′ and B-B′ (lines shown in Figure 2-7) are illustrated in Figures 2-8 and 2-9, respectively. Both sections show that the outwash sediments thicken to the north and east.

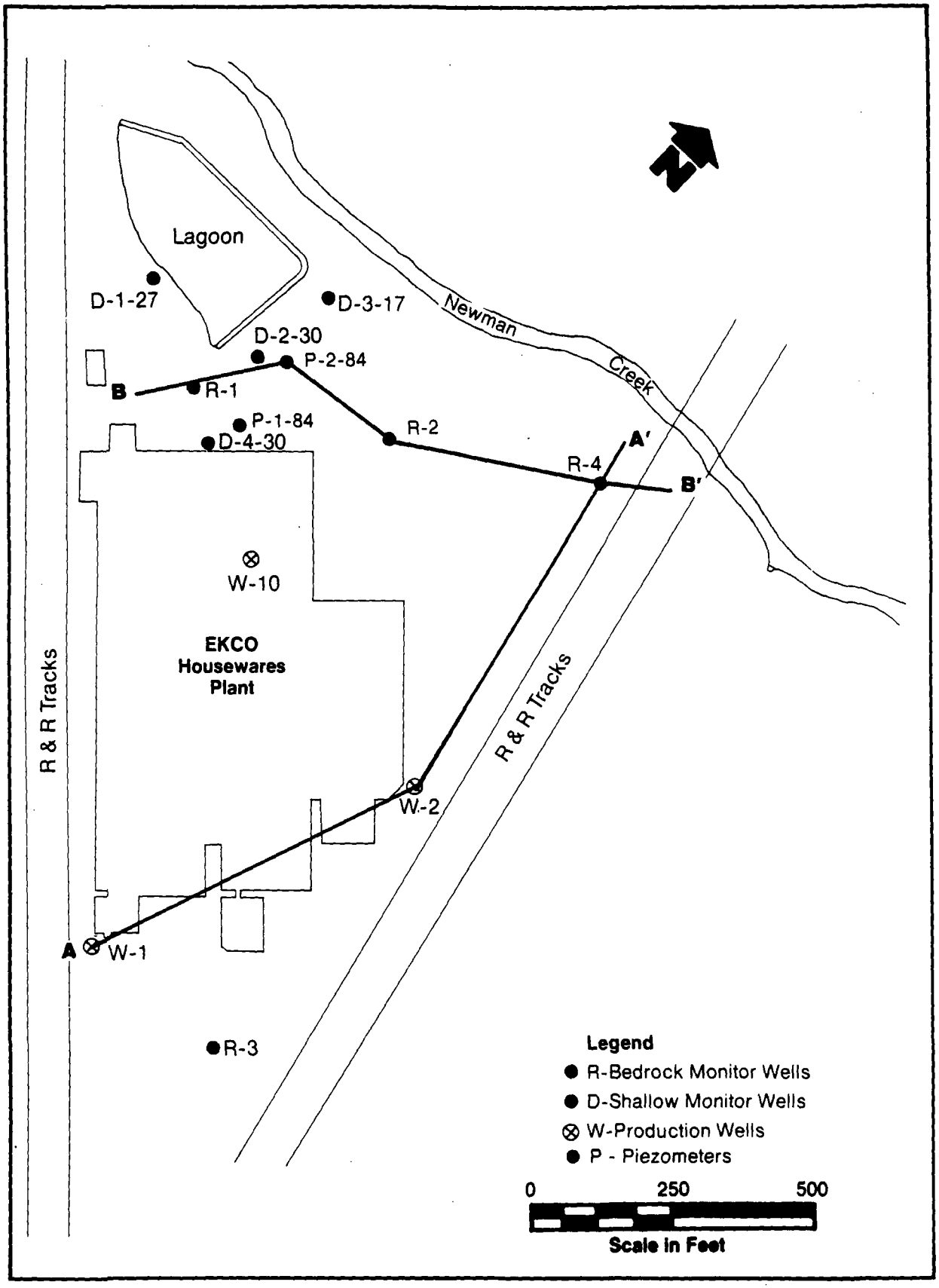

FIGURE 2-7 **LOCATIONS OF CROSS SECTIONS A-A' AND B-B' EKCO HOUSEWARES, INC., MASSILLON, OHIO**

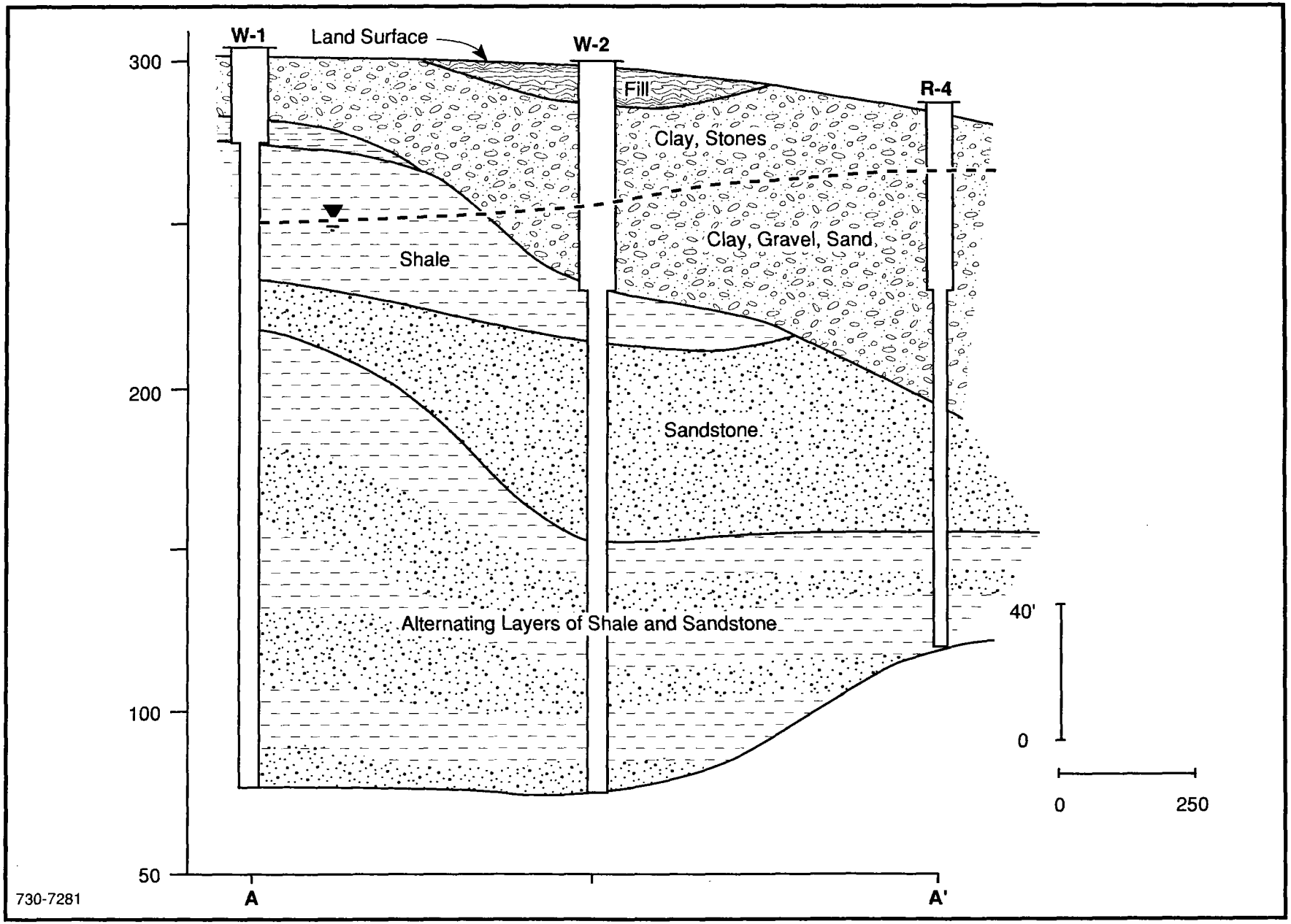

FIGURE 2-8 GEOLOGIC CROSS SECTION A-A'
EKCO HOUSEWARES, INC., MASSILLON, OHIO

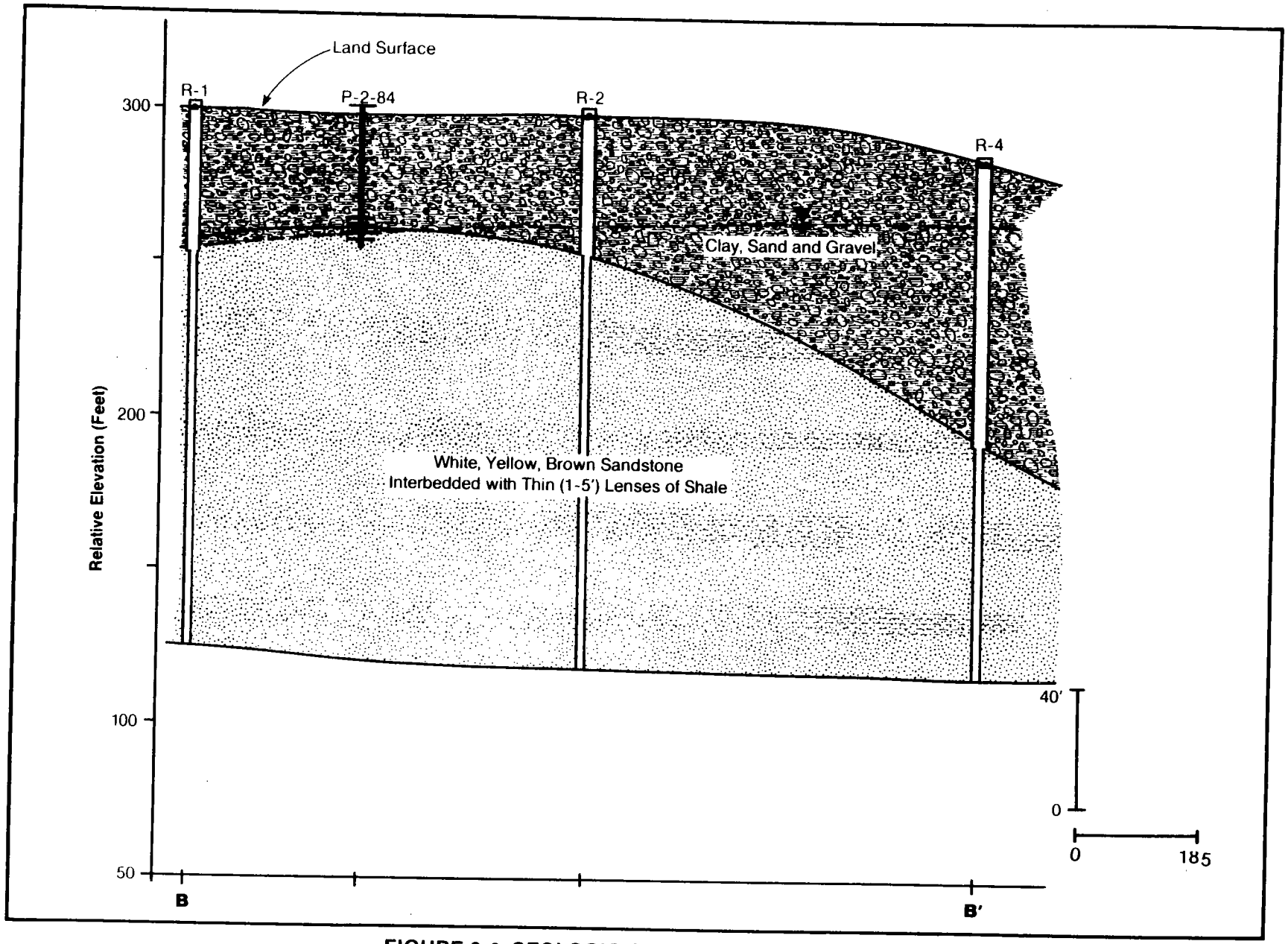

FIGURE 2-9 GEOLOGIC CROSS SECTION B-B'
EKCO HOUSEWARES, INC., MASSILLON, OHIO

2.5 HYDROGEOLOGY AND GROUNDWATER USE

As seen in Figure 2-10, the deep buried valley deposits just east of the site and the Pottsville sandstone are the principal aquifers utilized in the Massillon area. Because of the predominance of clay in the glacial outwash deposits that directly underlie and surround the EKCO facility, water wells are often drilled through these deposits to the underlying rock. Within a 1-mile radius of the site, approximately 50 domestic and five commercial or industrial wells (including site production wells W-1, W-2, and W-10) are completed in the Pottsville sandstone and six municipal wells (Ohio Water Service wells 1, 2, 3, 5, 7, and 8) tap the highly permeable sand and gravel deep buried valley deposits. No information is available on the average depth of the domestic wells, but depths of the commercial and municipal wells average approximately 225 and 150 ft, respectively.

Although the literature has reported groundwater yields from individual wells installed in the Pottsville sandstone of only 25 to 100 gallons per minute, the two on-site production wells collectively withdraw over 400 gallons per minute. Yields of over 2,000 gallons per minute have been obtained from the Ohio Water Service municipal wells completed in the deep buried valley deposits located just 2,500 ft east and northeast of the site.

The depth to groundwater in September 1991 ranged from 9 to 33 ft below ground surface for the on-site wells installed in the glacial outwash deposits. The groundwater level in the on-site wells installed in the Pottsville sandstone ranged from 21 to 49 ft below ground surface. Adjusting for elevation, this represents a vertical head difference of 16 to 17 ft between the overburden and bedrock. The groundwater flow direction in the shallower water table zone appears to be to the southeast, as seen in Figure 2-11. The regional gradient in the bedrock aquifer is obscured due to the groundwater withdrawal from on-site production wells W-1 and W-10, thus causing a cone of depression at the property center, as seen in Figure 2-12.

