

**Five-Year Review Report**  
**First Five-Year Review Report**  
**for**

**Lehigh Portland Cement Company Superfund Site**

**Mason City**

**Cerro Gordo County, Iowa**

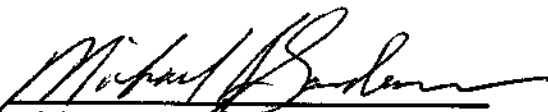
**September 2002**

**PREPARED BY:**

**United States Environmental Protection Agency**  
**Region VII**  
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Approved by:

Date:



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9-27-02

# Five-Year Review Report

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## List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
CKD	Cement Kiln Dust
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
E&E	Ecology and Environment, Inc.
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Difference
IDNR	Iowa Department of Natural Resources
IDOT	Iowa Department of Transportation
LPCC	Lehigh Portland Cement Company
LCNC	Lime Creek Nature Center
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
NCP	National Contingency Plan
NPDES	National Pollution Discharge Permit
NPL	National Priorities List
O&M	Operation and Maintenance
PRP	Potentially Responsible Party
PS	Performance Standards
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design

RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SDWA	Safe Drinking Water Act
TDS	Total Dissolved Solids
UAO	Unilateral Administrative Order
WHKS	Wallace, Holland, Katstler, Schmitz and Company

## **Executive Summary**

The Lehigh Portland Cement Company Superfund site (LPCC) is located just north of Mason City, Iowa. The site consists of the Lehigh cement-manufacturing facility and portions of the Line Creek Nature Center (LCNC).

The remedy for the site included consolidation and capping of the waste cement kiln dust (CKD) and dewatering the quarries to prevent migration of the CKD through the groundwater routes. The trigger for this five-year review was the actual start of construction on December 13, 1993.

The assessment of this five-year review found that the remedy was constructed in accordance with the requirements of the Record of Decision (ROD). The remedy is functioning as designed. The immediate threats have been addressed and the remedy is protective.

This five-year review included document and data review, site inspection, and a local interview.

## Five-Year Review Summary Form

SITE IDENTIFICATION		
<b>Site name : Lehigh Portland Cement Company Superfund Site</b>		
<b>EPA ID : IAD 005288634</b>		
<b>Region: VII</b>	<b>State: Iowa</b>	<b>City/County: Mason City, Cerro Gordo County</b>
SITE STATUS		
<b>NPL status:</b> <input checked="" type="checkbox"/> Final <input checked="" type="checkbox"/> Deleted <input checked="" type="checkbox"/> Other (specify) The listing was vacated by order of the Court of Appeals for DC 11/92.		
<b>Remediation status</b> (choose all that apply): <input checked="" type="checkbox"/> Under Construction <input checked="" type="checkbox"/> Operating <input checked="" type="checkbox"/> Complete		
<b>Multiple OUs?*</b> <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>Construction completion date:</b> ___/___/___	
<b>Has site been put into reuse?</b> <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> NO		
REVIEW STATUS		
<b>Lead agency:</b> <input checked="" type="checkbox"/> EPA <input checked="" type="checkbox"/> State <input checked="" type="checkbox"/> Tribe <input checked="" type="checkbox"/> Other Federal Agency _____		
<b>Author name:</b> Paul Roemerman		
<b>Author title:</b> Remedial Project Manager	<b>Author affiliation:</b> EPA	
<b>Review period:**</b> ___4 / 25___ / 2002___ to ___9 / 30 / 2002___		
<b>Date(s) of site inspection:</b> ___4___ / ___25___ / 2002___		
<b>Type of review:</b>  <div style="display: flex; justify-content: space-around; font-size: small;"> <span><input checked="" type="checkbox"/> Post-SARA</span> <span><input checked="" type="checkbox"/> Pre-SARA</span> <span><input checked="" type="checkbox"/> NPL-Removal only</span> </div> <div style="display: flex; justify-content: space-around; font-size: small;"> <span><input checked="" type="checkbox"/> Non-NPL Remedial Action Site</span> <span><input checked="" type="checkbox"/> NPL State/Tribe-lead</span> </div> <div style="display: flex; justify-content: space-around; font-size: small;"> <span><input checked="" type="checkbox"/> Regional Discretion</span> </div>		
<b>Review number:</b> <input checked="" type="checkbox"/> 1 (first) <input checked="" type="checkbox"/> 2 (second) <input checked="" type="checkbox"/> 3 (third) <input checked="" type="checkbox"/> Other (specify) _____		
<b>Triggering action:</b> <input checked="" type="checkbox"/> Actual RA Onsite Construction at OU #_1_ <input checked="" type="checkbox"/> Actual RA Start at OU#_____ <input checked="" type="checkbox"/> Construction Completion <input checked="" type="checkbox"/> Previous Five-Year Review Report <input checked="" type="checkbox"/> Other (specify) _____		
<b>Triggering action date (from WasteLAN):</b> ___12 / 13___ / 1993___		
<b>Due date (five years after triggering action date):</b> ___12 / 13___ / 1998___		