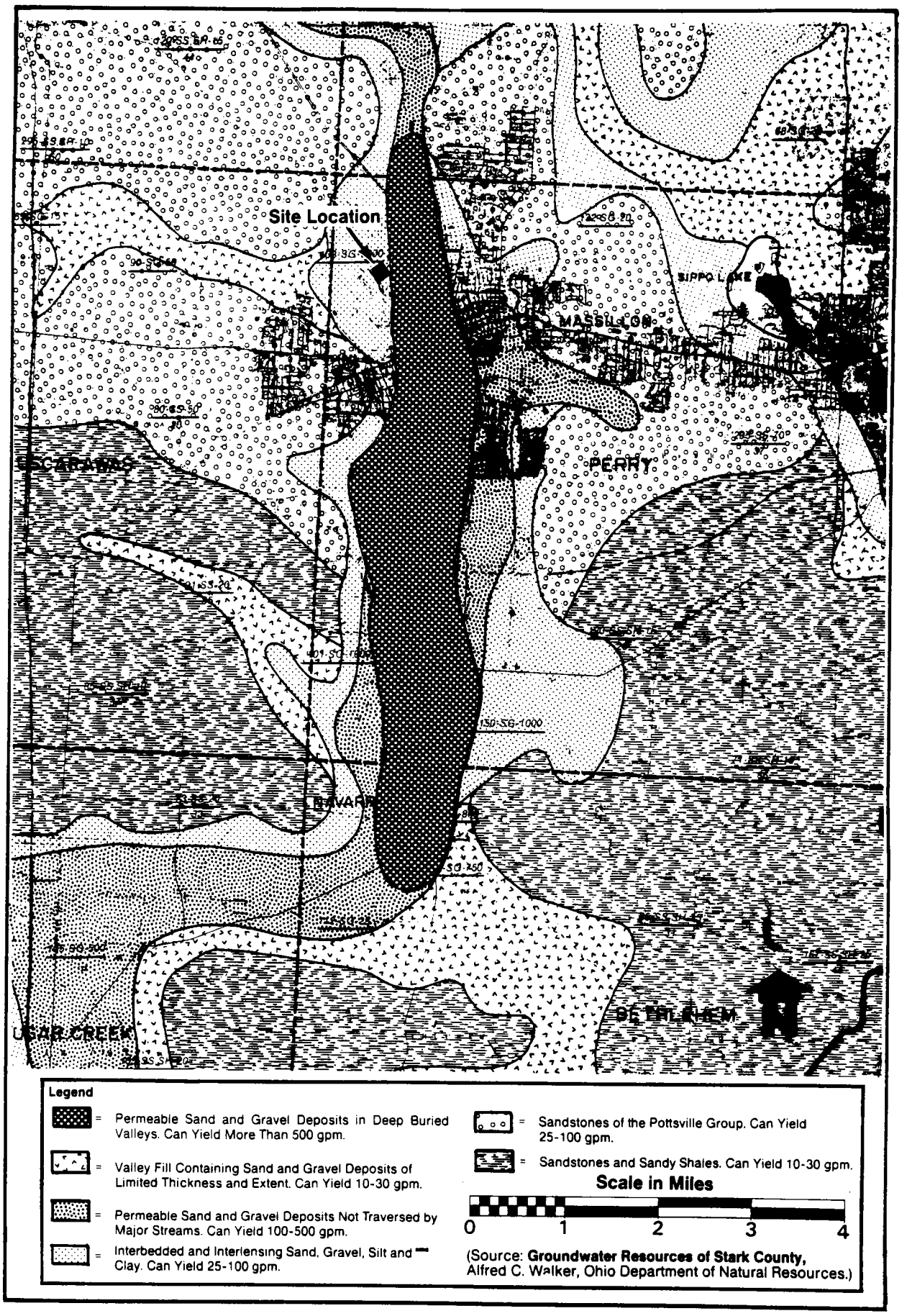

FIGURE 2-10 GROUNDWATER RESOURCES OF MASSILLON, OHIO

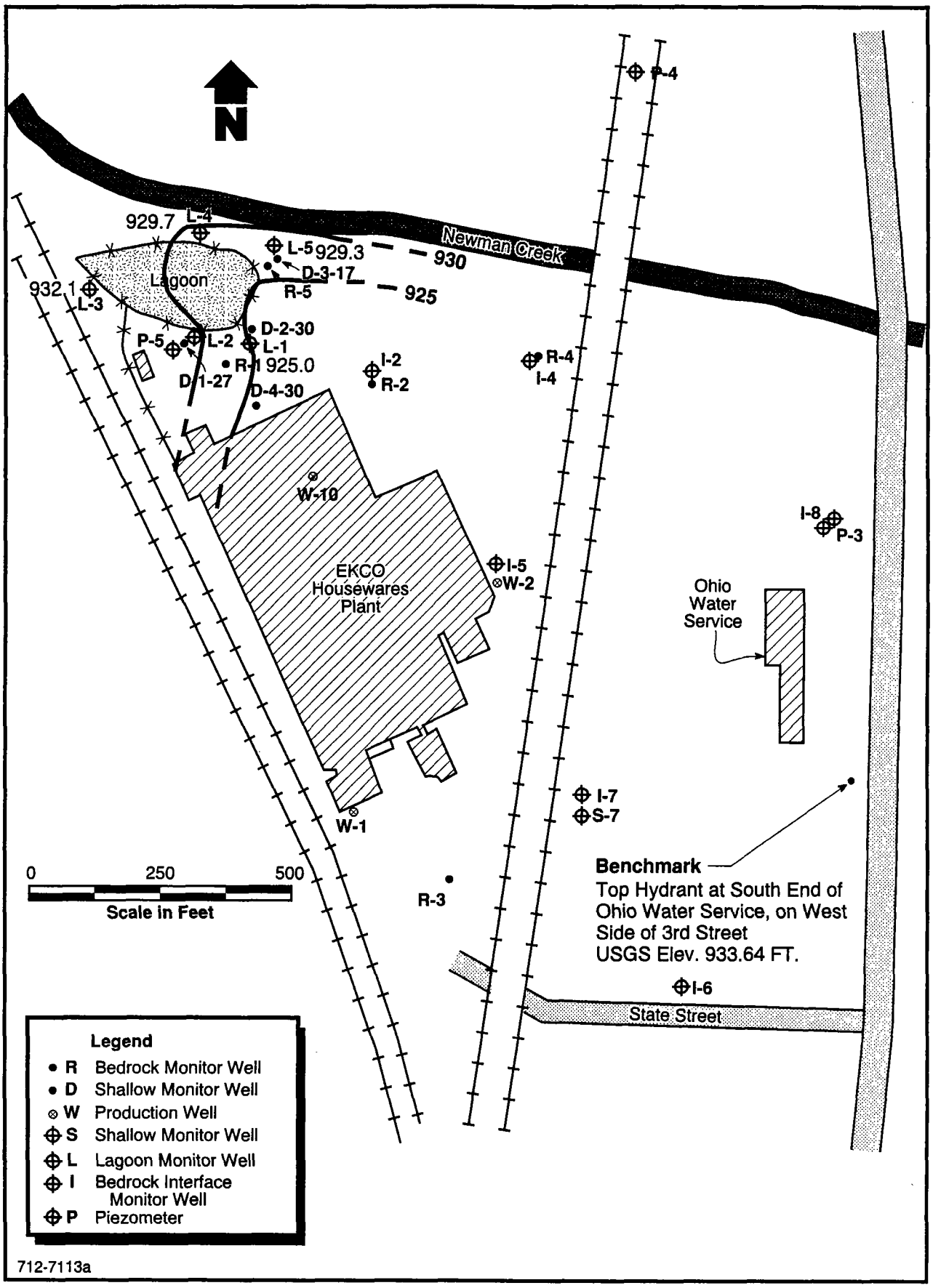

FIGURE 2-11 L-WELL GROUND WATER MAP
WATER LEVELS MEASURED 11/9/90

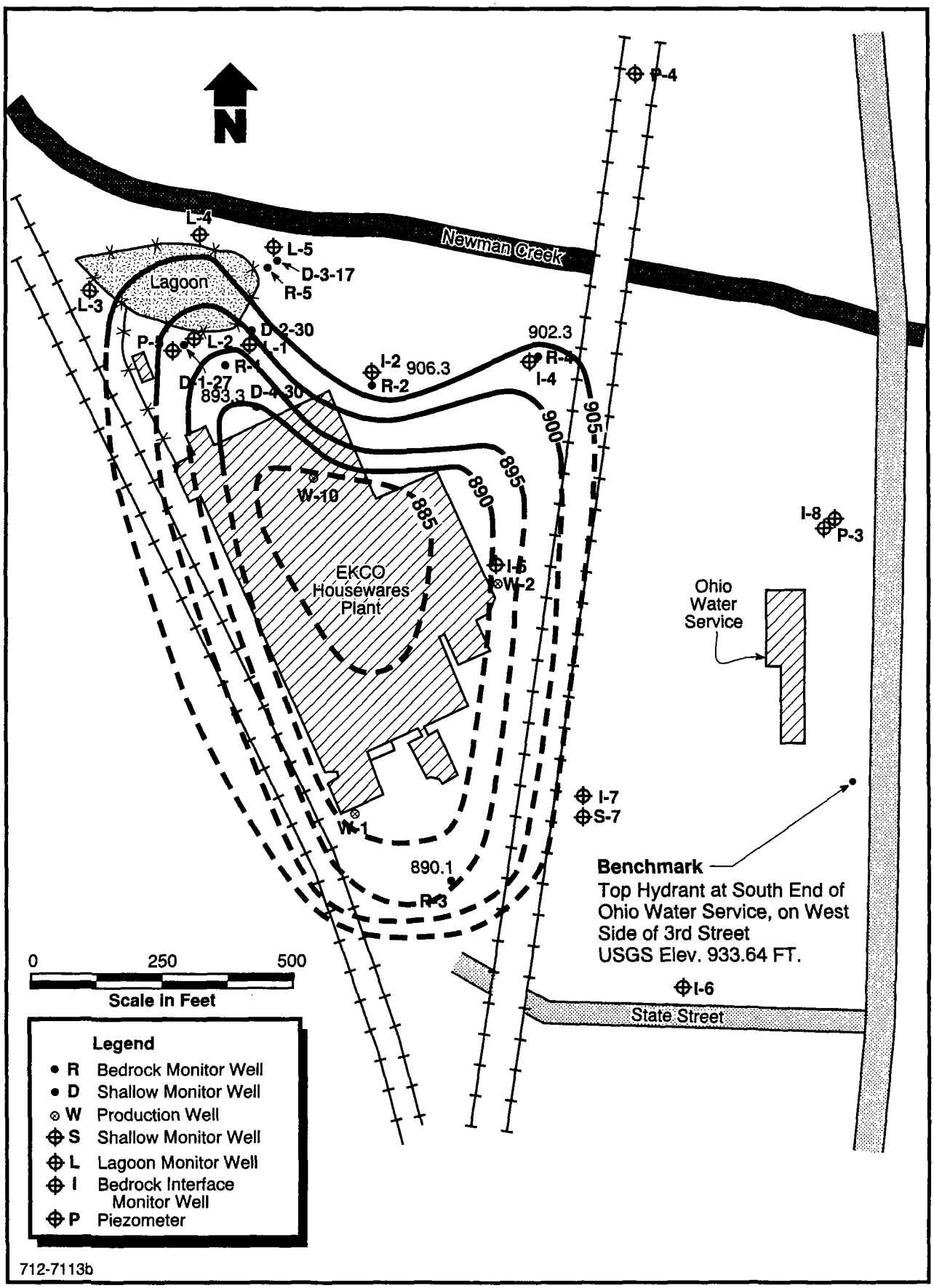

FIGURE 2-12 R-WELL GROUND WATER MAP WATER LEVELS MEASURED 12/90

2.6 CLIMATOLOGY

Information obtained from the Akron/Canton Weather Service Office reveals a precipitation rate of 35.90 inches per year based on records for a 30-year period, 1951 to 1980 inclusive. The mean annual Class A pan evaporation interpreted from a map in the Weather Bureau Technical Paper No. 37 is approximately 40 inches per year. Information regarding the pH of the precipitation in Stark County is not available. In addition, a major rainfall event, i.e., a 25-year/24-hour rainfall, is listed in Weather Bureau Technical Paper No. 40 to be approximately 4 inches for Stark County, Ohio.

2.7 ONGOING ACTIVITIES

2.7.1 RCRA Facility Investigation/Corrective Measures Study (RFI/CMS)

An RFI/CMS Work Plan for the facility was developed in May 1990. The objective of RFI/CMS activities is to collect data and complete an evaluation and selection of the appropriate corrective measures necessary to protect human health and the environment in a cost-effective manner. This ongoing program is scheduled to be completed in April 1992. The RFI/CMS will address the contaminants of concern. The primary remedial response objectives of the RFI/CMS are to:

- Identify and investigate contaminant source areas.
- Delineate the extent and magnitude of soil and groundwater contamination.
- Evaluate potential environmental impact from the identified contaminants.
- Develop and adequately evaluate sound corrective measures alternatives that will formulate a comprehensive strategy to mitigate the hazardous constituents and their potential impacts on human health and the environment.

Groundwater corrective measures are being investigated as part of the CMS.

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2.7.2 Present Groundwater Recovery and Treatment Systems

2.7.2.1 Recovery System

Two on-site production wells, W-1 and W-10, recover groundwater from the bedrock aquifer. Combined, the two withdraw over 400 gallons per minute (gpm), 24 hours per day. This pumping rate influences the groundwater flow in the bedrock zone by creating a cone of depression that extends beyond the property boundary.

2.7.2.2 Treatment System

The water withdrawn from these two wells is treated by an air stripping column to remove VOCs. The unit is a single-packed column 4 ft in diameter and 30 ft high, designed to treat 600 gpm of groundwater with a total VOC concentration not exceeding 40 ppm. A study of 1986 and 1987 levels indicated that the concentration of VOCs in the recovered groundwater has decreased during this period from 18 ppm to below 8 ppm.

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SECTION 3

SITE ASSESSMENT

3.1 PURPOSE

The purpose of this section is to:

- Identify the contaminants of concern and potential pathways of contaminant migration from the lagoon.
- Summarize previous investigations of the lagoon.
- Discuss WESTON's investigation.
- Identify and discuss the nature and extent of contaminants detected during WESTON's investigation.

3.2 PREVIOUS INVESTIGATIONS

Since 1984 various studies and investigations have been performed at the EKCO facility to assess wastewater streams and groundwater quality beneath the site and the lagoon. A summary of previous investigations at the EKCO facility and results are presented in Appendix B. However, not all of the investigations summarized were performed to assess the lagoon or subsurface conditions beneath the lagoon and therefore will not be discussed in detail in this document. The investigations that are pertinent to the lagoon are presented in Table 3-1. These will be discussed in the following subsections.

3.2.1 EKCO/Wadsworth Sampling

3.2.1.1 NPDES Sampling

Between March and May 1984, in efforts to renew a National Pollution Discharge Elimination System (NPDES) permit for the facility, a series of sampling events was performed.

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Table 3-1

Previous Lagoon Investigations at EKCO Facility
Massillon, Ohio

Date(s)	Investigator	Scope of/Reason for Investigation
March - May 1984	EKCO/Wadsworth Lab	Routine Sampling for Renewal of NPDES Permit
July 1985	EKCO/Wadsworth Lab	Soil Borings in the Lagoon/ Waste Characterization
July 1986	Floyd Brown Associates Ltd. (FBA)	Phase I Soil Boring Program/ Lagoon Closure
January 1987	Floyd Brown Associates Ltd. (FBA)	Phase II Soil Boring Program and Monitor Well Installation/ Lagoon Closure

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In March 1984 a sampling and analysis for volatile organic compounds (VOCs) revealed up to 22 ppm of 1,1,1-TCA and 1.1 ppm of TCE contamination in the lagoon wastewater, as well as 2.5 ppm of 1,1,1-TCA and 2.0 ppm of TCE in the incoming well water, and 3.0 ppm of 1,1,1-TCA and TCE in plant discharge. Further testing in April showed 3.7 ppm 1,1,1-TCA and TCE in the plant effluent and up to 9 ppm and 19.5 ppm of 1,1,1-TCA and TCE respectively in separate samples of influent lagoon water and soil. No traces of VOCs were detected from upstream and downstream samples on Newman Creek.

On 21 May 1984 the plant switched over to city water to test if the 1,1,1-TCA and TCE were in fact simply recharging from the lagoon to the well. Results of the 21 May 1984 test were similar to previous analyses indicating 28 ppm of total VOCs in influent lagoon water, 5 ppm total VOCs in incoming well water, 3 ppm total VOCs in plant effluent, and 0.48 ppm total VOCs in a downstream sample in Newman Creek. Table 3-2 presents these results.

On 31 May 1984 another series of samples were taken by Wadsworth Testing Laboratories, Inc. (Wadsworth), indicating up to 3.8 ppm of 1,1,1-TCA in a grab water sample from a manhole in the NPDES outfall piping system. This was an increase of 1.9 ppm from a sample taken on 21 May, when city water was used as process water. Water samples collected on 31 May 1984 indicated 3.3 ppm of 1,1,1-TCA in the plant outfall and 4.3 ppm of VOCs in the lagoon. Soil samples collected on 31 May 1984 from the northern and western tank farms indicated maximum total VOC concentrations of 200 ppm and 228 ppm, respectively. No traces of VOCs were found in upstream or downstream water samples from Newman Creek. On 4 June 1984 water samples from the discharge of the degreaser units indicated VOC concentrations up to 6.3 ppm. In addition, water samples taken from manholes further down on the NPDES sewer system showed up to 11 ppm of VOCs. Also, to test possible penetration of 1,1,1-TCA in the degreasers through internal refrigeration coils and into the refrigeration coil liquid, several samples were taken of the liquid inside refrigeration coils. Analysis showed up to 1,400 ppm of 1,1,1-TCA. In August 1984 the

Table 3-2

NPDES Sampling
21 May 1984

Sample Location	Total VOC Concentration (ppm)
Production Well	5
Plant Effluent	3
Lagoon Influent	28
Downstream Sample in Newman Creek	0.48

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analysis for production well W-2 sample showed 3.41 ppm of VOCs, and water samples from the plant's carbon absorption units steam lines had up to 0.71 ppm of TCE. This was probably a contributing factor in VOCs being discharged to the lagoon.

3.2.1.2 EKCO/Wadsworth Soil Borings

In July 1985 Wadsworth installed five 3-ft soil borings in the dry lagoon to investigate the VOCs and metals (total and EP toxicity analyses). The results of these analyses indicated the presence of VOCs ranging from 14 ppm to 71 ppm. Dichlorobenzene appeared to be the dominant volatile compound detected, ranging in concentration from nondetectable to 50 ppm. Two of the five soil samples exhibited characteristics of EP toxicity, with levels of cadmium exceeding 1 ppm (1.8 ppm and 2.0 ppm). The five soil sample analyses indicated concentrations of cadmium and lead ranging from 11 to 4,500 ppm and 540 to 11,000 ppm, respectively. The analysis of these samples indicated chromium concentrations up to 150 ppm. From this investigation it became evident that the sludge contained in the lagoon may be characterized as hazardous waste and further investigation was necessary.

3.2.2 Floyd Brown Associates Soil Boring Program

On 17 June 1986 the consulting firm of Floyd Brown Associates, Limited (FBA), contracted by EKCO, submitted a preliminary closure plan for the lagoon. As a result, FBA conducted two separate field investigations at the facility. Phase I was conducted on 9 and 10 July 1986, and Phase II was conducted between 12 and 26 January 1987.

3.2.2.1 Phase I FBA Soil Boring Program

Phase I consisted of completing a total of 12 test borings at the facility for the purpose of obtaining soil samples for laboratory analyses and determining site-specific geological characteristics. Borings were installed within the lagoon, downgradient, and in background areas, as shown in Figure 3-1. Four soil borings were installed within the lagoon, each to a

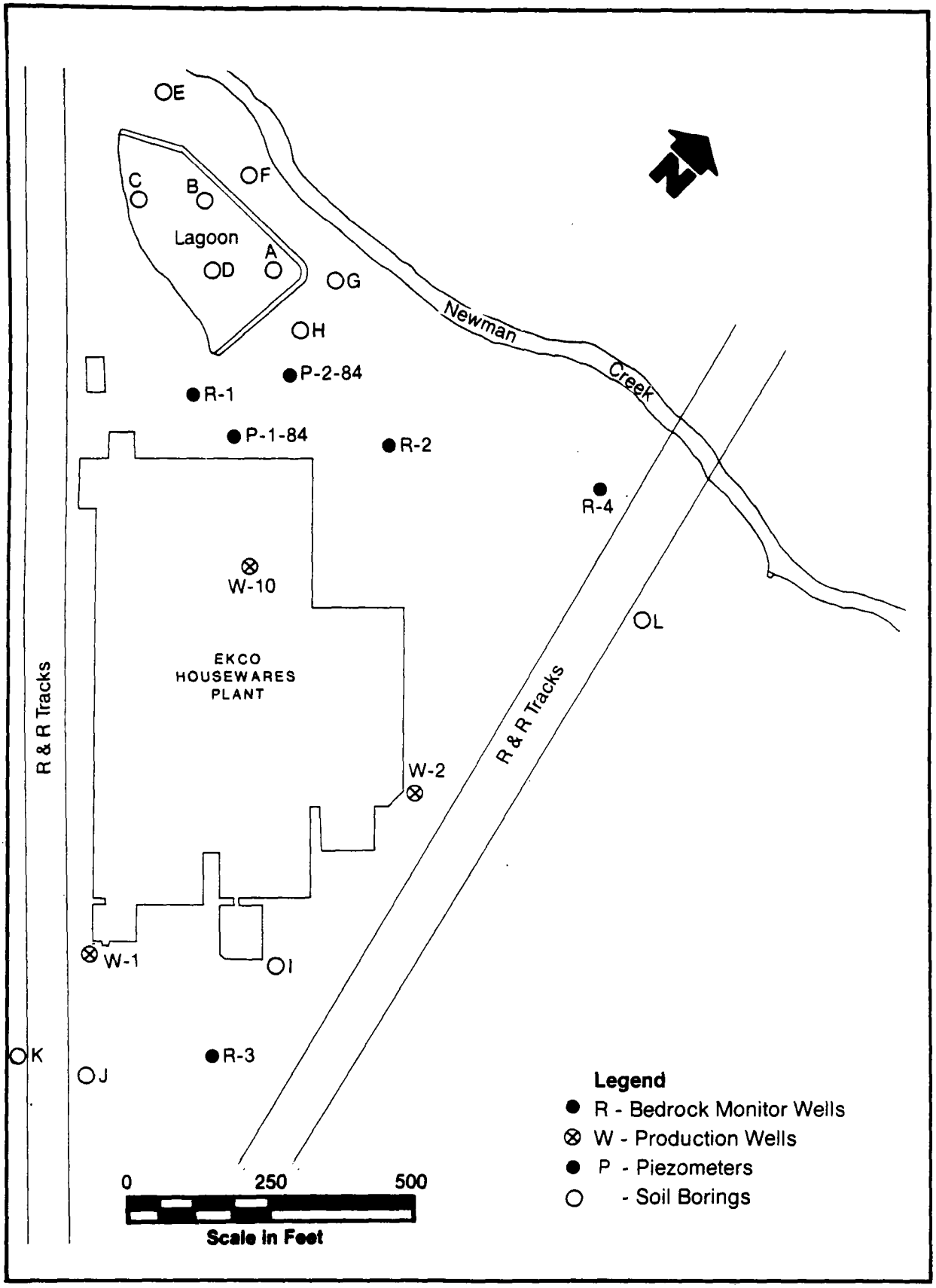

FIGURE 3-1 LOCATIONS OF FLOYD BROWN ASSOCIATES PHASE I SOIL BORINGS EKCO HOUSEWARES, INC., MASSILLON, OHIO

depth of 12 ft. Four soil borings were installed downgradient of the lagoon, each to a total depth of 12 ft, to evaluate contaminant migration, if any, from the lagoon. Four soil borings were installed, each to a depth of 3 ft, in uncontaminated areas (i.e., background). Soil samples from the lagoon and downgradient borings were composited according to depth and analyzed for total metals and VOCs. Background soil samples were analyzed for total metals. Tables 3-3, 3-4, and 3-5 present the results from the Phase I analyses. No priority pollutant VOCs were detected in the composited lagoon and composited downgradient samples. However, composited samples from the lagoon showed elevated concentrations for chromium (up to 230 ppm), and/or cadmium (up to 450 ppm), and/or lead (up to 2,430 ppm) to a depth of 4 ft.

Composited samples from downgradient areas exhibited concentrations of cadmium (up to 10 ppm) and lead (up to 57 ppm).

3.2.2.2 Phase II

Phase II was designed to delineate the extent of soil contamination beneath the lagoon based on noncomposited samples. Additionally, groundwater monitoring wells were installed in the vicinity of the lagoon to evaluate the impact, if any, of the detected heavy metals on groundwater quality. During Phase II field investigations, six test borings were installed to delineate the subsurface stratigraphy, and soil samples from discrete intervals were obtained and analyzed to assess possible soil contamination by VOCs. Four of the six test borings, three hydraulically downgradient and one hydraulically upgradient, were completed as 1.5-inch PVC groundwater monitoring wells (D-1 through D-4) (see Figure 3-2). The two remaining test borings (B-1 and B-2) were installed in areas adjacent to the lagoon to further assess background. Soil samples from discrete intervals of these six test borings were analyzed for the priority pollutants volatile (PPV) organic compounds, as well as for total concentrations of cadmium, chromium, and lead. Metals data for five of the six test borings are contained in Appendix C. VOCs were detected in soil samples from D-2 and D-4 as follows:

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Table 3-3

Results of Composited (by Depth) Lagoon Soil Boring Samples
FBA Phase I Soil Boring Program[a]

	Lagoon Composite Soils (Stations A through D)[b]							
Interval (ft)	0-1	1-2	2-3	3-4	6	8	10	12
Arsenic, mg/kg	13	12	12	21	9	10	11	13
Barium, mg/kg	600	130	77	140	58	42	120	42
Cadmium, mg/kg	450	4	<0.9	1.3	0.7	0.9	27	0.7
Chromium, mg/kg	230	130	35	120	9	7	14	10
Copper, mg/kg	880	400	93	47	20	12	230	15
Lead, mg/kg	2,430	1,670	12	17	18	8	190	13
Nickel, mg/kg	55	28	12	29	23	23	23	38
Selenium, mg/kg	3	<3	<4	<5	<3	<2.4	<4	<3
Zinc, mg/kg	830	1,370	70	500	120	170	200	73
Cyanide, mg/kg	0.3	0.4	0.6	1.6	0.4	0.2	0.2	0.2

[a]Referenced from Floyd Brown Associates, *Closure Plan Presentation*, Memorandum Draft, 4 November 1986.

[b]Locations found on Figure 3-1.

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Table 3-4

Results of Composited (by Depth) Downgradient Soil Boring Samples FBA Phase I Soil Boring Program[a]

	Downgradient Composite Soils Samples (Stations E through H)[b]							
Interval (ft)	0-1	1-2	2-3	3-4	6	8	10	12
Arsenic, mg/kg	13	14	7	9	6	25	14	17
Barium, mg/kg	72	99	47	69	58	18	58	17
Cadmium, mg/kg	10	3	0.7	0.7	<0.9	<0.7	<0.6	<0.6
Chromium, mg/kg	13	8	5	7	19	9	9	9
Copper, mg/kg	42	15	8	23	5	18	16	12
Lead, mg/kg	57	15	6	12	8	20	15	20
Nickel, mg/kg	28	24	30	16	6	26	16	22
Selenium, mg/kg	<2	<6	<3	<3	<3	<3	<2	<2
Zinc, mg/kg	65	86	56	89	18	91	52	65
Cyanide, mg/kg	0.2	0.4	0.1	0.1	1.8	<0.1	0.1	0.3

[a]Referenced from Floyd Brown Associates, *Closure Plan Presentation*, Memorandum Draft, 4 November 1986.

[b]Locations found on Figure 3-1.

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Table 3-5

Results of Background Soil Samples
FBA Phase I Soil Boring Program[a]

	Background Soil Samples (Stations I through L)[b]							
Boring Interval (ft)	I (0-1.5)	I (1.5-3.0)	J (0-1.5)	J (1.5-3.0)	K (0-1.5)	K (1.5-3.0)	L (0-1.5)	L (1.5-3.0)
Arsenic, mg/kg	15	18	2	6	10	10	11	5
Barium, mg/kg	350	51	45	26	70	14	110	72
Cadmium, mg/kg	<0.9	<1.0	<0.8	<0.8	2	<0.9	14	<0.6
Chromium, mg/kg	10	7	6	2	5	6	54	7
Copper, mg/kg	18	13	16	7	17	52	54	34
Lead, mg/kg	20	7	9	8	11	28	93	98
Nickel, mg/kg	14	230	35	23	19	72	24	32
Selenium, mg/kg	<4	<4	<3	<3	<3	<4	<4	<2
Zinc, mg/kg	32	54	65	23	64	32	180	100

[a]Referenced from Floyd Brown Associates *Closure Plan Presentation*, Memorandum Draft, 4 November 1986.

[b]Locations found on Figure 3-1.

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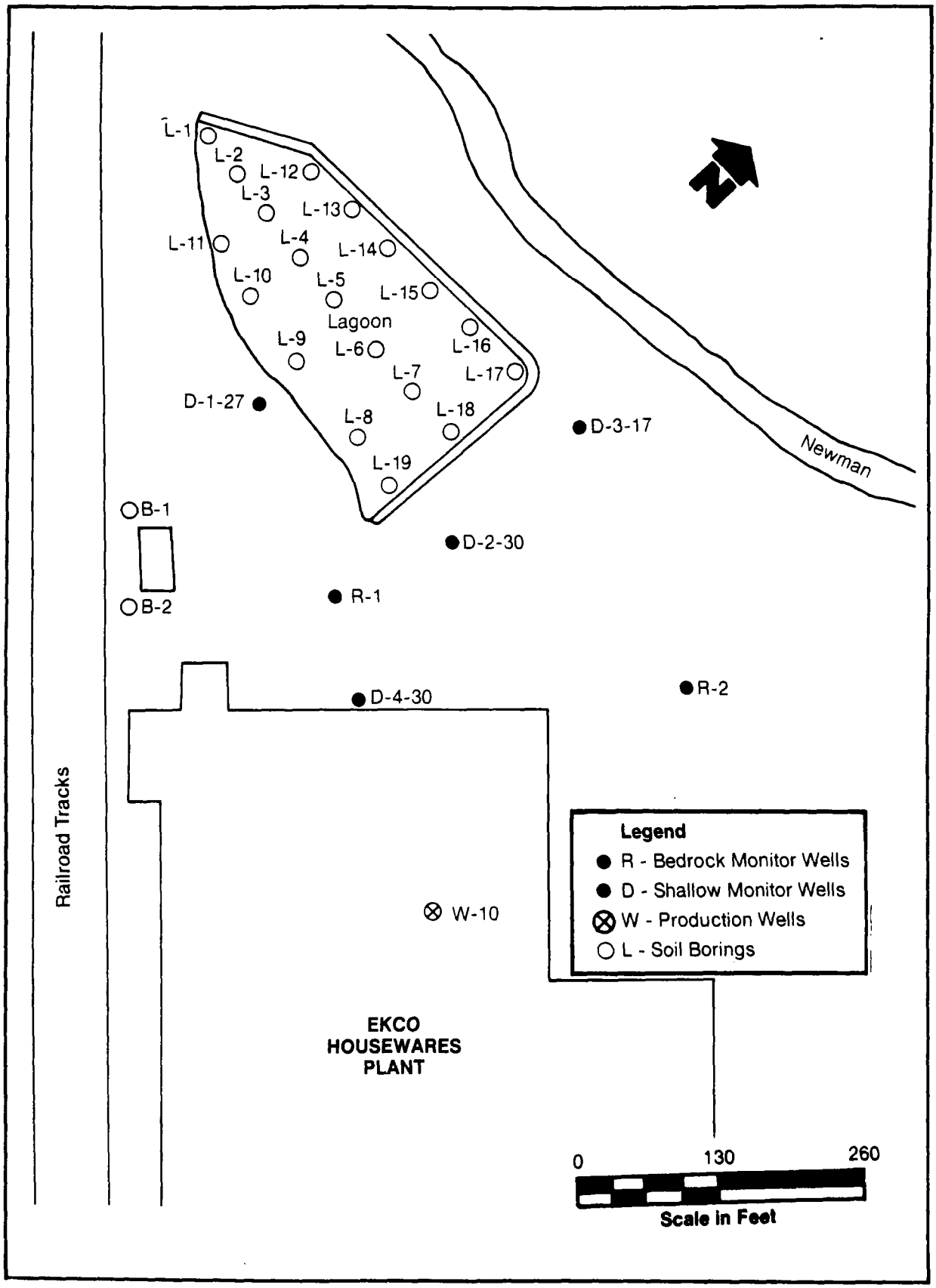

FIGURE 3-2 LOCATIONS OF FLOYD BROWN ASSOCIATES PHASE II SOIL BORINGS EKCO HOUSEWARES, INC., MASSILLON, OHIO

D-2		D-4	
Sample Depth (ft)	Total VOCs (ppm)	Sample Depth (ft)	Total VOCs (ppm)
13	0.21	2	7.56
15	0.05	5	0.26
17	0.00	8	1.48
		12	0.08
		15	1.43
		19	0.00

These data indicated that the detected concentrations of VOCs have decreased by greater than one order of magnitude between 1984, when Ohio Drilling completed nearby test holes for soil analysis, and this investigation's date of January 1987.

Also, 19 soil borings were installed in the lagoon (L-1 through L-19 in Figure 3-2), each to a maximum depth of 12 ft, with samples for laboratory analyses collected over each 1-ft interval. All lagoon soil samples were analyzed for total concentrations of cadmium, chromium, and lead. The analytical results from L-1 through L-19 are summarized in Appendix D. Results indicate elevated concentration of the metals of concern in soils to the maximum depth of the borings. However, this situation is localized in the area near the inlet of the lagoon. Maximum concentrations near the surface up to 8,400 ppm cadmium, 2,630 ppm chromium, and 19,500 ppm lead were indicated.

3.3 CONTAMINANTS OF CONCERN

3.3.1 Organic

Previous environmental investigations at this facility indicate the presence of several organic compounds in the groundwater and sludges/sediments within the lagoon, including trichloroethylene (TCE), trichloroethane (TCA), dichloroethylene, dichloroethane, dichlorobenzene, and vinyl chloride. The March 1988 lagoon soil borings confirmed the

presence of trichloroethylene, dichloroethylene, dichloroethane, chlorobenzene, vinyl chloride, 2-butanone, and methylene chloride at relatively low levels.

3.3.2 Inorganic

Soil borings installed within the lagoon during previous investigations indicated elevated total metal concentrations for cadmium, chromium, and lead. The March 1988 lagoon soil borings confirmed the presence of elevated levels of cadmium, chromium, and lead.

3.3.3 Potential Migration Pathways

3.3.3.1 Air

The potential of airborne migration of contaminants from the volatilization of VOCs and from the dispersion of soil particles contaminated with heavy metals may exist during excavation of soils from the lagoon. This could result in contaminant migration downwind from excavation activities.

3.3.3.2 Groundwater

The potential migration of hazardous waste constituents into groundwater beneath the lagoon is being addressed separately in the Groundwater Quality Assessment, as part of the RFI/CMS for this site. It is intended to execute clean closure of the lagoon and remove it as a source area.

3.3.3.3 Surface Water

The potential for migration to Newman Creek may have existed through the berms when the lagoon was operational. This may have resulted in discharges to Newman Creek. Another potential pathway exists via the discharge of groundwater to Newman Creek.

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3.4 WESTON INVESTIGATION

3.4.1 Purpose and Scope

The purpose of WESTON's investigation was to further assess the nature and extent of subsurface contamination beneath the lagoon and to establish a compliance monitoring network for the lagoon closure. To accomplish this, soil samples from six soil borings in the bottom of the lagoon and three soil borings along the side slopes were collected for chemical analysis and lithologic description. Based on previous wastestream characterizations and lagoon investigations, the WESTON investigation focused on heavy metal and VOCs. In addition, five monitoring wells and one piezometer were installed around the perimeter of the lagoon. Groundwater samples and water levels have been collected in five monitoring wells quarterly from May of 1989 to the present. These activities are further detailed in the following subsections.

3.4.2 Field Investigation Activities

3.4.2.1 Lagoon Soil Boring Program

To sufficiently characterize the sludge/sediment and subsurface material within the lagoon, nine test borings were completed using a hollow-stem auger rig. Appendix E contains the soil boring logs for these nine test borings.

Six borings were drilled to 16 ft below ground surface or until auger refusal in the bottom of the lagoon. The bottom soil borings (BSB) were approximately located on two perpendicular lines with the lateral line located at the former lagoon outfall and running approximately north to south, as shown in Figure 3-3. Each bottom soil boring was continuously sampled with a 2-ft split-spoon sampler, and a maximum of eight samples per boring were collected. Each sample was analyzed for total metals and cyanide. Four of these samples (the first, third, fifth, and eighth samples) were also analyzed for VOCs.

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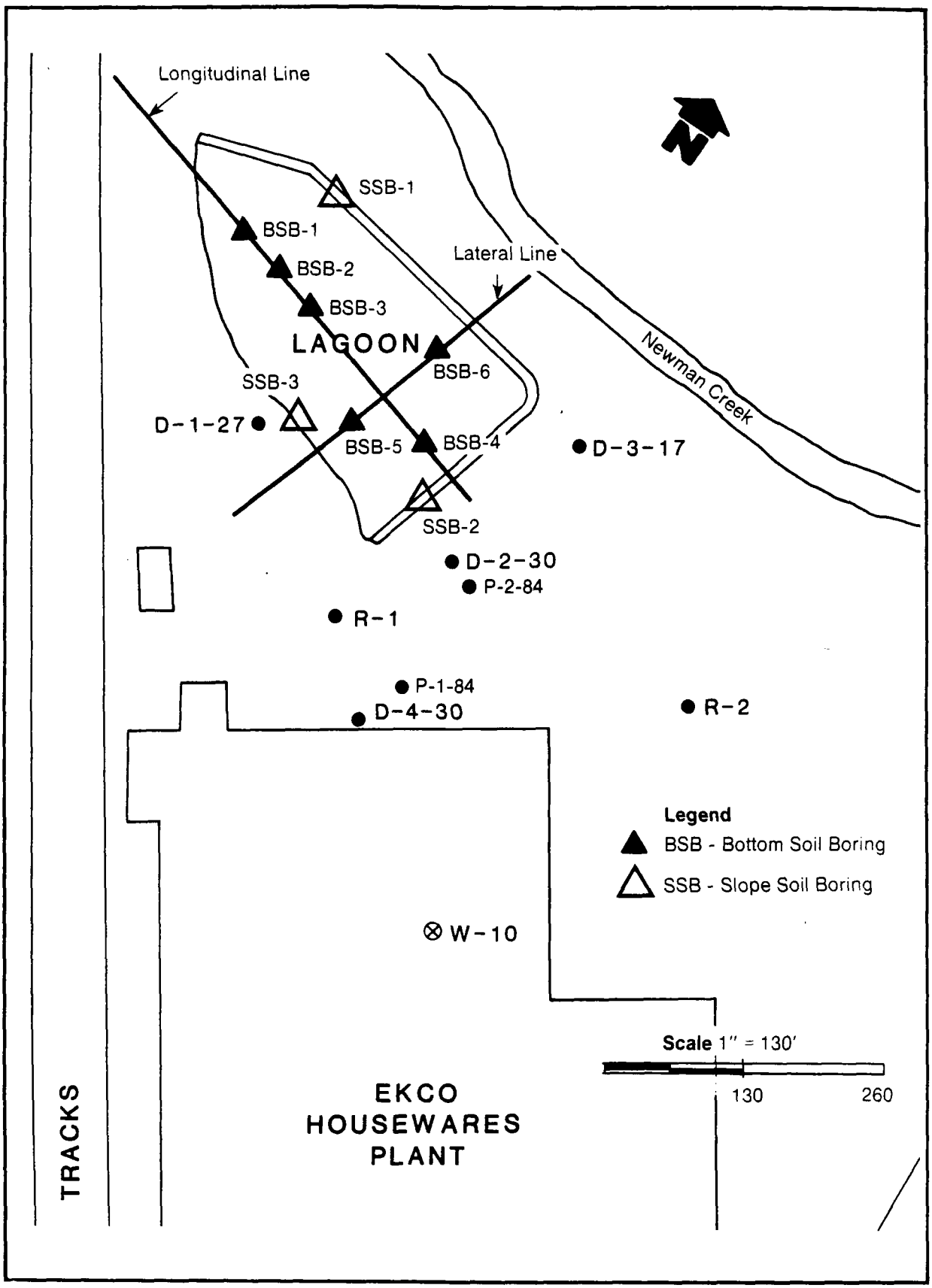

FIGURE 3-3 LOCATIONS OF LAGOON SOIL BORINGS
EKCO HOUSEWARES, INC., MASSILLON, OHIO

The remaining three borings were slope soil borings (SSB) and were drilled, when possible, to a depth of 6 ft below ground surface on the encircling berm and embankment. Since the lagoon is roughly triangular in plan view, the three slope soil borings were located as follows: one on the northern berm, one on the eastern berm, and one on the natural embankment that forms the southwest boundary. Continuous split-spoon samples were taken from each slope soil boring except for SSB-3, which was hand sampled because the area was inaccessible to the drill rig. Samples from the first and last spoon sample of each slope soil boring were analyzed for VOCs. Total metal and cyanide analyses were performed on all samples.

Prior to the start of drilling at each location all downhole equipment was decontaminated using a steam cleaner. Between each split-spoon sample, the split-spoon sampler was washed in a solution of Alconox and tap water followed by a tap water rinse.

Following completion of the soil borings, the pilot holes were grouted, and the ground surface elevation at all locations were surveyed relative to mean sea level. These data are included in the soil boring logs found in Appendix E.

3.4.2.2 Groundwater Monitoring Well Installation

In order to establish a groundwater monitoring system that can adequately monitor the groundwater beneath the surface impoundment, five monitoring wells and one piezometer were installed at the locations shown in Figure 3-4. Four downgradient wells (L-1, L-2, L-4, and L-5) were installed in order to monitor the contaminant migration toward Newman Creek and the Tuscarawas River. One upgradient well (L-3) was installed to provide background groundwater quality data. One piezometer (P-5) was installed adjacent to L-2 to assess whether two hydrologic zones existed in the subsurface soil surrounding the lagoon. These wells serve as replacements for the existing D-wells (shallow monitoring wells). The D-wells are not adequate monitoring points because of their inner diameter (2-inch) and possible inadequate development procedures (each contain large amounts of sediment). However, because of the location and past sampling results, monitoring well D-4-30 will

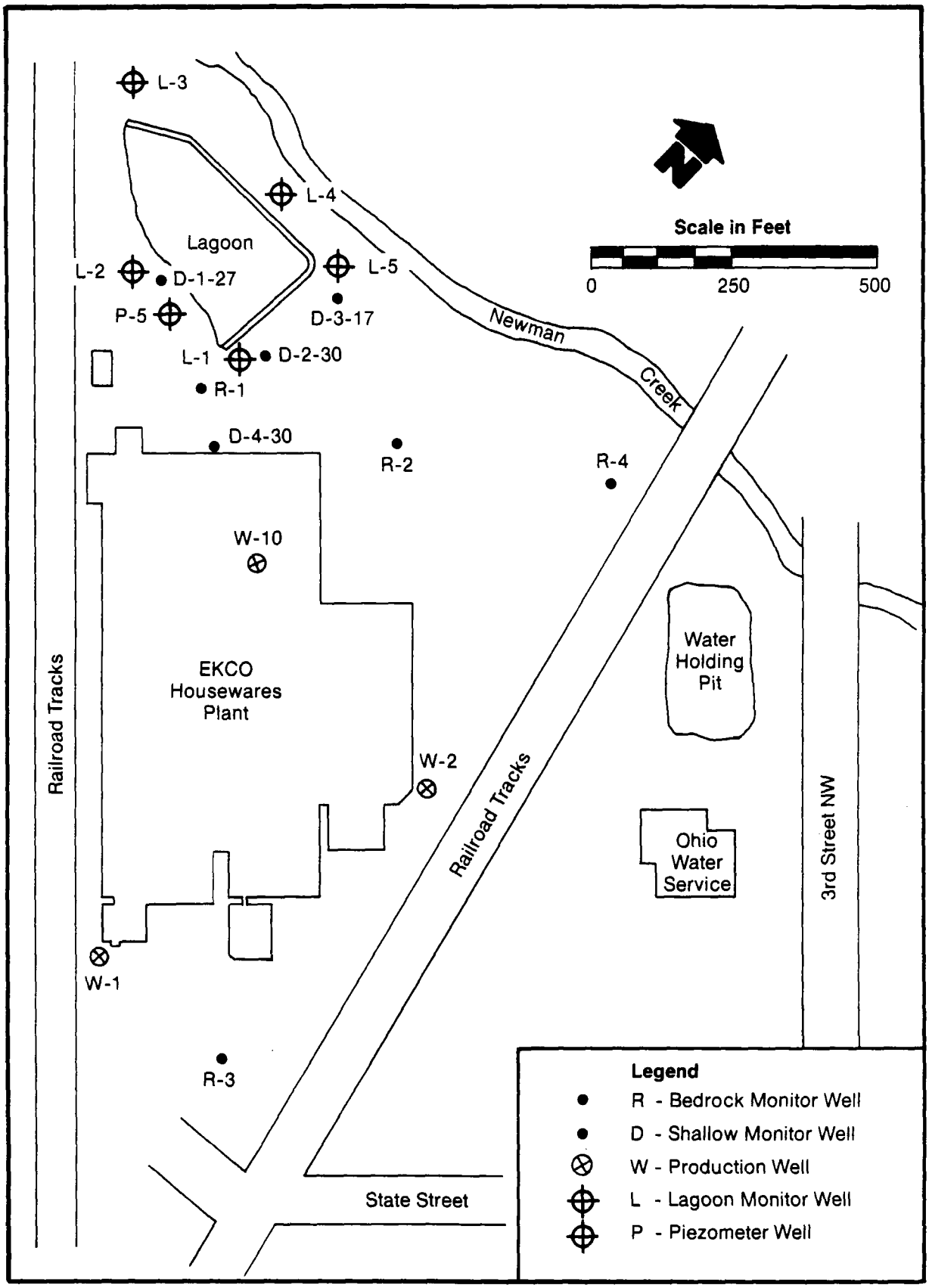

FIGURE 3-4 LOCATIONS OF NEW AND EXISTING MONITORING WELLS AT EKCO HOUSEWARES, INC., MASSILLON, OHIO

continue to be a groundwater quality monitoring point and will be sampled at the same frequency as the new monitoring wells. The remaining D-wells will be used solely to monitor groundwater levels.

Prior to the start of drilling activities, the new well locations were staked, cleared of underground obstructions and utilities, and then approved by representatives of EKCO. Also, prior to and in between drilling, all downhole equipment (the augers, drilling rods, rig tools, and split-spoon samplers) were decontaminated using a steam cleaner. Split-spoon samplers were cleaned between samples in an Alconox and tap water solution followed by a tap water rinse.