\* ["OU" refers to operable unit.]

\*\* [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

## **Five-Year Review Summary Form, cont'd.**

### **Issues:**

Submittal of quarterly monitoring data by the responsible party to the Environmental Protection Agency (EPA) had been sporadic. Data are now submitted on a regular basis after this issue was brought to the attention of the responsible party.

### **Recommendations and Follow-up Actions:**

The recommendations at this time are to maintain the low water levels in the sump to provide inward gradients and to continue monitoring groundwater elevation and quality on a regular basis.

### **Protectiveness Statement(s):**

The remedy is protective of human health and the environment, and exposure pathways that could result in unacceptable risks are being controlled.



## Five-Year Review Report

### I. Introduction

The purpose of five-year reviews is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports. In addition, five-year review reports identify issues found during the review, if any, and recommendations to address them.

The Agency is preparing this five-year review pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) §121 and the National Contingency Plan (NCP). CERCLA §121 states:

*If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

*If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The United States Environmental Protection Agency (EPA), Region VII, has conducted a five-year review of the remedial actions implemented at the Lehigh Portland Cement Company (LPCC) Superfund site in Mason City, Iowa. This review was conducted from April 2002 through September 2002. This report documents the results of the review.

This is the first five-year review for the LPCC Superfund site. The triggering action for this statutory review is the date of the start of the remedial action on site construction, as shown in EPA's WasteLAN database: December 13, 1993. Waste cement kiln dust (CKD) has been left on site above levels that allow for unlimited use and unrestricted exposure thus triggering the five-year review.

## II. Site Chronology

**Table 1: Chronology of Site Events**

<b>Event</b>	<b>Date</b>
Initial discovery of problem or contamination	<b>1/16/86</b>
National Priorities Listing	<b>8/30/1990</b>
Remedial Investigation/Feasibility Study complete	<b>6/28/1991</b>
Record of Decision signature	<b>6/28/1991</b>
Unilateral Administrative Order	<b>9/29/1992</b>
Remedial design start	<b>11/30/92</b>
Record of Decision Amendments or Explanation of Significant Differences	<b>1/08/1993</b>
Start of on-site remedial action construction	<b>12/13/1993</b>
Remedial design complete	<b>5/23/1994</b>

## III. Background

### Physical Characteristics

The Lehigh site consists of the Lehigh cement-manufacturing facility located just north of Mason City, Iowa, near the intersection of 25th Street and U.S. Highway 65 and portions of the Lime Creek Nature Center (LCNC) located across the road from Lehigh. The LPCC property is located at 700 25th Street on the north side of Mason City in Cerro Gordo County, Iowa (Refer to Figure 1).

The site is situated in the northern half of Section 32, Township 97 North, Range 20 West and the eastern half of the northern half of Section 32, Township 97 North, Range 20 West. The area of investigation is bordered by 25th Street on the south, State Highway 65 on the east and northeast, the Chicago Rock Island and Pacific Railroad and Calmus Creek on the west. The site is bounded by rural and agricultural areas to the east and west of the site, by the Holcim (U. S. Inc.) Cement manufacturing facility to the south, and American Crystal Sugar Company to the north. The LCNC is approximately one mile northeast of the site. Calmus Creek flows to the Winnebago River which is less than a mile east of the site. The Winnebago River flows north of the Lehigh site as well. The Winnebago River and Calmus Creek are used mainly for recreational purposes.