The monitoring wells are constructed of 10 ft of 4-inch-diameter wound wire type 304 stainless steel screen, low carbon steel riser pipe, and a protective black iron surface casing with lockable lid. The screens were installed approximately 10 ft into the first water-bearing zone. The piezometer is constructed of 5 ft of 2-inch 10-slot PVC screen, schedule 40 PVC riser pipe, and a protective black iron surface casing with lockable lid. The screen was installed 15 ft into the first water-bearing zone.

At the bottom of each borehole, the well screen and riser were installed and the augers withdrawn to the top of the screen. Silica sand was used, when necessary, to fill the annular space after the augers were withdrawn. When plumbing the hole indicated that the sand pack was at the desired height (approximately 2 to 5 ft above the screen), a 2-ft bentonite pellet seal was installed. The wells were completed by gravity feeding a neat cement mixture into the remaining annular space as the augers were gradually withdrawn to ensure that no collapse of the borehole occurred. The upper 2.5 ft of annular space was then filled with a cement/sand mixture and a protective casing was installed.

Each well was developed by airlifting or bailing until at least five well volumes were removed. Each well did not maintain a sufficient head, went dry, and was slow or very slow to recover. All purge water was collected in a tank and was taken to the on-site air stripper for processing and discharge.

All data were recorded on well construction summary forms and are presented in Appendix F. Well construction details are presented in Table 3-6.

Subsequent to well installation and development, the top of casing and surface elevations were surveyed relative to mean sea level to the nearest 0.01 ft and water level measurements were collected (see Table 3-6). Groundwater samples and water levels have been collected from these wells quarterly from May 1989 to the present.

3.4.3 Results

3.4.3.1 Sludge/Subsurface Soil

The boring logs in Appendix E indicate that the sediments beneath and surrounding the lagoon are both variable and irregular. Cross section A-A′ (line runs south to north across the lagoon and is shown in Figure 3-5) is illustrated in Figure 3-6, which shows that up to 10 ft of sludge or soil displaying the characteristics of the sludge are at the bottom of the lagoon. The southern embankment of the lagoon is comprised of up to 23 ft of fill material consisting of sand, gravel, clay, silt, wood chips, and cinders. The northern berm of the lagoon was constructed of clay, sand, sandy silt, and silt and gravel. Underlying these are undisturbed sediments consisting of fine- to medium-grained sand and gravel that grades into a silty sand and silt. Beneath this is bedrock.

Cross section B-B′, illustrated in Figure 3-7 (line runs west to east across the lagoon and is shown in Figure 3-5), shows that up to 10 ft of sludge or soils displaying the characteristics of sludge overlies a 1- to 4-ft thick clay layer. The clay layer thins to the southeastern corner of the lagoon and is not present at soil boring BSB-5. This clay layer is also observed in cross section A-A′. However, it is not as defined. Beneath the clay layer are sediments typical of glacial outwash sediments, which consist of sand, sandy silts, some gravel, and clay. The bedrock beneath the undisturbed sediments appears to dip to the east and southeast.

Table 3-6

Well Construction Summary

Well	Total Depth (ft bgs)	Screened Interval (ft)	Depth to Water* (from top of casing, ft)	Well Head Elevation (ft above MSL)	Groundwater Elevation (ft above MSL)
L-1	40	39.5 to 29.5	26.27	946.25	919.98
L-2	25	25 to 15	20.58	947.48	926.90
L-3	20	19.5 to 9.5	18.19	946.78	928.59
L-4	16	16 to 6	9.42	938.11	928.69
L-5	27	24 to 14	8.33	936.86	928.53
P-5	33	33 to 27	24.73	948.34	923.61

*Depth to water measured on 12 July 1988.
Note: bgs = below ground surface; MSL = mean sea level.

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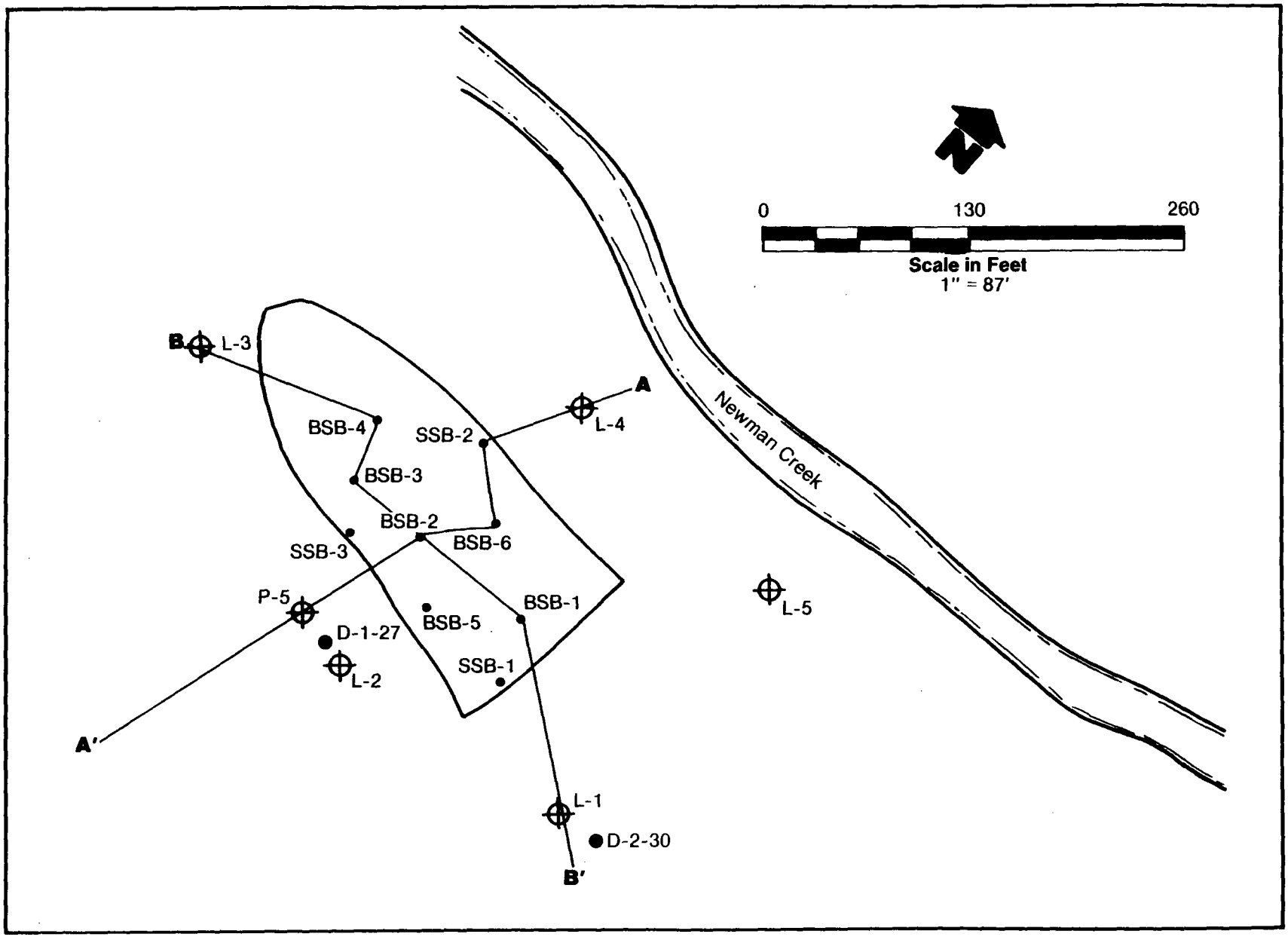

FIGURE 3-5 CROSS SECTION LINES A-A' AND B-B' THROUGH THE LAGOON

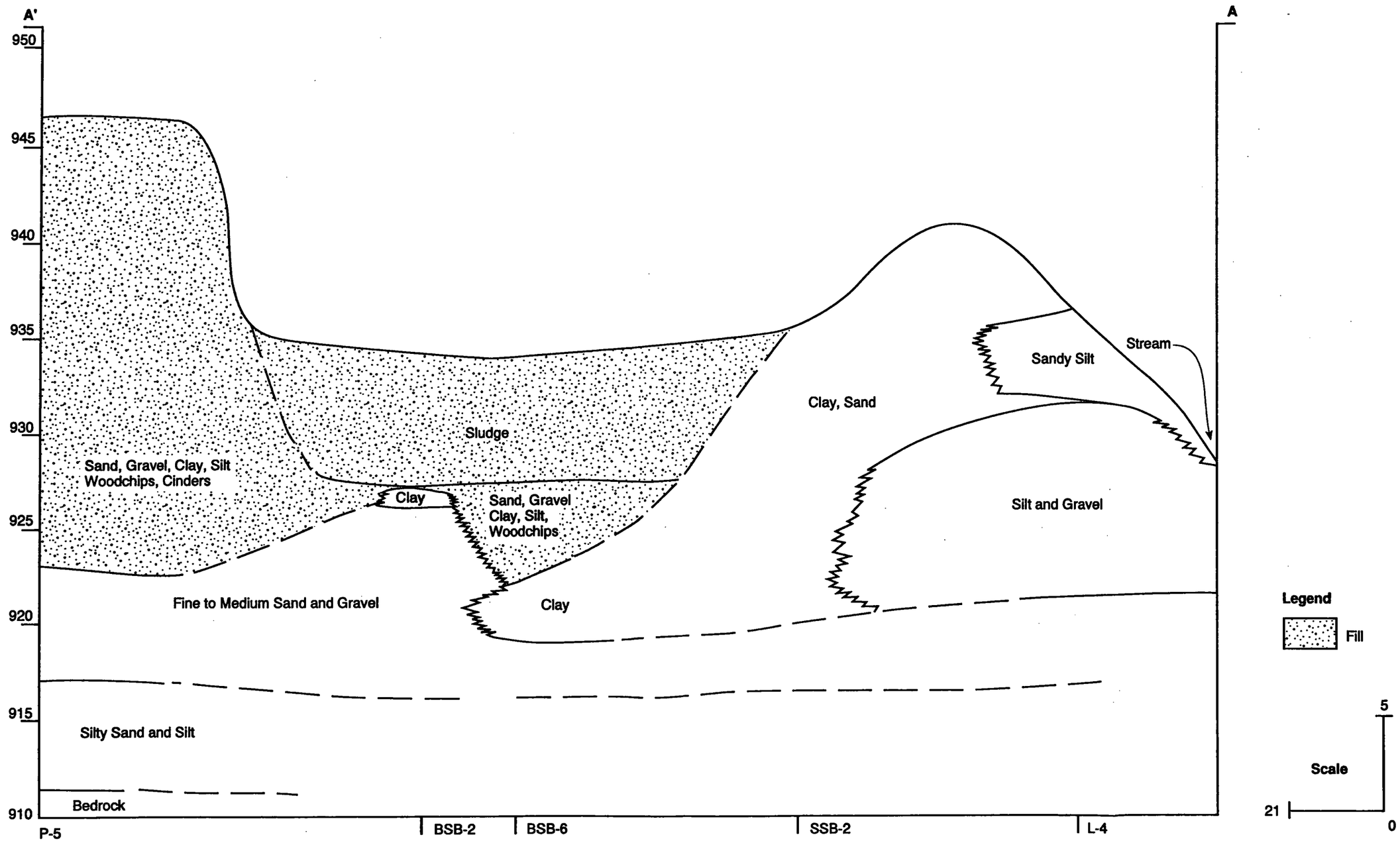

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FIGURE 3-6 CROSS SECTION A-A' THROUGH THE LAGOON

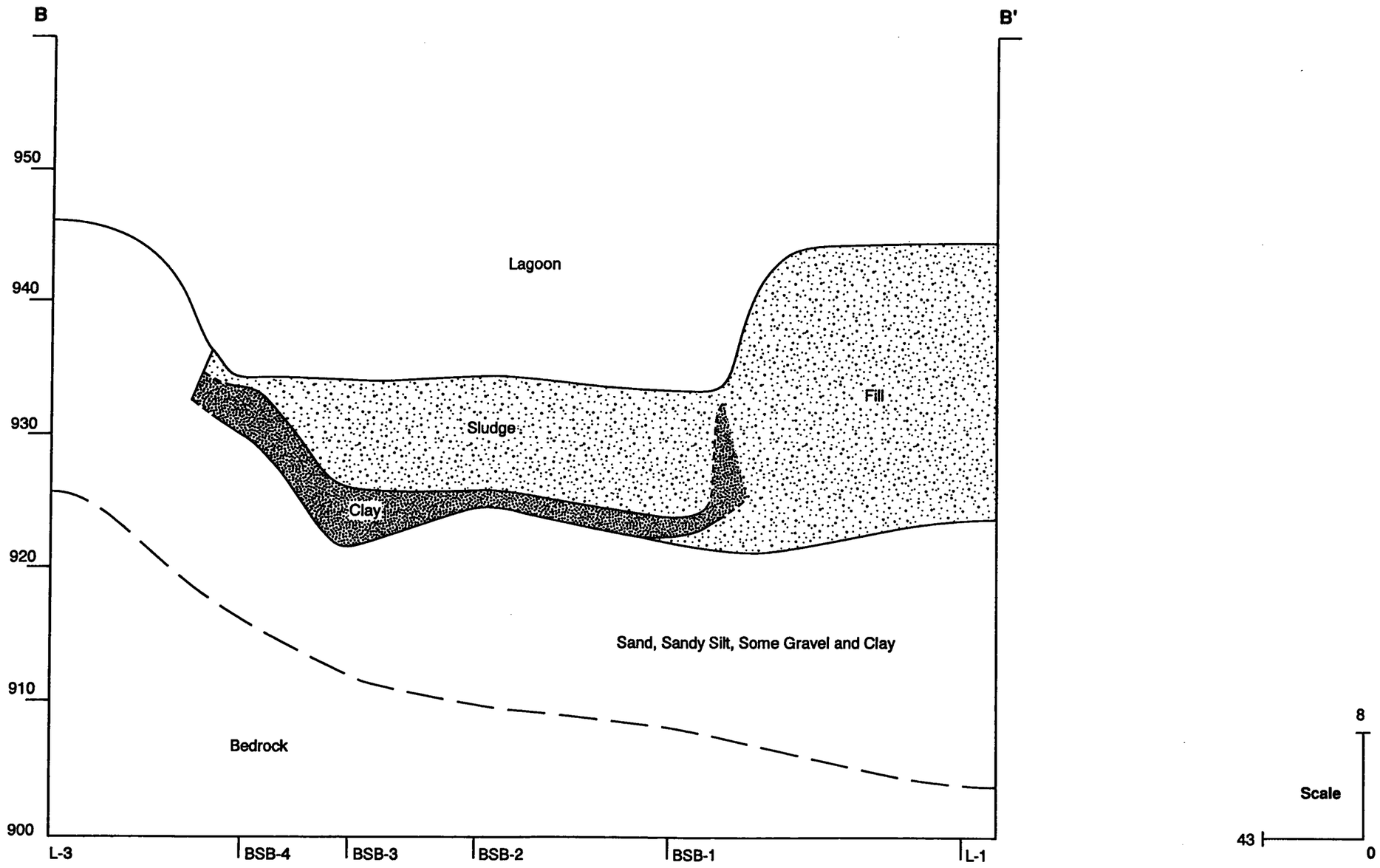

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FIGURE 3-7 CROSS SECTION B-B' THROUGH THE LAGOON

3.4.3.2 Groundwater Elevations

Groundwater elevation measurements have been taken in the L-wells quarterly from May 1989 to the present. The groundwater elevations for 1989 and 1990 are listed in Table 3-7.

Groundwater elevation contour maps for each are shown in Figures 3-8 through 3-14. These figures show that the shallow groundwater gradient in the area of the lagoon is to the southeast, which is toward the site production well W-10.

3.4.3.3 Analytical Data

The inorganic analyses from the soil boring samples in the lagoon (see Appendix G for the laboratory analytical data) show that high concentrations of chromium, cadmium, and lead were present in the samples. Table 3-8 summarizes these data.

The volatile organic analyses from the soil borings (see Appendix G for the laboratory analytical data) indicated that 14 parameters were detected. These results are summarized in Table 3-9.

The L-wells were sampled for dissolved metals and VOCs. The results for the 1989 and 1990 sampling are listed in Table 3-10. Total dissolved metals concentrations ranged from nondetected (ND) to 0.2432 mg/L. The VOCs commonly detected were TCE, 1,1,1-TCA, 1,2-DCE, 1,1-DCA, and vinyl chloride. The two wells with the highest concentrations of VOCs were wells L-2 and L-5 with average concentrations of 244 and 205 ppb, respectively. Concentrations in wells L-1 and L-4 averaged 176 and 54 ppb, respectively. Well L-3 had 1 to 2 ppb of methylene chloride.

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Table 3-7

L-Well Groundwater Surface Elevations (MSL)

Well I.D.	2nd Quarter 5/10/89	3rd Quarter 8/10/89	4th Quarter 11/14/89	1st Quarter 2/8/90	2nd Quarter 5/8/90	3rd Quarter 8/9/90	4th Quarter 11/9/90
(DN) L-1	919.80	920.16	920.33	924.73	921.30	923.08	425.00
(DN) L-2	930.57	929.12	929.57	930.57	931.90	930.89	932.13
(DN) L-4	929.97	928.97	929.22	929.62	929.44	929.47	929.79
(DN) L-5	930.08	928.40	928.98	928.95	929.18	928.92	929.31
(UP) L-3	931.66	929.41	929.91	932.66	931.81	931.66	932.09

Notes: (DN) indicates a downgradient well.
(UP) indicates an upgradient well.

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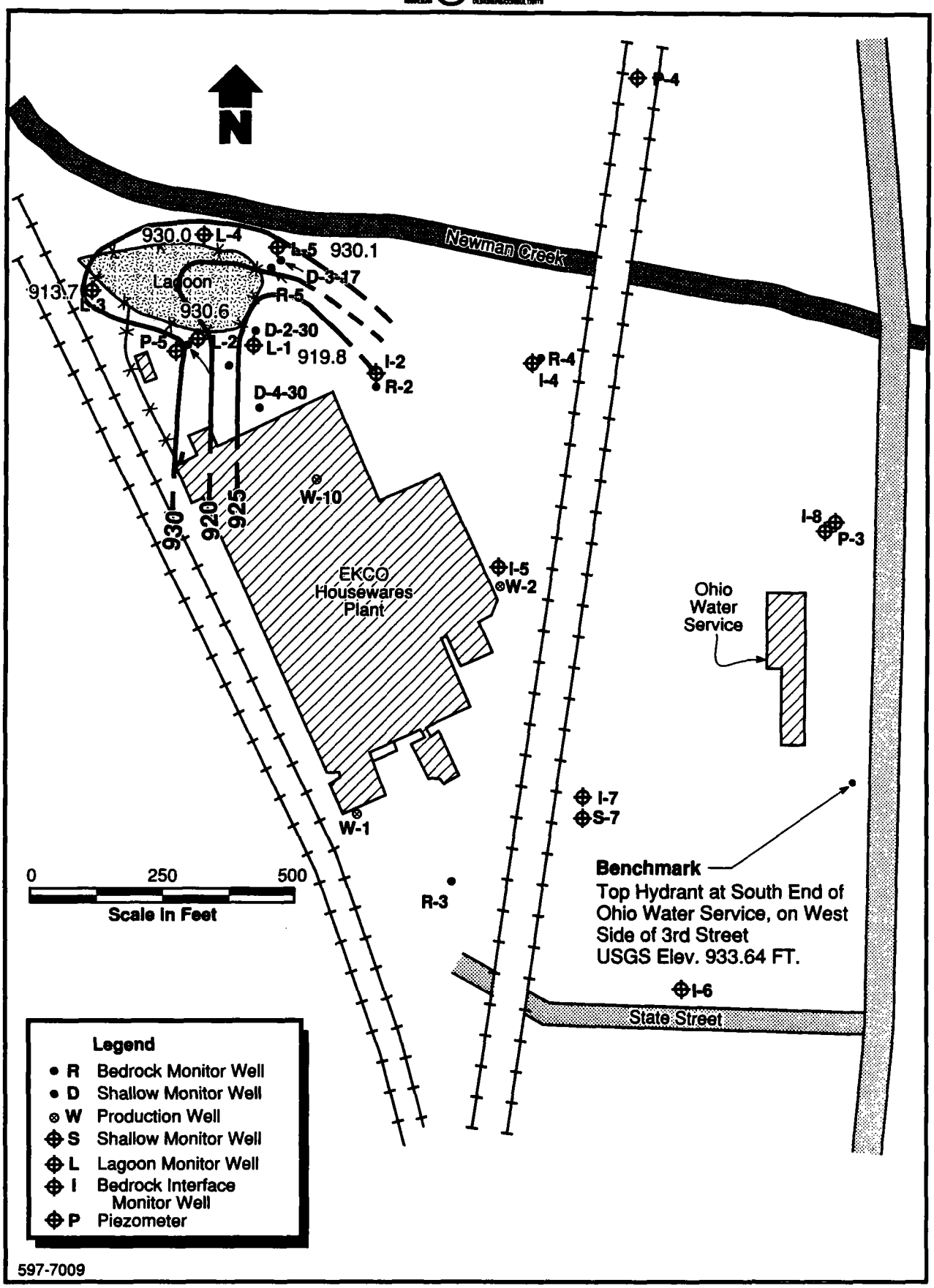

FIGURE 3-8 L-WELL GROUNDWATER MAP WATER LEVELS MEASURED 5/10/89

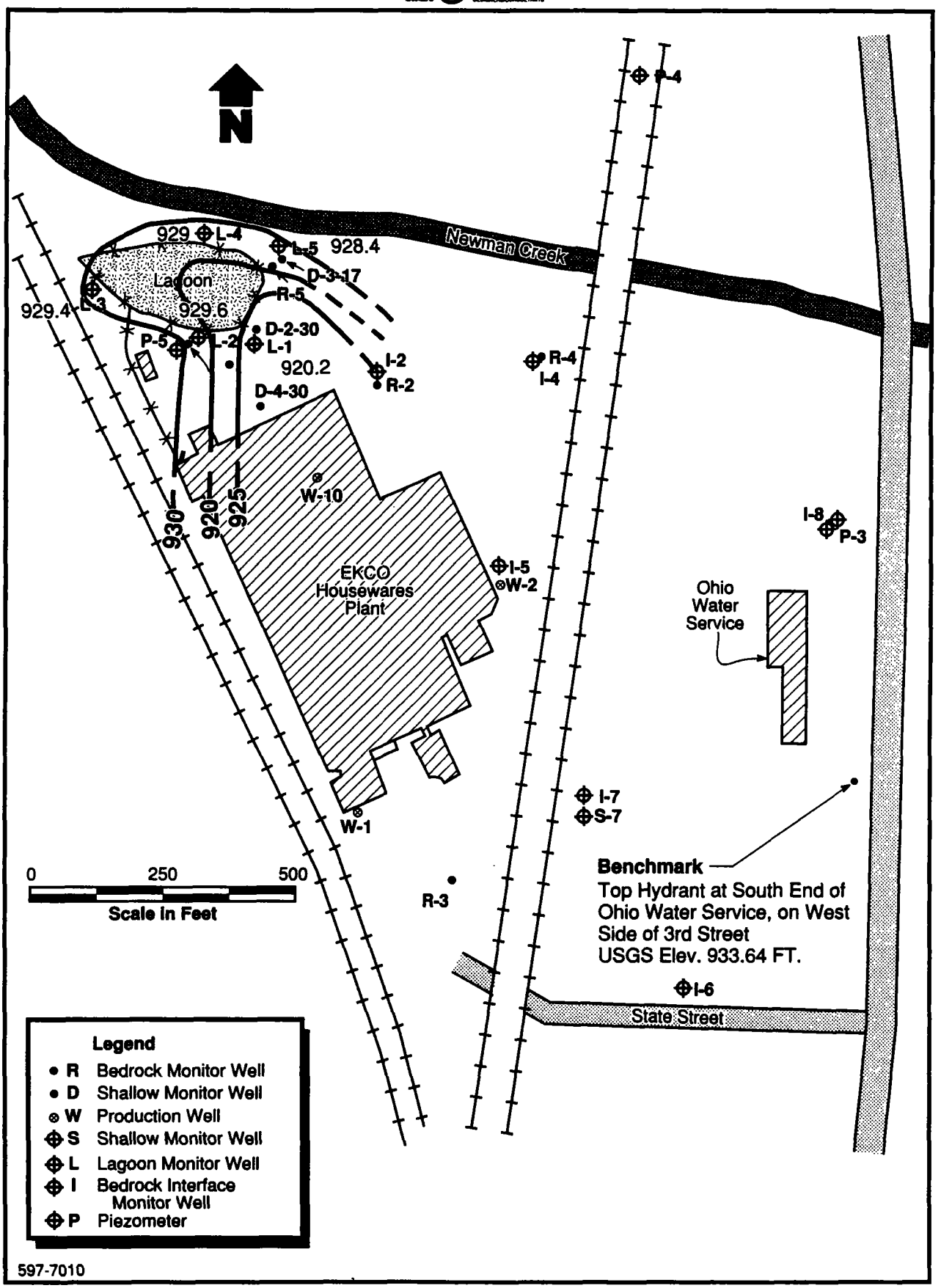

FIGURE 3-9 L-WELL GROUNDWATER MAP WATER LEVELS MEASURED 8/10/89

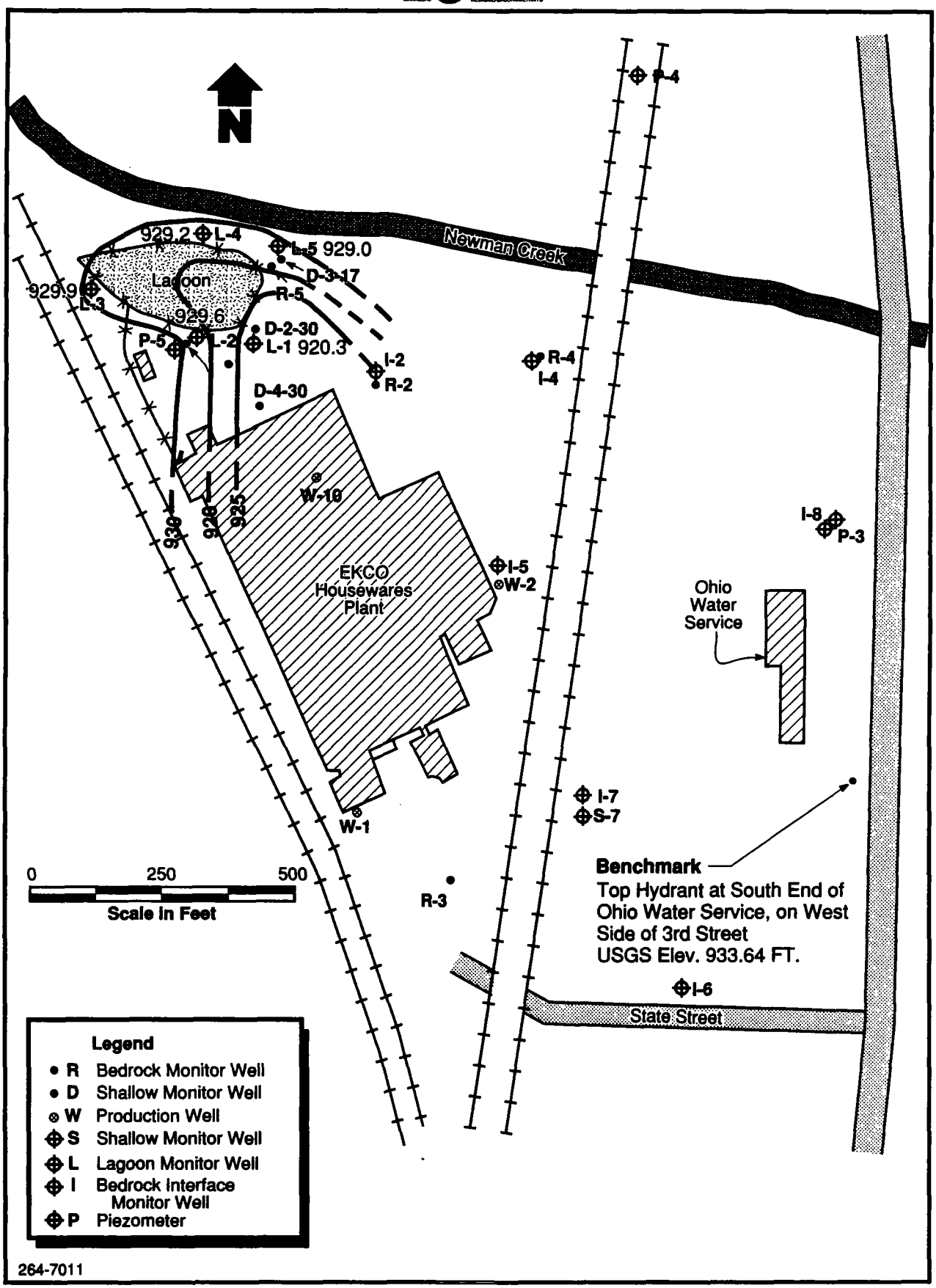

FIGURE 3-10 L-WELL GROUNDWATER MAP WATER LEVELS MEASURED 11/14/89

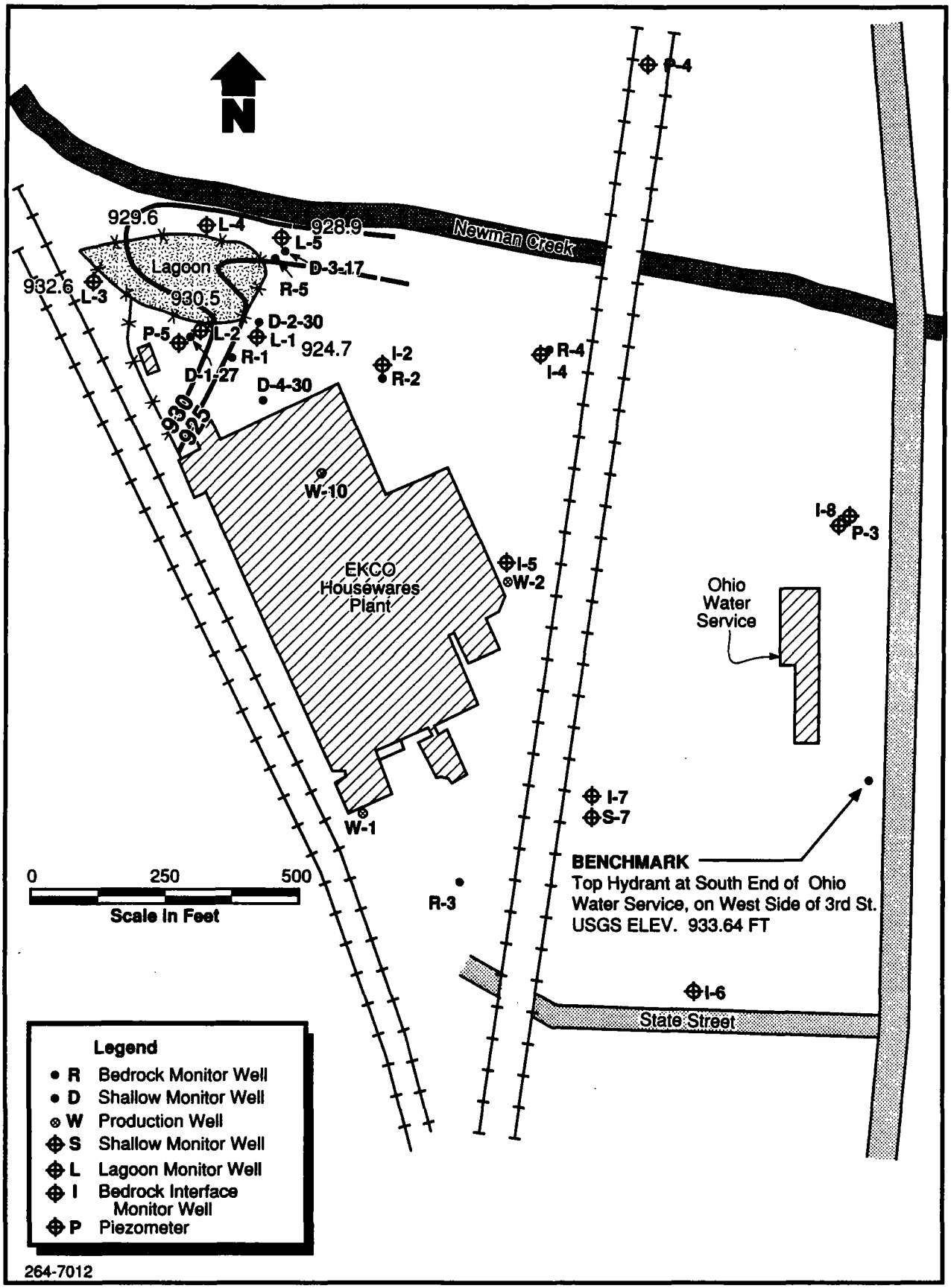

FIGURE 3-11 L-WELL GROUNDWATER MAP WATER LEVELS MEASURED 2/8/90

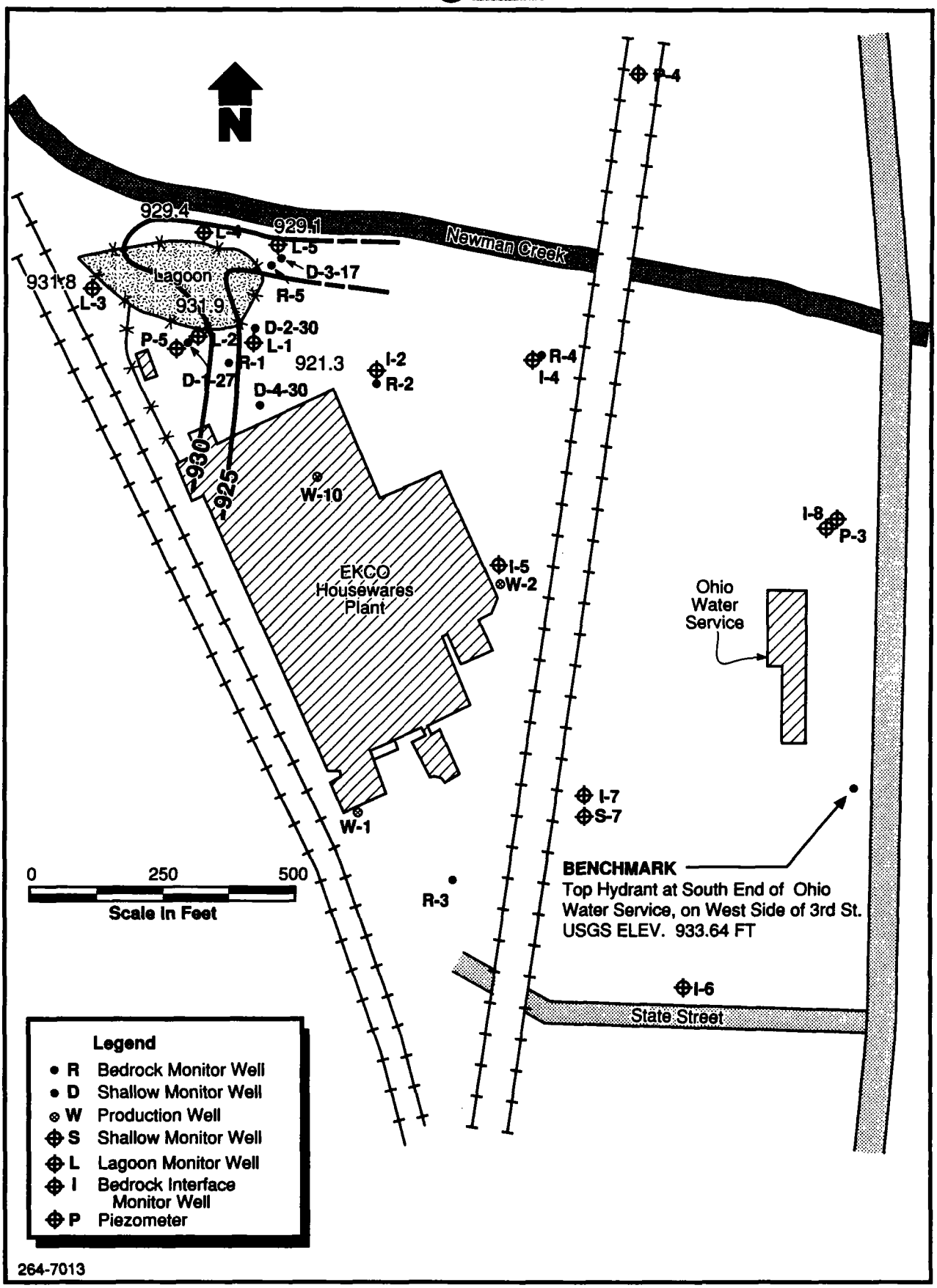

FIGURE 3-12 L-WELL GROUNDWATER MAP WATER LEVELS MEASURED 5/8/90

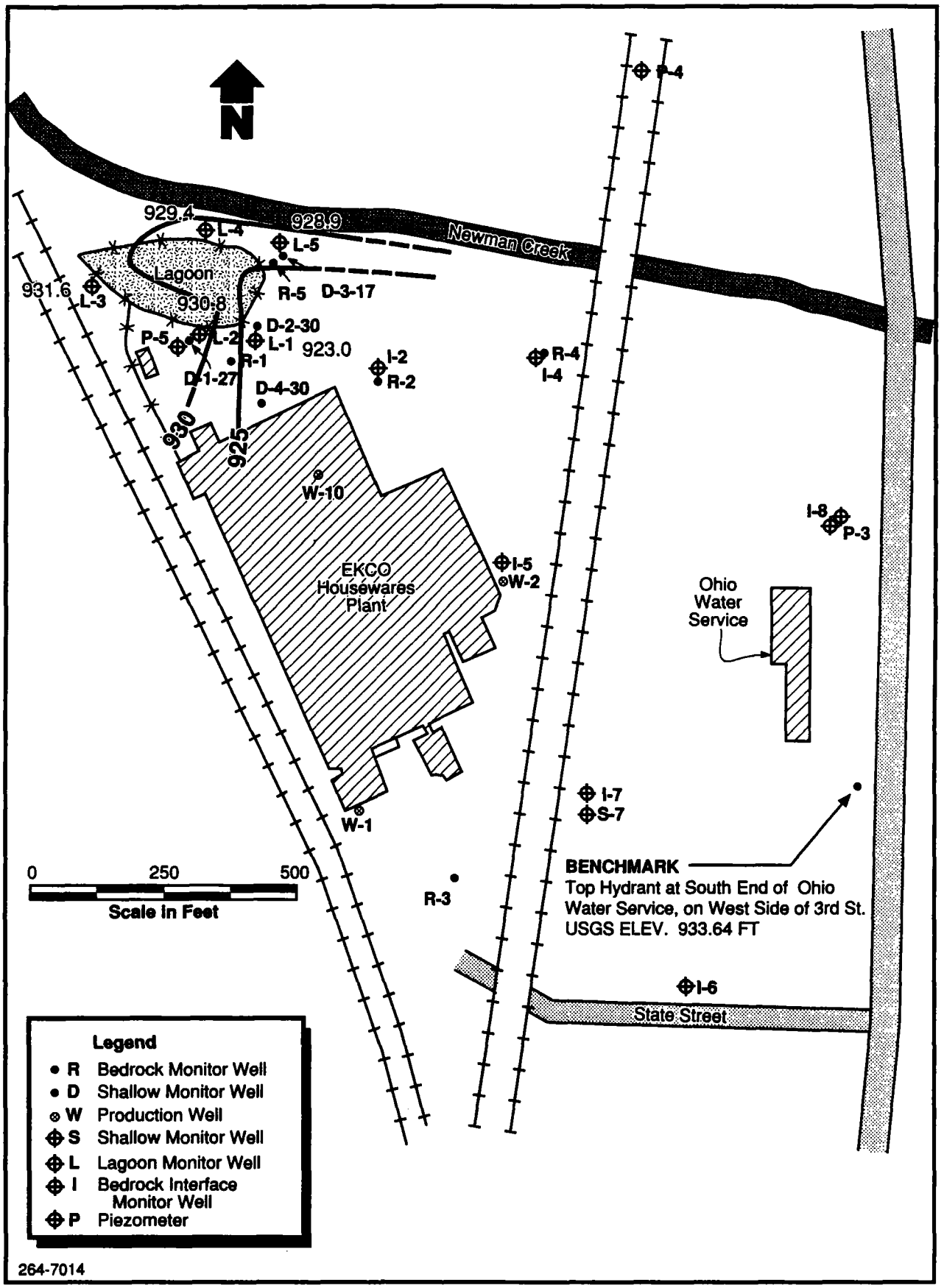

FIGURE 3-13 L-WELL GROUNDWATER MAP WATER LEVELS MEASURED 8/9/90

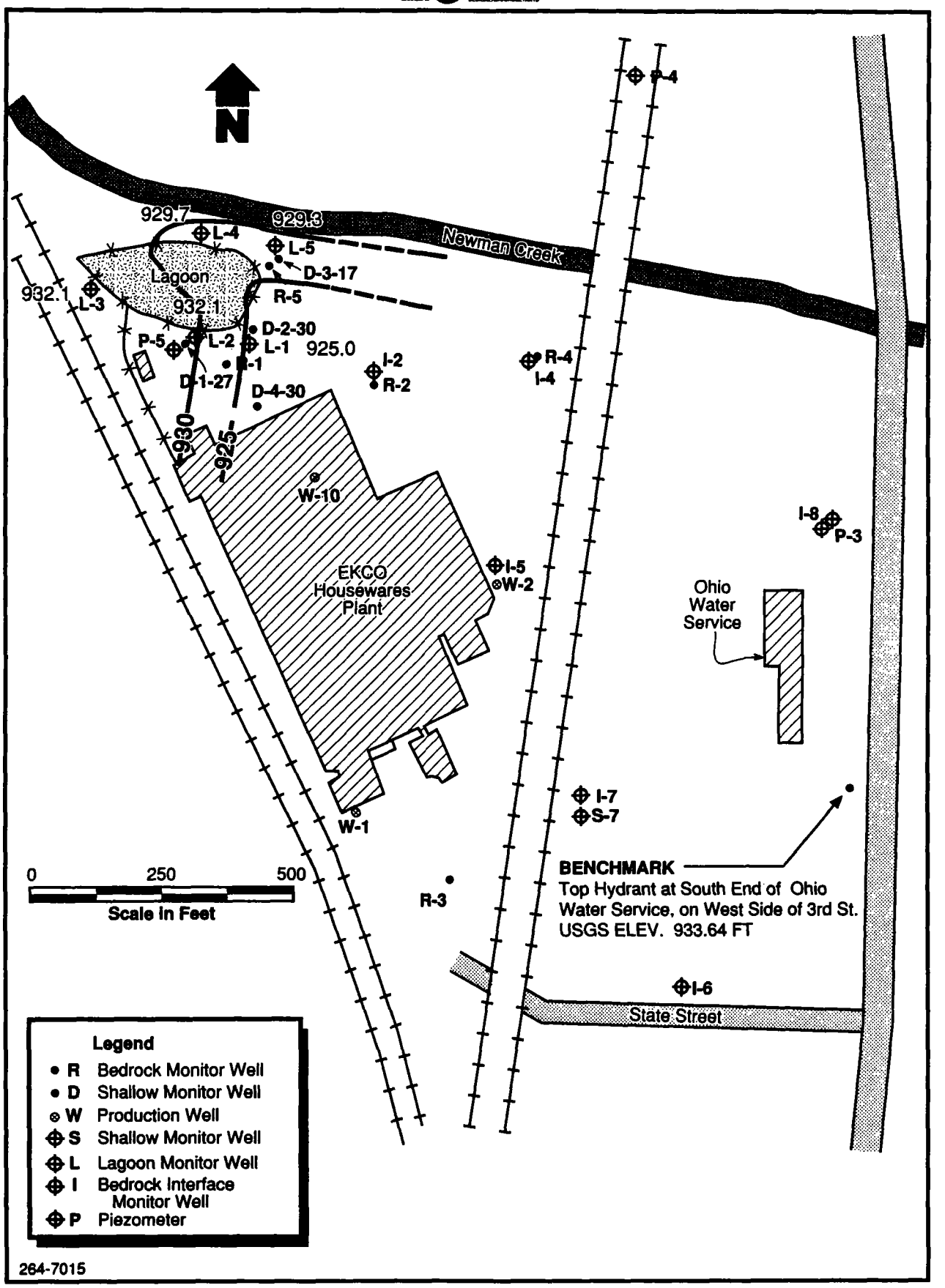

FIGURE 3-14 L-WELL GROUNDWATER MAP WATER LEVELS MEASURED 11/9/90

Table 3-8

Summary of Concentrations of Cadmium, Chromium, and Lead in Lagoon Soil Borings

Sample	Depth (ft)	Parameters*		
		Cadmium	Chromium	Lead
SSB-1				
1R	0 - 2	1,680	880	6,100
2R	2 - 4	3.26	414	55
3R	4 - 6	2.58	235	20
SSB-2				
1R	0 - 2	188	121	1,300
2R	2 - 4	77.2	53.8	320
3R	4 - 6	7.78	23.6	150
SSB-3				
1R	0 - 2	1,580	354	8,600
2R	2 - 4	1.29	93.0	170
BSB-1				
1R	0 - 2	19.2	262	900
2R	2 - 4	9.13	103	72
3R	4 - 6	6.73	17.0	38
4R	6 - 8	215	295	860
5R	8 - 10	16.1	61.5	91
6R	10 - 12	0.789	4.74	42
6RD	10 - 12	0.563	5.55	42
BSB-2				
1R	0 - 2	1,370	405	5,100
2R	2 - 4	6.10	11.8	42
2RD	2 - 4	6.04	13.5	43
3R	4 - 6	136	70.4	760
4R	6 - 8	<0.381	8.92	20
5R	8 - 10	84.6	8.72	320
6R	10 - 12	11.1	7.15	58
7R	12 - 14	2.70	7.60	33
7RD	12 - 14	3.46	8.30	32
8R	14 - 16	<0.396	6.81	36
BSB-3				
1R	0 - 2	18.9	152	990
2R	2 - 4	1.24	384	36
3R	4 - 6	1.21	527	43
4R	6 - 8	3,790	264	13,000
5R	8 - 10	<0.369	6.55	36
5RD	8 - 10	5.62	11.3	52
6R	10 - 12	5.23	11.6	39
7R	12 - 14	8.06	15.2	56
8R	14 - 16	2.27	4.44	16
8RD	14 - 16	0.728	5.16	13

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Table 3-8

Summary of Concentrations of Cadmium, Chromium, and Lead in Lagoon Soil Borings (continued)

Sample	Depth (ft)	Parameters*		
		Cadmium	Chromium	Lead
BSB-4				
1R	0 - 2	369	169	1,400
2R	2 - 4	<0.371	4.52	22
3R	4 - 6	51.8	54.5	570
4R	6 - 8	1,560	354	93
5R	8 - 10	13.4	16.0	93
6R	10 - 12	–	–	–
7R	12 - 14	<0.375	10.2	39
8R	14 - 16	8.52	11.4	36
BSB-5				
1R	0 - 2	8,320	400	19,000
2R	2 - 4	7,055	230	24,000
2RD	2 - 4	7,110	226	25,000
3R	4 - 6	262	923	1,100
4R	6 - 8	725	482	6,100
5R	8 - 10	0.460	8.43	22
5RD	8 - 10	1.14	19.6	18
6R	10 - 12	0.941	8.70	22
7R	12 - 14	3.80	24.0	40
8R	14 - 16	14.3	20.9	70
BSB-6				
1R	0 - 2	517	188	2,400
2R	2 - 4	3.52	8.43	29
3R	4 - 6	13.4	14.1	71
4R	6 - 8	5,400	743	18,000
5R	8 - 10	53.4	12.6	180
6R	10 - 12	8.43	6.10	52
7R	12 - 14	19.5	12.3	79
8R	14 - 16	5.23	8.57	42

*Concentrations presented in parts per million.

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Table 3-9

Summary of Volatile Organic Compounds Present in Lagoon Soil Borings*

Depth (ft)	0 - 2	4 - 6	8 - 10
Sample No.	1R	3R	5R
Boring BSB-1			
Vinyl Chloride	BDL	BDL	BDL
Methylene Chloride	30B	14B	6B
Acetone	10B	11B	29B
Carbon Disulfide	4J	BDL	BDL
1,1-Dichloroethane	2J	2J	8
1,2-Dichloroethene (total)	7	3J	BDL
2-Butanone	4J	5J	10
1,1,1-Trichloroethane	BDL	BDL	BDL
Trichloroethene	10	6	BDL
Benzene	BDL	1JB	BDL
Toluene	BDL	BDL	BDL
Chlorobenzene	BDL	BDL	BDL
Ethylbenzene	BDL	BDL	BDL
Xylene	BDL	BDL	BDL

Depth (ft)	0 - 2	4 - 6	8 - 10	12 - 14
Sample No.	1R	3R	5R	8R
Boring BSB-2				
Vinyl Chloride	BDL	BDL	BDL	BDL
Methylene Chloride	30B	4JB	3JB	1JB
Acetone	37B	64B	22B	13B
Carbon Disulfide	BDL	2J	BDL	BDL
1,1-Dichloroethane	BDL	13	BDL	10
1,2-Dichloroethene (total)	44	BDL	BDL	BDL
2-Butanone	11	16	6J	6J
1,1,1-Trichloroethane	BDL	BDL	BDL	BDL
Trichloroethene	64	9	8	5
Benzene	BDL	BDL	BDL	BDL
Toluene	BDL	1J	1J	BDL
Chlorobenzene	BDL	BDL	BDL	BDL
Ethylbenzene	BDL	2J	BDL	BDL
Xylene	BDL	3J	BDL	BDL

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Table 3-9

Summary of Volatile Organic Compounds Present in Lagoon Soil Borings* (continued)

Depth (ft)	0 - 2	4 - 6	8 - 10	8 - 10	14 - 16
Sample No.	1R	3R	5R	5D	8R
Boring BSB-3					
Vinyl Chloride	37	1J	9J	BDL	BDL
Methylene Chloride	5B	7B	9	3J	6
Acetone	190B	44B	12B	34B	23B
Carbon Disulfide	4J	2J	5	BDL	BDL
1,1-Dichloroethane	BDL	10	5	BDL	BDL
1,2-Dichloroethene (total)	80	3J	140	3J	6
2-Butanone	82	13	5JB	7JB	8JB
1,1,1-Trichloroethane	2J	BDL	BDL	BDL	BDL
Trichloroethene	12	15	13	5	12
Benzene	BDL	BDL	BDL	BDL	BDL
Toluene	2J	3J	BDL	BDL	BDL
Chlorobenzene	BDL	BDL	BDL	BDL	BDL
Ethylbenzene	BDL	BDL	BDL	BDL	BDL
Xylene	BDL	BDL	BDL	BDL	BDL

Depth (ft)	0 - 2	4 - 6	8 - 10	12 - 14
Sample No.	1R	3R	5R	8R
Boring BSB-4				
Vinyl Chloride	BDL	BDL	8J	BDL
Methylene Chloride	11	1J	2J	8
Acetone	86B	48B	8JB	22B
Carbon Disulfide	BDL	BDL	1J	BDL
1,1-Dichloroethane	5	10	BDL	4J
1,2-Dichloroethene (total)	22	6	130	120
2-Butanone	20	12B	4JB	6JB
1,1,1-Trichloroethane	BDL	BDL	BDL	BDL
Trichloroethene	10	3J	3J	140
Benzene	BDL	BDL	BDL	BDL
Toluene	2J	BDL	BDL	1J
Chlorobenzene	BDL	BDL	BDL	BDL
Ethylbenzene	BDL	BDL	BDL	BDL
Xylene	BDL	BDL	BDL	BDL

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Table 3-9

Summary of Volatile Organic Compounds Present in Lagoon Soil Borings* (continued)

Depth (ft)	0-2	4-6	8-10	8-10	14-16
Sample No.	1R	3R	5R	5D	8R
Boring BSB-5					
Vinyl Chloride	BDL	7J	BDL	BDL	BDL
Methylene Chloride	18B	10B	7B	7B	5B
Acetone	28B	45B	47B	67B	13B
Carbon Disulfide	3J	BDL	BDL	BDL	BDL
1,1-Dichloroethane	40	25	4J	BDL	13
1,2-Dichloroethene (total)	20	BDL	7	BDL	24
2-Butanone	BDL	11	BDL	11	4J
1,1,1-Trichloroethane	BDL	BDL	2J	BDL	BDL
Trichloroethene	29	5	7	BDL	85
Benzene	BDL	BDL	BDL	BDL	BDL
Toluene	BDl	BDL	1J	BDL	BDL
Chlorobenzene	5	BDL	BDL	BDL	BDL
Ethylbenzene	BDL	BDL	BDL	BDL	BDL
Xylene	BDL	BDL	BDL	BDL	BDL
	BDL	4J	BDL	BDL	BDL

Depth (ft)	0-2	4-6	8-10	12-14
Sample No.	1R	3R	5R	8R
Boring BSB-6				
Vinyl Chloride	BDL	BDL	BDL	BDL
Methylene Chloride	24B	20B	6B	8B
Acetone	23B	370B	21B	18B
Carbon Disulfide	BDL	4J	BDL	BDL
1,1-Dichloroethane	BDL	70	10	5
1,2-Dichloroethene (total)	44	8	2J	BDL
2-Butanone	10	110		4J
1,1,1-Trichloroethane	BDL	BDL	6J	BDL
Trichloroethene	13	12	BDL	3J
Benzene	BDL	BDL	3J	BDL
Toluene	BDL	3J	BDL	1J
Chlorobenzene	BDL	6	BDL	BDL
Ethylbenzene	BDL	2J	BDL	BDL
Xylene	BDL	BDL	BDL	BDL
			BDL	

Table 3-9

Summary of Volatile Organic Compounds Present in Lagoon Soil Borings* (continued)

Depth (ft)	0 - 2	4 - 6
Sample No.	1R	3R
Boring SSB-1		
Vinyl Chloride	BDL[3]	BDL
Methylene Chloride	10B[5]	5B
Acetone	8JB[4]	33B
Carbon Disulfide	BDL	BDL
1,1-Dichloroethane	BDL	1J
1,2-Dichloroethene (total)	BDL	BDL
2-Butanone	4J	7J
1,1,1-Trichloroethane	BDL	BDL
Trichloroethene	BDL	BDL
Benzene	BDL	BDL
Toluene	BDL	BDL
Chlorobenzene	BDL	BDL
Ethylbenzene	BDL	BDL
Xylene	BDL	BDL

Depth (ft)	0 - 2	4 - 6
Sample No.	1R	3R
Boring SSB-2		
	BDL[3]	BDL
Vinyl Chloride	18B[5]	11B
Methylene Chloride	9JB[4]	42B
Acetone	BDL	BDL
Carbon Disulfide	BDL	6
1,1-Dichloroethane	BDL	16
1,2-Dichloroethene (total)	3J	8J
2-Butanone	BDL	2J