In general, the remedial actions at the site involved the Area C Pond, the CKD Reclamation area, the Blue Waters Pond area on the Lehigh property, and two areas located at the LCNC. The site location is as indicated in Figures 1 and 2.

The LPCC facility has manufactured cement since 1911 and is currently manufacturing a hydraulic cement. The Lehigh site covers approximately 150 acres and consists of a cement manufacturing plant and associated buildings and four abandoned limestone quarries and tailing piles (Figures 2 & 3). The abandoned quarries on the Lehigh property are: Blue Waters Pond; Arch Pond; and Area "C" Pond. Another pond, known as Cooling Waters Pond, is located west of the plant. This pond provides cooling water to the plant's rotary kiln and accepts warm water returned from the plant. The abandoned quarries were filled with water. Unreclaimed waste kiln dust has been disposed of in the northern quarry (Area "C" Pond). Several piles of waste CKD surrounded the perimeter of this pond. The CKD was piled in other locations as well and could be seen mixed with soil on the site. Some of the CKD piles had been graded and revegetated.

The process of manufacturing cement generates large quantities of waste kiln dust. Kiln dust is the waste produced from the process of heating the raw materials. During the manufacturing of Portland cement, raw materials such as limestone and clay are quarried then crushed, dried, and mixed in the correct proportions. This mixture is ground to a fine powder then burned in a sloping rotary kiln maintained at a temperature of about 2600-2800° F. to form a glassy "clinker". The "clinker" is crushed, a small amount of gypsum is added, and the mixture is reground to form cement.

Collection of the dust is difficult because it is entrained in large volumes of hot exhaust gases, and it often contains unacceptably high concentrations of alkalis (sodium and potassium) which make it unsuitable for return to the cement-making process. At Lehigh, the unreclaimed CKD was placed in piles throughout the facility, and a large quantity had been disposed of into the Area "C" Pond.

The chemical composition of kiln dust is determined by the composition of the raw materials and the conditions the dust particles have encountered in the kiln. The major constituents of this Portland cement are calcium oxide (lime), aluminum, silica, and iron oxide. Magnesium oxide, sodium, potassium, and sulfates are also present. Trace quantities of chromium, lead, zinc, and other metals may be present depending on the source of raw materials used to manufacture the cement. Waste kiln dust contains fine particles of cement composed of these constituents and fossil fuel combustion products.

Waste kiln dust has highly corrosive properties and produces large quantities of hydroxides when combined with water. At the Lehigh site, the CKD has a pH value as high as 13.0 units. Corrosivity is characterized by a pH that is equal or greater than 12.5 units. The CKD has been

designated a special study waste under both the Resource Conservation and Recovery Act (RCRA) and the CERCLA. Human or animal contact with such highly corrosive material causes chemical-type burns of exposed tissue. High pH levels in water also limit the survivability of aquatic organisms, including fish.

It has been estimated that a minimum of 136,000 tons of waste kiln dust has been disposed of on site since 1981. No records are available for the 70 years before 1981. Consequently, the actual amount of waste disposed of on site is much greater than 136,000 tons and has been estimated at over one million tons.

The Mason City area was an ideal area for cement manufacture due to the easily accessible raw materials needed, such as clay and limestone. Limestone was quarried from several areas on the site to depths where the bedrock became unsuitable for cement making. Over time, the quarries partially filled with water following the suspension of quarrying operations. As determined from chronologic photos, Blue Waters Pond existed by 1950, Arch Pond was an active quarry during the mid to late 1950s, and Area "C" was an active quarry during the late 1950s and beyond.