1,1,1-Trichloroethane	2J	10
Trichloroethene	BDL	BDL
Benzene	BDL	1J
Toluene	BDL	BDL
Chlorobenzene	BDL	BDL
Ethylbenzene	BDL	BDL
Xylene		

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Table 3-9

Summary of Volatile Organic Compounds Present in Lagoon Soil Borings* (continued)

Depth (ft)	0 - 2
Sample No.	1R
Boring SSB-3	
Vinyl Chloride	BDL[3]
Methylene Chloride	15B[5]
Acetone	7JB[4]
Carbon Disulfide	BDL
1,1-Dichloroethane	BDL
1,2-Dichloroethene (total)	17
2-Butanone	5
1,1,1-Trichloroethane	4J
Trichloroethene	12
Benzene	BDL
Toluene	BDL
Chlorobenzene	BDL
Ethylbenzene	BDL
Xylene	BDL

*Compounds not listed were below detection limits.

Notes: Concentrations presented in parts per billion.
BDL = Below detection limit.
J = Present below detection limit.
B = Present in blank as well as the sample.

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Table 3-10

L-Well Analytical Results

Date	L-1	L-2	L-3	L-4	L-5	Total
5/11/89						
Total VOCs	229	173	ND	29	202	722
Total Dissolved Metals	ND	ND	ND	0.1615	0.063	0.2245
8/11/89						
Total VOCs	234.2	56	ND	129.4	257	676
Total Dissolved Metals	ND	ND	0.0046	0.12	ND	0.1246
11/14/89						
Total VOCs	257	42.9	1.0	95.7	120	516.6
Total Dissolved Metals	ND	ND	ND	0.121	.0635	0.1845
2/8/90						
Total VOCs	298	176	1	29	202	706
Total Dissolved Metals	0.0051	ND	ND	0.1684	.0654	0.2389
5/8/90						
Total VOCs	119	452	ND	33	155	759
Total Dissolved Metals	0.0173	ND	ND	0.165	0.0609	0.2432
8/9/90						
Total VOCs	122	198	2	78	236	636
Total Dissolved Metals	ND	ND	ND	0.132	0.0584	0.1904
11/9/90						
Total VOCs	166.7	151	ND	79	241	637.7
Total Dissolved Metals	0.0064	ND	ND	0.135	0.0647	0.2061

Notes: ND indicates none detected; VOCs measured in ppb; total dissolved metals measured in $\mu g/L$.

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3.5 NATURE AND EXTENT OF CONTAMINANTS OF CONCERN

This subsection will discuss the results presented in Subsection 3.4 and their effects on the closure of the surface impoundment. This discussion forms the technical basis for the selection of the appropriate closure methodology.

3.5.1 Description of Contaminants of Concern

The investigation performed by WESTON verified the presence of the contaminants found in the previous investigations performed at this site. The contaminants found during this study can be categorized into two subsets: organics and inorganics.

3.5.1.1 Organic Compounds

The VOCs found in the sludges and subsurface soils of the lagoon are present at very low concentrations. The maximum concentration of 140 ppb of TCE was detected. The concentrations of detected compounds presented in Table 3-9 of the previous subsection range from nondetectable to 140 ppb. The two compounds detected most frequently and with the highest concentrations are 1,2-dichloroethene and trichloroethene (TCE). The second most frequently detected compounds were 2-butanone and 1,1-dichloroethane. The frequencies at which the organic compounds were detected are presented in Table 3-11. Vinyl chloride and carbon disulfide were detected in less than 5% of the samples and, therefore, will be disregarded in accordance with EPA guidance. Benzene, toluene, xylene, and ethylbenzene (BTXE) were detected below 5 ppb.

The organic compounds detected in and beneath the lagoon represent residual concentrations of trace solvents that may have entered through the plant wastewater. The chlorinated hydrocarbons and 2-butanone are common industrial solvents. These compounds are characterized as being volatile and mobile. It should be noted that these compounds have been found in the groundwater beneath the site. The groundwater assessment being performed by WESTON will address the presence of these compounds. At this time, WESTON feels the lagoon is not the primary source of organic contaminants in the

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Table 3-11

Frequency of Detects of Organic Compounds in Sludges and Subsurface Soils

Compound	Number of Detects*	Total
Vinyl Chloride	1	26
Methylene Chloride	4	26
Carbon Disulfide	1	26
1,1-Dichloroethane	14	26
1,2-Dichloroethene (total)	16	26
2-Butanone	11	26
Trichloroethylene	20	26
Chlorobenzene	2	26

*Data do not include estimated values or those detects that were also detected in blanks.

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groundwater because the concentrations of the organic contaminants in other on-site monitoring wells (Table 3-12) are significantly higher than the concentrations in the lagoon wells (Table 3-10).

3.5.1.2 Inorganic Compounds

The analyses of the sludges and subsurface soils for the heavy metals indicate three metals are present in elevated concentrations in the sludge and some subsurface soils. These metals are cadmium, chromium, and lead as indicated by previous investigations of this lagoon. Cyanides were not observed above the analytical detection limit. These metals occur naturally in the environment and as different compounds or forms and may have varying mobility based on environmental factors.

Cadmium concentration in soil is influenced by soil organic matter, iron, manganese, aluminum hydrous oxides, and reduction-oxidation (redox) potential. At lower pH values, exchange reactions control the removal of cadmium that is bound as hydrous oxides from solution, while at higher pH values, the formation of cadmium hydroxide [$Cd(OH)_4$] controls the equilibrium concentration of cadmium that is available. Organic matter has been proposed by Frost and Griffin (1977) as indirectly influencing cadmium retention in soil through its contribution to cation exchange capacity over a pH range of 3 to 9. Under reducing conditions, precipitates of cadmium sulfide occur in the presence of adequate sulfide ions.

Adsorptive type mechanisms are the dominant means of controlling cadmium retention in soil, except when cadmium concentrations in waste leachate are high. Then, precipitation probably becomes the controlling factor. Stones, Sommers, and Silviera (1976) concluded that the order of prevalent forms of cadmium in soil are:

Carbonates > Sulfides = Organic Complexes > Adsorbed = Exchangeable

This order would indicate that the effect of pH on cadmium retention in soil is the production and maintenance of the insoluble hydroxides and carbonates of cadmium.

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Table 3-12

Total VOC Concentrations for Selected Monitoring Wells at EKCO Housewares December 1988

Well	Total VOCs (ppb)
D-4-39	276,393
W-10	4,042
R-1	1,424
R-2	3,250
I-2	1,185

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Lead is present in soils as Pb^{2+}, which precipitates easily as lead sulfite, hydroxides, and carbonate. Lead is also readily adsorbed on clay surfaces and on aluminum silicates (Fuller, 1977).

The availability of lead in soils is related to moisture content, soil pH, organic matter, calcium, and phosphates. As soil pH increases, lead is precipitated as lead hydroxide, carbonate, and phosphate. Organometallic complexes are formed with organic matter. Increasing pH and Ca^{2+} availability provides competition with the Pb^{2+} for exchange sites on the soil.

Chromium may exist in the hexavalent form (Cr^{6+}) as chromate or as dichromate and as trivalent chromium (Cr^{3+}). Hexavalent chromium is toxic and quite mobile in a soil system. Overcash and Pal (1979) reported that in an anaerobic soil, hexavalent chromium is quickly converted to the less toxic trivalent chromium, which is quite immobile. The trivalent chromium precipitates from pure solutions as hydroxy-oxides of varying degrees of hydration. Trivalent chromium may be retained in soils by adsorption on soil surfaces, complexation with organic matter, and coprecipitation as minor constituents with other metals such as iron and aluminum.

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3.5.2 Distribution of Contaminants of Concern

3.5.2.1 Organic Compounds

The distribution of organic compounds in and beneath the lagoon as characterized by the six bottom soil borings indicate that the contaminants are present at a depth of 16 ft below the present-day lagoon surface. Table 3-13 presents the total volatile organics in these borings. However, these results may be misleading because the soil samples were collected in the water table and may represent the presence of these compounds in both the groundwater and in the subsurface soils.

Table 3-13

Distribution of Total Volatile Organic Compounds*
in the Bottom Soil Borings

Depth (ft)	Soil Boring					
	BSB-1	BSB-2	BSB-3	BSB-4	BSB-5	BSB-7
0 - 2	17	119	211	68	94	67
4 - 6	6	38	38	16	41	206
8 - 10	18	8	172	130	14	10
14 - 16	N.S.	15	25	268	122	5

*Total volatile organics DO NOT include estimated values or values noted as present in blank.

Notes: N.S. = No Sample. Concentrations are in ppb.

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3.5.2.2 Inorganic Compounds

The analytical results of the sludges and subsurface soils indicate a high degree of variability in the concentrations of cadmium, chromium, and lead. The range of concentrations indicated by this study are:

Metal	Range of Concentration (ppm)
Cadmium	< 0.37 to 8370
Chromium	4.52 to 923
Lead	13 to 25,000

Because of the variability of these metals, it is appropriate to discuss the distribution of these metals in terms of differences in ranges occurring at different depths below the surface of the lagoon.

In reviewing the soil boring descriptions and the ranges of concentrations indicated by the chemical analyses, a depth of approximately 8 ft demonstrates where the range of concentrations of chromium, cadmium, and lead and soil description change. The change in range of concentrations is presented in Table 3-14. From this table a decrease of at least one order of magnitude can be observed at the 8-ft depth. Sludge material is generally present to a depth of 8 ft. However, it should be noted that spacial variation in this depth can be seen from one boring to another. A maximum depth of approximately 10 ft occurs in the area of BSB-2 and BSB-6. This may be a result of the absence of the clay layer beneath the southeastern corner of the lagoon and the presence of fill material, which may itself have elevated metals concentrations due to the cinder content.

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Table 3-14

Comparison of Ranges of Metals Occurring Beneath the Lagoon

Soil Boring	Depth (ft)	Cadmium	Chromium	Lead
BSB-1	0 to 8 8 to 12	6.7 to 215 0.56 to 16.1	17 to 295 4.74 to 61.5	38 to 900 42 to 91
BSB-2	0 to 8 8 to 16	0.38 to 1,370 <0.40 to 84.6	8.92 to 405 6.81 to 8.72	20 to 5,100 32 to 320
BSB-3	0 to 8 8 to 16	<0.38 to 1,370 <0.40 to 84.6	152 to 527 4.44 to 15.2	36 to 13,000 13 to 56
BSB-4	0 to 8 8 to 16	<0.37 to 1,560 <0.375 to 13.4	4.52 to 354 10.2 to 16	22 to 1,400 36 to 93
BSB-5	0 to 8 8 to 16	282 to 8,320 0.46 to 14.3	226 to 923 8.4 to 24	1,100 to 25,000 18 to 70
BSB-6	0 - 8 8 - 16	3.52 to 5,400 5.2 to 53.4	8.43 to 743 6.1 to 12.6	29 to 18,000 42 to 180

Note: Concentrations in ppm.

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SECTION 4
CLOSURE PLAN

4.1 PURPOSE AND SCOPE

This section presents the proposed closure method for the lagoon. This section also contains the other requirements of a closure plan, including health and safety, closure period, closure cost estimates, and certification.

Subsection 4.2 presents the approach to the closure. Subsection 4.3 presents the specific regulatory requirements for the closure of a surface impoundment in accordance with RCRA. Subsection 4.4 presents a proposed closure method to achieve clean closure based on the available site characterization information. Subsection 4.5 discusses the requirements of a health and safety plan and decontamination procedures during closure. Subsection 4.6 discusses the closure period and schedule for closure. Subsections 4.7 and 4.8 present a closure cost estimate and the approach to certification of the closure, respectively.

4.2 APPROACH

The closure of the EKCO surface impoundment is based on the site characterization presented in the preceding section. It will be performed in a manner that will minimize future environmental impacts from the facility. Environmental impacts may potentially occur through the following pathways:

- Air emissions.
- Leaching of contaminants into groundwater.
- Migration of waste and/or waste constituents via surface water runon and runoff.
- Direct contact.

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The closure method presented in this closure plan will effectively negate these pathways. This closure method will include stabilization within the footprint of the lagoon, followed by the removal of the stabilized waste materials with off-site disposal. Table 4-1 presents how this closure will affect each of these pathways.

4.3 REGULATORY REQUIREMENTS

4.3.1 Applicable Regulations and Standards

As discussed in Section 1, the lagoon is classified as a hazardous waste surface impoundment because characteristic hazardous wastes have been identified in the lagoon and the lagoon was in operation after the effective date of the RCRA regulations. This closure plan is written as required by OAC 3745-66-10 through -20, OAC 3745-67-20 through -30, and OAC 3745-68-10. To achieve clean closure, all waste residues, contaminated subsoil, and structures contaminated with waste and leachate will be removed.

The following subsections address compliance with these requirements or standards.

4.4 METHOD OF CLOSURE

The closure of this surface impoundment will include the stabilization of sludges and subsoils to the water table to render the waste nonhazardous. The treated material will be excavated to the water table and transported off-site for disposal as a solid waste.

The intent of this closure method is to excavate the waste material in order to remove all waste, system components, and contaminated soil above the water table.

The following steps will be used to close the lagoon:

- Select the stabilization process based on the treatability study and process considerations.
- Remove parts of the fence around the lagoon to facilitate equipment access.

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Table 4-1

Migration Pathway Disruption

Pathway	Performance
Air Emissions	Removal of waste constituents will effectively negate this pathway.
Leaching of Constituents into Groundwater	Removal of waste constituents to the groundwater followed by replacement with clean fill will eliminate quantity of waste material that could leach into groundwater.
Migration of Waste and/or Waste Constituents via Surface Water	Removal of waste constituents to the groundwater followed by replacement with clean fill will eliminate contact of the waste material with surface water.
Direct Contact	Removal of waste constituents to the groundwater followed by replacement with clean fill will eliminate incidental contact by humans or animals with the waste material.

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- Stabilize material within the lagoon through addition of stabilizing agents.
- Excavate treated soils to the water table and dispose off-site as a solid waste.
- Regrade existing berm into excavation.
- Import clean backfill as required.
- Install new fence and warning signs.

Groundwater monitoring and remediation activities, if necessary, will be covered under the RFI/CMS process.

4.4.1 Stabilization

4.4.1.1 Summary of Treatability Study

A treatability study of sludge collected from the lagoon was performed from February through May 1990. In the study six treatment formulations were examined. The TCLP metals results for four of the six formulations were less than the values for a characteristic hazardous waste. The results of the treatability study are summarized in Table 4-2. The vendors whose formulations meet treatment requirements were:

- Enreco, Inc. (Enreco) of Cincinnati, Ohio.
- Williams Environmental Services, Inc. (WES), formerly Harmon Environmental Services, Inc. (Harmon), of Plymouth Meeting, Pennsylvania.
- Silicate Technology Corporation (STC) of Scottsdale, Arizona.

The Enreco Hydro-Injection system stabilizes waste in situ at a maximum depth of 12 ft. The Hydro-Injection system moves laterally along the surrounding embankment and is capable of stabilizing a 25-ft pass (distance from beam). Upon completion of each pass, the Hydro-Injection system operates directly on top of the previously stabilized material. This process is repeated until the entire contents of the lagoon have been stabilized. This system can stabilize an estimated 1,000 yd^3 daily. This process will produce a clay/soil-like material which will pass TCLP within 7 days of curing. Within 1 day the material is

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Table 4-2

Comparison of Untreated and Treated Soil TCLP Metals Concentrations with the Maximum Allowable Concentrations

Parameter	Total Metals Concentration in TCLP Extract, milligrams per liter[a]							
	Untreated Soil[b]	Enreco		Harmon AHG	STC 1327	WESTON		Maximum Allowable[c]
		A	B			1	2	
Silver	0.030U	0.030U	0.030U	0.030U	0.030U	0.030U	0.030U	5.0
Arsenic	0.016U	0.016U	0.016U	0.016U	0.016U	0.016U	0.016U	5.0
Barium	0.77	0.43	0.78	0.47	0.44	0.43	0.68	100
Cadmium	4.9	0.0040U	0.0040U	0.0040U	0.0052	6.6	1.7	1.0
Chromium	0.020U	0.060	0.079	0.140	0.098	0.020U	0.140	5.0
Mercury	0.0010U	0.0010U	0.0010U	0.0010U	0.0010U	0.0010U	0.0010U	0.2
Lead	0.050U	0.050U	0.050U	0.050U	0.050U	0.050U	0.050U	5.0
Selenium	0.039	0.050	0.051	0.041	0.029	0.039	0.062	1.0

[a]U - indicates compound was analyzed for but not detected
[b]Average results of triplicate soil samples collected from a mixed composite sample representing the site.
[c]40 CFR 261.24(b)

Note: NA = not applicable

sufficiently cured to support heavy equipment. This process is not affected by weather with the exception of subfreezing temperatures.

STC presented the option of treating the lagoon sludge and soils in cement mixing trucks. With STC's technology a wet, concrete-like slurry is formed. The treated waste would pass TCLP by the end of mixing. If cement mixing trucks were used, a processing rate of 80 yd^3 per truck per day could be reached.

The WES treatment process produces a clay-like soil material that will meet TCLP requirements after curing for 3 days. WES recommended their Harmon HSS™ stabilization system. The HSS™ is a dozer-mounted high energy mixing system that uses a 265-horsepower engine to drive two front-mounted mixers. With this system 400 yd^3 daily of waste can be stabilized per day.

The detailed results of this stabilization study are contained in WESTON's June 1990 report, *Evaluation of Stabilization Processes for Closure of the Surface Impoundment at the EKCO Housewares, Inc. Massillon, Ohio Facility.*

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4.4.1.2 On-Site Stabilization

Stabilization of sludges and subsoils will be performed to render all waste materials nonhazardous prior to off-site disposal. Soils and sludges will not be removed from the footprint of the lagoon until rendered nonhazardous through treatment by stabilization.

The stabilization process will be performed within the footprint of the lagoon. The treatment technology used to stabilize the waste material will be selected from one of the following vendors:

- Enreco
- WES
- STC

As discussed in Subsection 4.4.1.1, each of these vendors' treatment options successfully stabilized the material, rendering it a nonhazardous waste. The specifics of the treatment design are dependent on the vendor/treatment methodology selected. When the treatment methodology is selected, specific information regarding the stabilization formulation will be provided to OEPA. Although the vendor processes are proprietary and cannot be included in this Closure Plan, WESTON will make arrangements to send proprietary information directly to OEPA for evaluation.

The closure activities will begin with mobilization, site preparation, fence removal, cleaning, and grubbing. After these activities are completed, treatment of the sludges and soils can begin. Treatment of the lagoon material is expected to take approximately 8 to 10 days.

During all site activities, organic vapor levels in the work area will be monitored with a portable photo ionization detector (HNu). If an instrument response of 5 ppm is registered, work activities will cease. Work activities will not commence until an instrument response reading of 1 ppm or less is registered for 10 minutes. At this time work can start, however, only at a two-thirds rate.

After treatment is completed, a maximum of 7 days is needed to allow the material time to cure sufficiently to pass the treatment requirements. Once stabilized, TCLP testing will be performed before handling the sludge to confirm that the stabilized material is nonhazardous. Sampling requirements are presented in Subsection 4.4.1.3.1. The stabilized material will then be removed.

The stabilized material will be placed in 20 yd^3 roll-off containers and sent to the selected disposal facility. The excavation itself will proceed as follows. If only single access to load trucks is available, the excavation would begin at the lagoon end opposite the loading area, thereby allowing the excavating equipment to work toward the access point. If possible, the excavation will start at the end where the lagoon bottom elevation is lowest. This will provide for drainage away from the excavation working face.

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Assuming the sideslopes of the interior of the lagoon are stable, confirmatory sampling of the excavation walls can occur. If the sideslopes are not stable, shoring will be required. The requirements for confirmatory sampling are detailed in Subsection 4.4.1.3.2. Confirmatory sampling will be performed to determine the limits of the excavation.

After the results of the confirmatory samples are received and approved, backfill operations can begin. If the subgrade is slightly unstable, a geotextile fabric will be placed on top of the exposed subgrade. Backfill will be extended to final grades that will provide for positive drainage of surface water. The grading plan is shown in Figure 4-1. The preferred backfill material would be a well graded coarse aggregate; if unavailable, then a low plasticity fine-grained soil would be used. Top soil will be placed over the compacted fill and the area revegetated with crown vetch or equivalent.

After the cover is installed, equipment and personnel will be demobilized.

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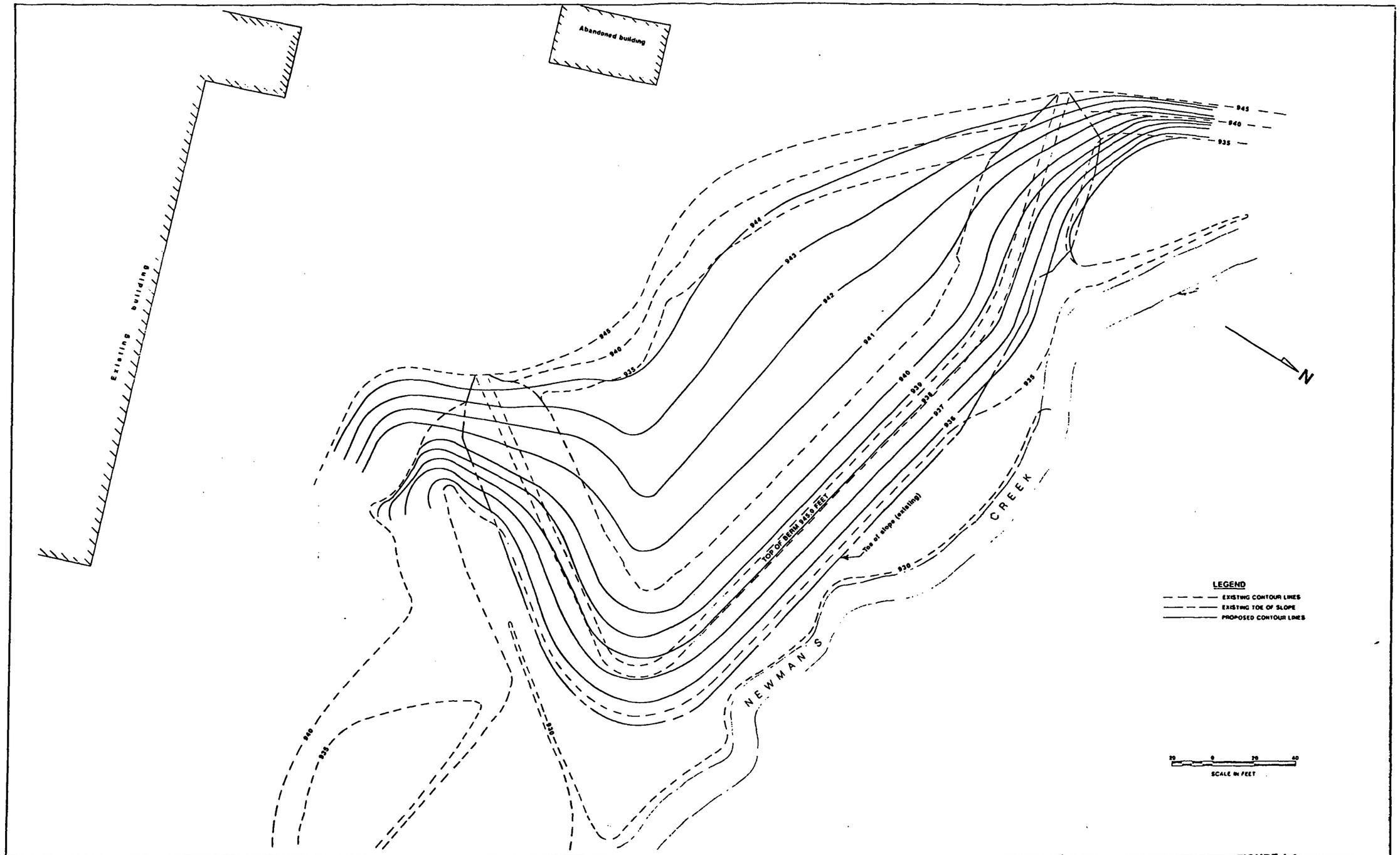
4.4.1.3 Sampling and Analysis

The sampling and analysis program is divided into three phases. The goal of the first phase of sampling is to confirm sufficient treatment of the lagoon sludges and subsoils. The second phase of sampling will be performed to confirm the areal extent of contamination has been removed. In the third phase sampling and analysis will be performed to identify a source of clean fill. Sampling, analytical, and quality assurance/quality control (QA/QC) procedures that will be used during closure activities are detailed in Subsection 4.5.2.

4.4.1.3.1 Verification of Treatment. To confirm successful treatment of the lagoon material, nine borings will be advanced into the stabilized material. Two-inch split spoons will be advanced in the following intervals:

- 0-2 ft
- 2-4 ft
- 4-6 ft
- At the groundwater interface



NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION

EKCO HOUSEWARES
MASSILLON, OHIO

WESTON
WEST CHESTER — MANAGERS DESIGNERS/CONSULTANTS — PENNSYLVANIA

CHECKED	DATE	CLIENT APPROVALS	DATE
DES. ENG.			
PROJ. ENG.			
PROJ. MGR.			
APPROVED			
APPROVED		ISSUED FOR	DATE

FIGURE 4-1
PROPOSED GRADING PLAN
FOR LAGOON CLOSURE

DRAWN	DATE	DWG. NO.	REV. NO.
A. DELTUFFO	AUGUST 11, 1988	PLATE 1	0
SCALE 1"=20'-0"	W.O. NO. 2994-02-03	SHT. 1 OF 1	

The samples collected from these intervals will be analyzed for RCRA metals by the TCLP and HSL VOA.

4.4.1.3.2 Verification of Horizontal Extent. Samples will be taken at three vertical intervals every 50 ft along the excavation wall to determine that the horizontal extent of contamination has been removed. These samples will be analyzed for TCLP cadmium.

The results of these analyses will be compared to the characteristic hazardous waste level for cadmium (40 CFR 261.24(b): 1 mg/L). An area 50 ft by 25 ft at each section that exceeded this level will be treated according to the procedure described in Subsection 4.4.1.2.

4.4.1.3.3 Testing of Soils Used as Backfill. Borrow material to be used for fill will be composited and sampled for acceptance. It is anticipated that one sample will be collected for chemical analysis. The analytical parameters will include the following:

- HSL VOA
- HSL semivolatile organic analysis (BNA)
- HSL pesticides/polychlorinated biphenyls (PCB)
- RCRA metals

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4.5 IMPLEMENTATION REQUIREMENTS

4.5.1 Health and Safety Plans

A health and safety plan (HASP) will be prepared for the site to ensure the health and safety of all site personnel during the activities covered by the plan. The HASP presented in the Quality Assurance Management Plan for EKCO Housewares, Inc. of Massillon, Ohio will be used to direct site activities.