Problems with the site were first identified in 1981 during a routine hydrochemical test of the Blue Waters Pond. The results of the test indicated that the pond water was highly alkaline. Lehigh had installed an overflow control structure at the southeastern corner of Blue Waters Pond. The control structure had been constructed because the Iowa Department of Transportation altered drainage patterns in the area which resulted in large volumes of water entering Blue Waters Pond. The flow control structure allowed water from the pond to be discharged directly to Calmus Creek to eliminate possible back-flooding of equipment critical to Lehigh's operation.

The result of testing in 1981 indicated pH values of approximately 10.6. State regulations only allow for the discharge of water with a pH value up to 9.0 into Class "B" warm water streams. Lehigh was instructed not to allow overflow until the alkalinity could be reduced.

At this time, Lehigh hired the consultant, Wallace, Holland, Kastler, Schmitz and Company (WHKS) of Mason City, Iowa, to determine the source of high pH waters. Lehigh also performed their own chemical tests and determined that CKD and cement were the predominant sources of elevated pH.

WHKS obtained and analyzed 28 water samples from various surface water sources in order to determine the source of the elevated pH in Blue Waters Pond. The results of the WHKS report identified three potential sources, of which Arch Pond contributed the most significant quantities of high pH water to Blue Waters Pond. The high pH of Arch Pond was attributed predominantly to direct contact with CKD.

The WHKS report recommended options to reduce or contain high pH site waters. Lehigh chose to transfer the water from Blue Waters Pond to Area "C" Pond and retain the water behind two earthen dikes. These dikes have since failed due to high rainfall.

In 1984, the state of Iowa Department of Natural Resources (IDNR) conducted a Comprehensive Work/Quality Assurance project at Calmus Creek, which is located approximately 1,000 feet south and downgradient from the Blue Waters Pond. This investigation found that surface water contamination was directly related to the Lehigh facility. According to this report, a highly alkaline discharge of the Blue Waters Pond into nearby Calmus Creek via the tile drain outlet southeast of the plant is believed to have contaminated Calmus Creek.

The biological quality of Calmus Creek was found to have deteriorated from effluents from Lehigh and Northwestern States Portland Cement Company sites. Because of the deterioration of the chemical balance in Calmus Creek and the quarry ponds, the number and variety of fish and benthic organisms were found to be substantially reduced downstream of the tile drain outlet. (See Calmus Creek Water Quality Study, 1984, University Hygienic Laboratory). Calmus Creek also discharges into the Winnebago River, approximately 1,500 feet from the tile drain outlet.

In 1987, the EPA hired a consultant, Ecology and Environment, Inc. (E&E), to study the area. Field work conducted by E&E in April 1987 included kiln dust/sediment, surface water, and groundwater sampling. This investigation confirmed that the on-site quarry ponds and groundwater are contaminated locally and have the potential to migrate off site.

The E&E investigation found waste kiln dust to have a pH of 13.0 units. The measured pH levels in water from the on-site quarry ponds and monitoring wells ranged from 7.19 to 12.04. Other constituents of the kiln dust included arsenic, chromium, lead, zinc, and sulfates. The E&E noted that these kiln dust constituents are "toxic and persistent".

In 1987, Lehigh hired R. E. Wright and Associates to present a plan for the elimination of the Blue Waters Pond discharge. The project involved reducing or eliminating the volume of water with high alkalinity levels which seeps into Blue Waters Pond from Arch Pond by constructing a slurry wall between Arch Pond and Blue Waters Pond and grout curtain.

The second objective of the project was to eliminate the runoff of storm water from Highway 65, which discharges into Blue Waters Pond, in order to prevent future overflows. This was to be accomplished by redirecting the storm water drainage from Highway 65 to discharge into the 25th Street storm sewer. The third task outlined was to dispose of existing high alkaline water in Blue Waters Pond by pumping water through an irrigation system into Area "C" Pond.

These steps were implemented by Lehigh. However, due to the persistence of high pH values on site and the results of the E&E study, Lehigh was evaluated in 1987 and 1988 for the National Priorities Listing (NPL). Lehigh was proposed for the NPL in 1988. In August 1990, Lehigh was made a Final NPL site. The listing was vacated by order of the Court of Appeals in November 1992. The Lehigh site was withdrawn from the NPL on May 10, 1993.

In 1989, Lehigh hired Layne GeoSciences to perform the Remedial Investigation/Feasibility Study (RI/FS) for the site. Nine monitoring wells were installed on the site, one a nested well. As the investigation proceeded, two additional shallow monitoring wells were installed east of Highway 65, on Lehigh property (Figure 4). These wells were installed at the request of the IDNR to determine pH as well as any other inorganic contaminant movement eastward onto the LCNC.

On June 20, 1990, the first round of sampling was performed. Elevated pH values, total dissolved solids (TDS), and similar contaminants as identified in prior studies were found in the groundwater and surface water. The pH values (field measurements) ranged from background to as high as 11.44 in MW-9. TDS in this well were also the highest, at 7,000. The pH values in the ponds on site were higher, up to 13.0 in Arch Pond, with TDS levels at 11,000.

On July 19, 1990, the second round of sampling was performed. The results of this sampling round were comparable to the first round; pH values were still elevated, as were TDS, sulfates, and in some monitoring wells, inorganic constituents. MW-9, for example, had a pH of 11.43 (field) and TDS of 9,700. Arch Pond had a pH of 13.15, with TDS levels of 10,000.

Further sampling was performed at the Lehigh site area in October, November, and December 1990. Similar results as the first two rounds of sampling were discovered. In addition to these results, the two monitoring wells installed east of Highway 65, MW-10 and MW-11, were showing little impact from pH or inorganics.

In the fall of 1990, it was also determined that the LCNC needed to be investigated for the same contaminants as the Lehigh site. Lehigh had formerly owned property at the nature center, and a large quantity of CKD had been dumped in abandoned quarries on nature center property. The areas of greatest concern were a quarry pond area on the western edge of the nature center and an area known as the "Badlands" which contained about 40 acres of CKD.

In November 1990, at the request of IDNR, Lehigh agreed to a limited investigation of the LCNC. This involved the installation of four monitoring wells, sampling the existing well on site, and sampling the CKD and surface water on site. The results of the LCNC investigation are discussed later in this report.

The major concern at LPCC is contaminated surface water and groundwater as a result of contact with waste CKD in the site ponds and the CKD Reclamation area. The kiln dust is composed of a major cement constituent, calcium oxide (CaO), which reacts with water and releases hydroxide ions (OH<sup>-</sup>) into solution. The hydroxide ion concentration directly controls the pH level of an aqueous solution. Local groundwater and surface water have been impacted by high pH levels and by an increase in TDS content, as well as elevated concentrations of potassium, sulfate, sodium, and other relatively nonhazardous parameters. Trace amounts of heavy metals have also been detected. Of the contaminants identified, arsenic, lead, and chromium are suspected carcinogens. Levels of metals found in soil/sediment samples are not considered to be significantly different than background soils. The kiln dust at LPCC is a RCRA special study waste, not a RCRA hazardous waste. Water at the LPCC site having a pH value exceeding 12.5 would exceed the RCRA criterion for corrosivity and be considered a RCRA hazardous waste.

Impacted groundwater has been found to exist at the site, but does not appear to have significantly migrated to the bedrock underlying and adjacent to the site. The degree of impact has been shown to lessen with depth. No significant off-site groundwater contamination has been found. Groundwater flow on site appears to be southeastward to either the Calmus Creek or the Winnebago River. Potential pathways of groundwater migration exist via the upper bedrock (Devonian aquifer).

The U.S. Public Health Service Agency for Toxic Substances and Disease Registry (ATSDR) conducted a Health Assessment for the Lehigh site, which concluded that the site was of potential health concern because of the potential risk to human health resulting from possible exposure to hazardous constituents of CKD at concentrations that may result in adverse health effects. Human exposure to elevated pH may occur and may have occurred in the past via dermal contact, ocular contact, and incidental ingestion of on-site soil, sediment, surface water, and groundwater, and via inhalation of reintrained dust.