The HASP defines specific procedures and protocols that will be implemented to protect the health and safety of all personnel during the completion of closure activities at the EKCO Housewares site. The plan will identify potential health and safety hazards at the

site during the specific site activities and prescribe procedures to minimize effects of the hazards on personnel performing onsite activities. A copy of the HASP will be available at the site. The plan will address chemical and physical hazards.

All subcontractors will be required, at a minimum, to comply with the HASP. In addition, the subcontractors will be required to comply with all pertinent federal, state, and local health and safety standards.

The following information must be supplied to WESTON by each subcontractor:

- A general statement indicating that the subcontractor's health and safety program(s) is in compliance with applicable sections of 29 CFR 1910 and 1926. Specifically, the statement must identify that the subcontractor's employees are aware of, and that the subcontractor is in compliance with, the OSHA standard 1910.120, "Hazardous Waste Operations and Emergency Response."
- A statement indicating that all employees who will or may take part in site operations during the closure activities are enrolled with a medical monitoring program that complies with OSHA.
- A statement indicating that the subcontractor will provide protective equipment for its own employees, and that the equipment is NIOSH/OSHA-approved.

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4.5.2 Sample Collection Procedures

The type of samples collected will vary depending on the area to be evaluated during closure. The following types of samples are expected and discussed in this subsection:

- Excavation soil sample (from exposed side wall).
- Subsurface soil sample.

If other types of samples are required during closure activities, standard operating procedures (SOPs) will be developed and applied to ensure that samples are representative of the area from which they are collected.

The site-specific HASP will be reviewed and implemented prior to sample collection.

4.5.2.1 General

Independent of the type of sample to be collected, certain sample collection procedures will be required. First, documentation of sample collection will be maintained in a bound logbook. For each sample, an accurate description of the sample type, location, identification and characteristics will be recorded. The date, time, and the name of the individual collecting the sample will be noted in the logbook.

Following sample collection, sample information will be recorded on the label applied to the laboratory certified clean bottle and on the chain of custody form (see Subsection 4.5.3). This form will accompany the samples to the laboratory and provides documentation of sample custody. Chain-of-custody tape will be placed on each sample container as well as the shipping container to provide documentation that the samples remained unopened during shipment.

Samples will be shipped in such a manner as to maintain their integrity. Samples will be packed in the shipping container with packing material, such as vermiculite, to minimize breakage. Ice will be placed in the shipping container per EPA protocol.

Following sample collection, equipment used for sampling will be decontaminated when designed for a single use. The goal of decontaminating sampling equipment is to prevent the cross-contamination of materials at one location with materials from another. Outer gloves (latex) worn by sampling personnel will be removed and discarded between samples to minimize the potential for cross contamination of samples by contact with the gloves. Any solution generated during decontamination of sampling equipment will be sampled and analyzed to decontaminate disposal.

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4.5.2.2 Excavation Soil Samples

Verification samples along the perimeter of the excavation will be located and identified by a temporary marker (i.e., pinflag or stake). A clean stainless steel bowl and trowel will be used to obtain a representative, homogenized sample. The trowel will be used to collect a soil sample from 0 to 6 inches. Gravel, and other debris will be removed from the surface prior to sampling and the type and depth of material removed will be recorded in the logbook.

The soil to be sampled will be placed in the bowl and thoroughly mixed. Large rocks will be removed from the bowl.

Outer gloves, such as latex gloves, worn by sampling personnel, will be removed between samples to avoid cross contamination of samples. The trowel and bowl will be decontaminated before each sample is collected.

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4.5.2.3 Subsurface Soil Samples

Subsurface soil samples will be located and identified by a temporary marker (i.e., pinflag or stake), and they will be collected as prescribed in the closure plans. A drilling rig with continuous split-spoon sampling will be employed to collect the subsurface soils. Samples will be collected at 2-ft intervals. The soil in the boring will be logged at the time of collection by a geologist. A borehole log will be prepared for each soil boring.

The soil from each interval will be placed in a stainless steel bowl and thoroughly mixed and any large rocks will be removed. The exception to homogenizing the sample is for those samples collected for volatile organic analysis. Samples for VOA will be collected directly from the borehole equipment and placed in the laboratory bottle to minimize aeration of the sample.

Outer gloves, such as latex gloves, worn by sampling personnel will be removed between samples to avoid cross contamination of samples. Sampling equipment will be decontaminated before each use.

4.5.3 Sample Custody Procedures

The samples collected during closure activities will be recorded on a chain-of-custody form (Figure 4-2 is an example). Typically, the chain-of-custody documentation is combined with the laboratory work request (see Figure 4-2) although separate forms can be prepared to serve each function.

Following sample collection, the chain-of-custody form is prepared listing each sample. The samples must remain in the custody of the field team until custody is relinquished. The chain-of-custody record is employed as physical evidence of sample custody. The sampler completes a chain-of-custody record to accompany each sample container shipped from the field to the laboratory.

A sample is considered to be in an individual's custody if the following criteria are met: it is in your possession or it is in your view after being in your possession; or it was in your possession and then locked up or sealed to prevent tampering; or it is in a secured area. Under this definition, the team member actually performing the sampling is personally responsible for the care and custody of the samples collected until they are transferred or dispatched properly. In followup, the sampling team leader reviews all field activities to confirm that proper custody procedures were followed during the field work.

Similar information to that entered on the sample label is recorded on the chain-of-custody record. When relinquishing the samples for shipment, the sampler signs in the space indicated at the bottom of the form, entering the date and time the samples are relinquished. The sampler enters the shipper's name and airbill number under the "Remarks" section on the bottom right of the form.

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJ. NAME (use site code only)
SAMPLERS: (Signature)	

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS							REMARKS

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks:	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

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Figure 4-2. Example Chain-of-Custody Form.

The custody record is completed using waterproof ink. Any corrections are made by drawing a line through and initialing the error, then entering the correct information. Erasures are not permissible.

The top, original signature copy of the chain-of-custody record is enclosed in plastic and secured to the inside of the shipping container lid. A copy of the custody record is retained for the sampler's files.

Shipping coolers are secured and custody seals are placed across cooler openings. As long as custody forms are sealed inside the sample cooler and custody seals remain intact, commercial carriers are not required to sign off on the custody form.

The laboratory representative who accepts the incoming sample shipment signs and dates the chain-of-custody record to acknowledge receipt of the samples, completing the sample transfer process. It is then the laboratory's responsibility to maintain internal logbooks and records that provide a custody record throughout sample preparation and analysis.

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4.5.4 Analytical Procedures

4.5.4.1 Laboratory Certification

WESTON's Analytics Division will be responsible for ensuring the following:

- The laboratory and personnel are qualified to perform assigned tasks.
- Adequate equipment and facilities are available.
- Documentation procedures, including chain-of-custody of samples are implemented.
- Proper analytical methods are being used.
- Adequate analytical quality control is being provided.
- Acceptable data handling and documentation techniques are being used.

4.5.4.2 Sample Containers and Preservation

The types of samples to be collected are soil and water samples. For soil samples, no preservation is required. Suggested sample containers for all samples and preservation for water samples only are provided in Table 4-3. All sample bottles will be laboratory certified clean. Holding times are provided in Table 4-3.

4.5.4.3 Analytical Methods

Table 4-3 summarizes the analytical methods to be employed during analysis of samples collected during closure activities. In addition, specific analyses and detection limits for each analysis is listed as follows:

- Selected Metals - Table 4-4.
- Hazardous Substances List (HSL) VOA (see Appendix A).
- HSL Base Neutral Acid Analysis (see Appendix A).
- HSL Pesticides/PCBs (see Appendix A).
- Toxicity characteristic leaching procedure (TCLP) VOA
- TCLP metals.

The analytical method for volatile compounds may be either Method 8240 or 8010 of EPA SW-846. In general, analyses will be by Method 8240.

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4.5.5 Quality Assurance and Quality Control

Quality assurance/quality control (QA/QC) will be implemented throughout the sampling and analytical activities required during closure.

4.5.5.1 Field QC Samples

The number and type of field QC samples collected during closure activities will depend on the nature of the area to be closed and the samples required to characterize the area as clean. The following type of field QC samples may be required:

Table 4-3

Sample Collection and Analytical Information

Parameter	Container[a] Soil	Container[a] Water	Water Preservation	Analytical Method	Holding Time
HSL VOA	125 mL VOA	40 mL VOA	HC1	SW-846, 8240, 8010	14 days
HSL BNA	250 mL Amber G	1/2 gallon Amber G	None	SW-846, 8270	7 days[b]
Selected Metals	250 mL P	1 Liter P	HNO_3	SW-846, 6010, and 7000s	Hg - 28 days Others - 6 months
HSL Pesticides/PCBs	250 mL Amber G	1/2 gallon Amber G	None	SW-846, 8080	7 days[b]
TCLP VOA	125 mL VOA	40 mL	HCl	SW-846, 8240, 8010	14 days
TCLP Metals	250 mL P	1 Liter P	HNO_3	SW-846, 6010, and 7000s	Hg - 28 days Others - 6 months

[a]P stands for plastic; G stands for glass.
[b]Seven-day holding time for extraction, 40-day holding time for analysis following extraction.

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Table 4-4

Selected Metals

Analyte	Method Detection Limit ug/L)	Analytical Method
Arsenic	10	EPA SW-846, Method 7060
Barium	200	EPA SW-846, Method 6010
Cadmium	5	EPA SW-846, Method 6010
Chromium	10	EPA SW-846, Method 6010
Lead	3	EPA SW-846, Method 7421
Mercury	0.2	EPA SW-846, Method 7470
Nickel	40	EPA SW-846, Method 6010
Selenium	5	EPA SW-846, Method 7740
Silver	10	EPA SW-846, Method 6010
Thallium	10	EPA SW-846, Method 7841
Zinc	20	EPA SW-846, Method 6010

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- Duplicate sample
- Decontamination field blank (rinse blank)
- Trip blank (for VOAs)

The following description provides the method for collecting these samples and the frequency with which they will be collected:

- Duplicate Sample - a sample of the same matrix from the same area. Duplicate soil samples will be collected by homogenizing sufficient soil for the two samples (routine and duplicate) and placing the soil in separately identified laboratory bottles. A duplicate soil sample will be collected at a frequency of one for every ten samples.

- Decontamination Field Blank - a water sample collected by pouring HPLC (High Performance Liquid Chromatography) grade water (as defined by the American Chemical Society) over decontaminated sampling equipment. The water is collected and placed in separately identified laboratory bottles. These samples provide verification that sampling equipment is sufficiently decontaminated to prevent cross contamination of samples. A field blank will be collected once per day and analyzed for all analytes required for the samples collected that day.

- Trip Blank - a water sample prepared to accompany samples collected to be analyzed for volatile organic compounds. Two 40-mL vials with septum caps will be prepared to accompany the samples in each shipping container containing samples collected for volatile organic compounds.

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4.5.5.2 Laboratory QA/QC

Laboratory QA/QC procedures will be performed as required in the individual analytical procedures. Quality Control will be according to the specified methods, but as a minimum QC will include:

- GC/MS Analyses (VOA and BNA) - instrument tuning once per 12-hour shift; initial calibration using at least five concentration solutions; continuing calibration at a mid-point concentration each 12-hour shift; analysis of a method blank, two method blank spikes; and appropriate surrogate spike analyses.

- GC and HPLC Analyses (Pesticides, PCBs, Herbicides) - initial calibration daily with a blank and at least five calibration standards; continuing calibration at a mid-point concentration will be run every 10 samples; and analysis of a method blank and two method blank spikes.

- AA Analyses (Metals) - initial calibration daily with a blank and at least three calibration standards; continuing calibration blank and standard analyses will be run after every 10 samples; and analysis of a method blank and two laboratory control samples.

- ICP Analyses (Metals) - initial calibration with a blank and at least five calibration standards quarterly; daily calibration with a blank and the highest concentration standard; continuing calibration with a blank and standard after every 10 samples; and analysis of method blank and two laboratory control samples.

The laboratory QA review of the analytical package and accompanying QC results will ensure accurate analytical results. Data package deliverables will consist of a cover page, case narrative (dates sampled, received, extracted/prepared and analyzed; method reference and a description of any technical problem), QC and sample data summary, and a list of up to five tentatively identified compounds per each sample for GC/MS fractions.

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4.6 CLOSURE PERIOD

4.6.1 Schedule

The schedule for the closure of the EKCO surface impoundment depends primarily on the predominant weather conditions during the construction period. There are two factors involved in the timing of the construction of this closure method. They are:

- The seasonal variation in the elevation of the water table.
- The climatic conditions expected during construction.

The closure activities will be scheduled during a period when the water table is expected to be low. This usually occurs between July and October in response to low rainfall during the summer. This period also correlates to climatic conditions (i.e., low rainfall) that are

favorable for the earthwork involved in the stabilization process and cover system. The schedule is presented in Figure 4-3.

4.6.2 Time Allowed for Closure

The time allowed to implement closure specified in OAC 3745-66-13 is 180 days after approval of the Closure Plan. Depending on the date of OEPA's approval of the closure plan, a request for an extension of the time allowed for closure may be necessary. This extension is warranted because it would allow the construction to occur during periods of low water table conditions, which would allow a more environmentally effective closure. Also, fewer construction delays will occur during a construction period that occurs between June and October. This request will be submitted based on the date of OEPA's approval of the closure plan or can be granted by OEPA as part of the approval process.

4.7 CLOSURE COST ESTIMATES

This subsection presents the estimated costs for closure of the EKCO facilities lagoon in accordance with the requirements of OAC 3745-66-20. The purpose of this subsection is to provide an estimate of the cost of a closure of the lagoon so that a financial assurance mechanism can be established. This financial assurance mechanism would assure that closure will occur if the owner/operator is unable to perform closure for financial reasons.

The closure cost estimate presented in Table 4-5 is based on the following major assumptions:

- Clearing and grubbing of 2 acres and removing fence.
- In-situ stabilization of material to the water table.
- Excavation of stabilized material.
- Importing backfill and regrading remaining berm.
- Transportation and final disposal of stabilized material at solid waste facilities.

The estimate is based on standard construction cost estimating techniques and consultations with vendors of specific material and services.

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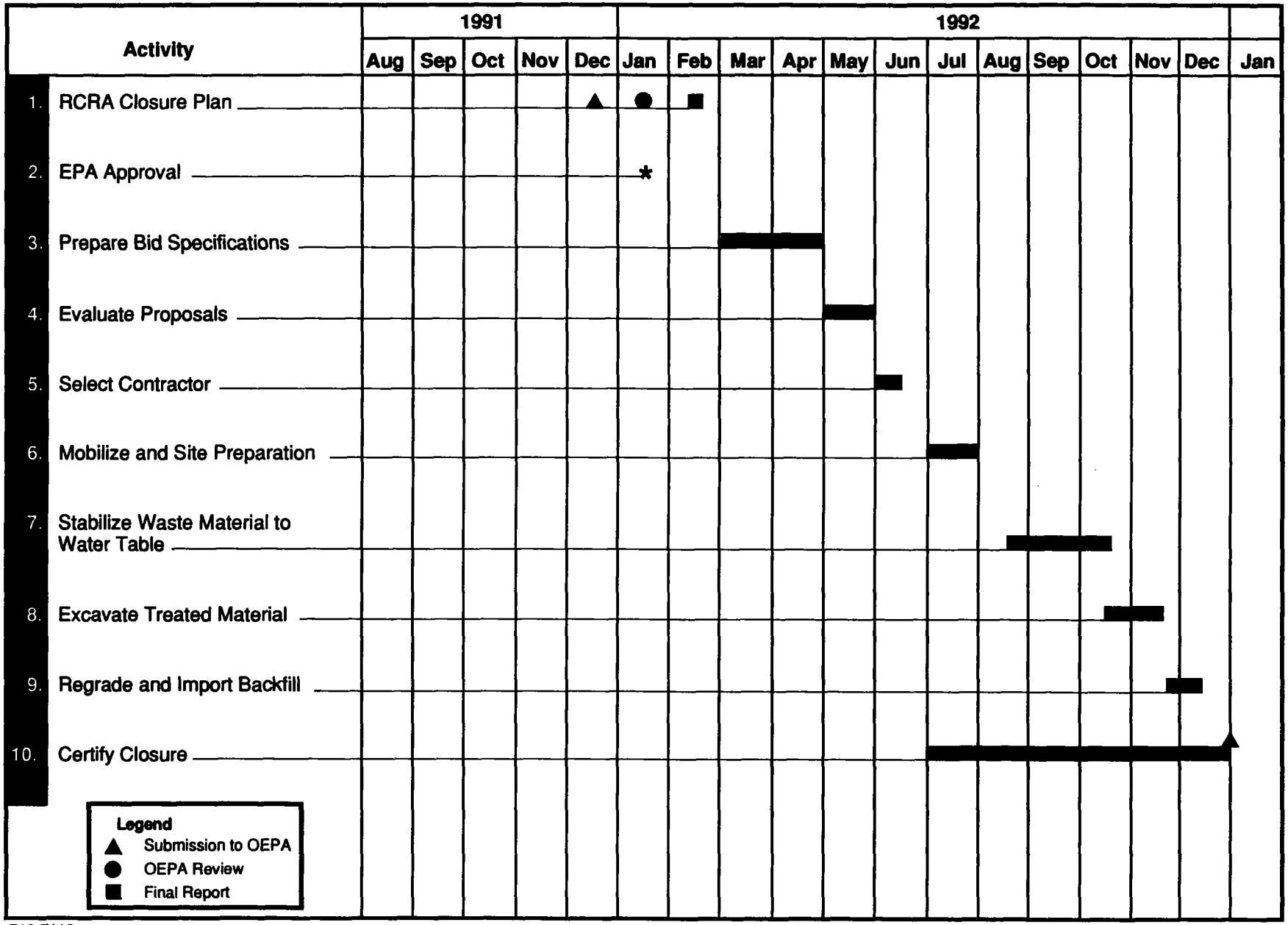

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FIGURE 4-3 SCHEDULE OF CLOSURE

Table 4-5

Excavation of Soils/Sludges and Stabilization On-Site with Transportation and Disposal Off-Site at a Solid Waste Facility

Task	Cost ($)
Mobilization	5,000
Site Preparation, Fence Removal, Clearing and Grubbing	8,000
Treatment of soils within footprint	273,000
Excavation of 7,500 yd^3 of soils/sludges	32,000
Transportation to Solid Waste Disposal Facility	31,000
Disposal at solid waste facility of treated soils	300,000
Backfill Excavation - Placement 7,500 yd^3 clean soil - Compact and Grade (20,150 s.f.) - Restoration of vegetation	68,000
Demobilization of Equipment	15,000
Supervision and Certification of Closure	60,000
20% Contingency	158,000
Total Cost	950,000

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The total estimated cost of closure is $950,000 in 1991 dollars.

4.8 CERTIFICATION

4.8.1 Purpose and Scope

This subsection addresses the requirements of OAC 3745-66-15 regarding certification of closure.

4.8.2 Approach

Within 60 days of completion of closure for the EKCO lagoon (surface impoundment), a certification of closure, prepared by an independent registered professional engineer and by EKCO Housewares Inc., will be sent to OEPA via registered mail indicating that the lagoon has been closed in accordance with the specifications in this closure plan.

The certification of the closure shall be preceded by a series of inspections by the independent professional engineer or his representative at critical points during the closure and possible random unannounced inspections and review of data gathered during closure.

The following information will be maintained as part of closure documentation:

- Date that closure activities begin.
- Contractors performing closure activities, including name, address, telephone number, and scope.
- Copies of manifests for all wastes removed during closure.
- Documentation of any deviation from the closure plan including any letters from OEPA approving changes to the plan.
- Daily inspection or field summary reports documenting closure events.
- Field notes of inspections, decontamination, and sample collection.

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- Chain of custody records and analytical results for all samples collected during closure.
- Engineering drawings for all excavations.

Any documentation supporting the independent registered professional engineer's certification will be furnished to OEPA or the EPA Regional Administrator upon request.

4.8.3 Certification Letter

When closure is completed, a certification letter will be submitted fulfilling the requirements of OAC 3745-66-15. A copy of the form is shown in Figure 4-4.

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The lagoon/surface impoundment at the EKCO Housewares, Inc., Massillon, Ohio facility has been closed in accordance with the Final Closure Plan dated _____.
(month/year)

I certify under penalty of law that the information contained in the accompanying closure certification documentation was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

FACILITY

Signature _____ Date _____

Name _____
Plant Manager
Massillon, Ohio, Facility
EKCO Housewares, Inc.

PROFESSIONAL ENGINEER

Signature _____ Date _____

Name _____

Address _____ Professional Seal
_____
_____

Telephone Number _____

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FIGURE 4-4 CLOSURE CERTIFICATION