The LPCC site also includes portions of the LCNC. This area, although separate from the above discussed plant area, also has deposits of CKD which were in contact with water. LCNC was investigated as part of the Lehigh RI/FS investigation.

The LCNC is a 410-acre facility controlled by the County of Cerro Gordo and operated as an area for outdoor recreation. It was opened to the public in May 1984. The LCNC is located immediately north of Mason City, and is bounded by the Winnebago River to the north and east, U.S. Highway 65 to the west, and private owners to the south. The Lehigh plant site is across Highway 65, west of the nature center. (See Figure 4)

Portions of the current LCNC were formerly owned by Lehigh. Lehigh transferred the property to Cerro Gordo County in 1979. During its ownership, Lehigh mined limestone from the site and replaced CKD within the exhausted quarries. The CKD is identifiable at three locations at the site. The CKD sites include two exhausted quarries located on the western side and one area of surficial deposit along the eastern boundary of the site, referred to as the "Badlands."

As with the Lehigh property, the primary concerns in the LCNC area include elevated pH and TDS levels. Based on the assumed thicknesses and lateral dimensions, there are approximately 30,000 cubic yards of CKD at Quarry Pond, approximately 400,000 cubic yards in the Badlands area, and 9,000 cubic yards in the exhausted quarry. Elevated pH levels were detected in Quarry Pond (9.5) and monitoring well 14 (10.4).

#### IV. Remedial Actions

The Remedial Objectives for the Lehigh site were established in the Record of Decision (ROD). These objectives, related to in-situ hydraulic isolation of the CKD deposit, are summarized below:

- 1) establish inward hydraulic gradients around and beneath the CKD body (thus preventing off-site migration);
- 2) minimize saturation of (dewater) the waste CKD;
- 3) recover, treat, and discharge impacted groundwater;
- 4) assess the effectiveness of the remedial actions through long-term groundwater monitoring; and
- 5) installation of kiln dust dewatering wells, if necessary, to facilitate kiln dust dewatering in the CKD Reclamation area.

#### Remedy Description

The remedy selected in the June 28, 1991, ROD consists of the following actions.

The selected remedy was CKD isolation and capping, quarry drainage, and water treatment. Blue Waters, Area "C", and Arch Ponds were drained. The pumped water was treated using acid neutralization and discharged to either Calmus Creek or the Winnebago River. This was changed to treatment with carbon dioxide to reduce use of hazardous acid in the treatment.

Following drainage of the ponds, drainage ways were constructed in the base of Blue Waters and Area "C" Ponds. These drainage ways were connected to a sump which was excavated in the Arch Pond following sediment dredging. Groundwater is also remediated during this drainage,



due to local shallow groundwater gradients reversing toward the quarries. As a result of this, impacted shallow groundwater is drained from the sump and prevented from being able to move off site.

An engineered clay cap was placed over the CKD Reclamation area. The cap was graded so that runoff is directed to the sump to allow blending of surface water with the impacted water prior to treatment. The cap was constructed to satisfy state landfill requirements and reduce long-term pumping costs from infiltration of water.

CKD in Area "C" Pond and the CKD sediment in Blue Waters and Arch Ponds were consolidated into the drained Area "C" Pond and covered with an engineered clay cap. This cap of the two CKD areas required approximately 80,000 cubic yards of clay-rich soil. The cap was finished with a seeded topsoil layer to facilitate runoff and protect the clay.

Finally, three monitoring wells were installed around the CKD Reclamation area in order to assess the effects of pond drainage and the effectiveness of the clay cap.

The overall effect of the remedy was the isolation of the contaminant source (CKD) from interaction with surface and groundwater, and the removal and treatment of impacted water presently in site ponds and shallow groundwater.

The treated discharge to the Winnebago River was monitored to ensure compliance with the Iowa National Pollution Discharge Elimination (NPDES) permit.

#### Remedial Action Construction

The EPA issued a Unilateral Administrative Order (UAO) on September 29, 1992, requiring Lehigh to conduct the remedial design and the remedial action at the site. The remedial design was approved on May 23, 1994. The EPA conducted oversight of the remedial action with the assistance of the Bureau of Reclamation and maintained an on-site presence through almost all of the construction phase. Blue Water Pond was dewatered and drainageways were constructed to a sump located in Arch Pond to dewater these areas as well as Area "C" Pond and the CKD Reclamation area. Clay caps were then constructed over the waste CKD in the Area "C" Pond Section and the CKD Reclamation area.

In the LCNC, a temporary dam was constructed to allow the southern area to be dewatered. Then waste CKD was removed from the quarry lake area to an exhausted quarry east of the lake, consolidated, and covered with a clay cap. The CKD in the Badlands portion of the LCNC was consolidated into two areas which were then covered with a clay cap.

Construction work was finished in 1997.

**Table 2: Annual System Operations/Operation & Maintenance Costs**

<b>Dates</b>		<b>Total Cost rounded to nearest \$1,000</b>
<b>From</b>	<b>To</b>	
1998	1999	\$109,000
1999	2000	\$271,000
2000	2001	\$224,000
2001	2002	\$117,000
2002	To date	\$280,000

V. Five-Year Review Process

Administrative Components

The LPCC Superfund site five-year review team was led by Paul Roemerman of EPA, Remedial Project Manager (RPM) for the site. Bob Drustrup of the IDNR assisted in the review as the representative for the support agency.

The review components included:

- Document Review;
- Data Review;
- Site Inspection;
- Local Interviews; and
- Five-Year Review Report Development and Review.

Soon after the approval of this five-year review report, a notice will be placed in the Mason City Gazette announcing that the report is complete and that it is available to the public at the Mason City Public Library in Mason City and at the EPA, Region 7, office.

Document Review

This five-year review consisted of a review of relevant documents including the ROD, the Remedial Action Report, the compaction data, operation & maintenance (O&M) records, and monitoring data.

Data Review

Groundwater monitoring has been conducted at the LPCC Superfund site since the late 1980s.

Operation, monitoring, and maintenance of the system by Lehigh has been ongoing to achieve the remedial objectives identified for the Lehigh site. The performance standards listed in the ROD and the UAO that are required to be achieved by the remedial action are as follows:

#### Groundwater

pH	6.5 to 8.5
Chromium	0.050 milligrams per liter (mg/l)
Arsenic	0.050 mg/l
Lead	0.050 mg/l

#### Discharge from the Treatment System to the Winnebago River

pH	6.5 to 9.0
----	------------

For TDS from the treatment discharge system, the remedy shall achieve, at a minimum, the effluent standards established in the Iowa NPDES permit to meet the water quality standard of 750 mg/l.

#### Groundwater Monitoring and Quality Assurance

From the quarterly monitoring reports it can be seen that the pH of the groundwater in the monitoring wells is declining. (See Figure 5 for well locations.) The pH of the groundwater is the primary parameter of concern at the Lehigh site. However, several wells including MW-5S, MW-6D, MW-14s, MW-16SMW-16D, MW-17s, and MW-17D were still showing higher pH levels than the allowable clean-up levels. Well MW-14S is located in the LCNC and has a pH level of 8.77, just above the clean-up level at the last sampling. The important aspect of this is that the pH levels are all trending down. (See Figure 6)

Several wells, including MW-6D, MW-16S, MW-16D, MW-17S, and MW-17D still show sporadic high levels of arsenic, chromium, and/or lead which are hazardous constituents of CKD. All of these wells are in the CKD Reclamation area. The sporadic heavy metals detections may be due to the lower volume of groundwater in the CKD Reclamation area and to the longer residence time caused by the reduction in infiltration and dewatering.

During construction, under EPA oversight, Lehigh built the clay cap and monitored soil density during construction and achieved the standards required in the UAO.

#### Groundwater Table

The other important parameter being monitored is the groundwater elevation level. This is important because the remedial action was designed to maintain an inward gradient from the CKD Reclamation area as well as the Area "C" Pond. Groundwater elevations are shown on the map in the Appendix. The data demonstrate that the dewatering brought about by the sump is clearly maintaining an inward gradient from the CKD Reclamation area as well as Area "C" to the sump and is preventing migration of any hazardous constituents from the waste CKD as intended.

### Operations and Maintenance

Problems in O&M included siltation in the sump area. This was solved by construction of a cold water well adjacent to the sump. Although not a problem, the acid treatment unit was replaced by a carbon dioxide treatment system to reduce costs and possible hazards associated with spills and leaks of the acid. There were also erosional features present on the caps until the vegetation was continuous over the caps.

### Site Inspection

The site was inspected in April 2002 by EPA. No significant issues have been identified regarding the cap or the drainage structures, other than some weeds growing in the drainage paths that are being eliminated. There were some intrusions on the cap in the CKD Reclamation area, but these are being eliminated by the responsible party.

The cap and the surrounding area were undisturbed, and no new uses of groundwater were observed. See Trip Report in Appendix.

### Interview

An interview was conducted with Dave Eckhardt, the site project manager for Lehigh, and is included in the Trip Report in the Appendix. The interview did not identify any significant issues.

## VI. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

The review of documents and data, Applicable, Relevant or Appropriate Regulations (ARARs), risk assumptions, and the results of the site inspection indicate that the remedy is functioning as intended by the ROD. The stabilization and capping of contaminated soils and sediments has

achieved the remedial objectives to minimize the migration of contaminants to groundwater and

surface water and prevent direct contact with, or ingestion of, contaminants in soil and sediments. The remedial action continues to be operating and functioning as designed. The remedy is intended to maintain an inward gradient for the groundwater and that is being maintained giving effective containment.

O&M of the cap and drainage structures has been effective. The O&M annual costs are consistent with original estimates and there are no indications of difficulties with the remedy.

There were no opportunities for system optimization observed during this review. The monitoring well network provides sufficient data to assess the progress of natural attenuation within the plume, and maintenance on the cap is sufficient to maintain its integrity.

Pumping of water from the Arch Pond sump lowers the groundwater table sufficiently to maintain an inward gradient from the CKD Reclamation area and Area C towards the sump area. The CKD isolation has been achieved due to maintaining the inward groundwater gradient.

Current operating procedures, as implemented, will maintain the effectiveness of response actions. Opportunities to improve the performance and/or reduce costs of the treatment systems have been implemented via the conversion to a carbon dioxide treatment system and installation of a cold water well.

No issues or problems that could place protectiveness at risk are present at this time.

The remedial objectives of the response actions have established inward hydraulic gradients around and beneath the Lehigh site, thus preventing off-site migration. By producing the inward hydraulic gradients around the boundary of the site, the remedial objective of preventing off-site migration is being achieved. The inward gradient will be maintained only if the Arch Pond sump is continued to be pumped as required by the UAO.

Question B: Are the exposure assumptions, toxicity data, clean-up levels, and remedial action objectives used at the time of remedy selection still valid?

The five-year review process includes a review of newly promulgated or modified requirements of federal and state environmental laws. These new laws are evaluated to determine whether they are ARARs and whether they call into question the protectiveness of the response action selected in the ROD. The intent of the review is to evaluate whether the selected remedy remains protective of human health and the environment. Although ARARs are usually considered frozen as of the date of the ROD, if an evaluation in the light of the new laws concludes that the remedy is no longer protective of human health and the environment, it would be necessary to change the remedy to meet the new ARAR standards.

Groundwater beneath the site must meet certain performance standards as stated in the UAO:

pH	6.5 - 8.5
Lead	0.050 mg/l
Arsenic	0.050 mg/l
Chromium	0.050 mg/l

The concentrations for pH, chromium, lead, and arsenic were based on Maximum Contaminant Levels (MCLs) for these compounds. MCLs are from the Federal Safe Drinking Water Act (SDWA), which is stated to be an ARAR in the ROD.

For the contaminated water extracted from the Arch Pond and then discharged to the Winnebago River, the ARAR was the NPDES effluent limitations. These standards were as follows for the contaminants of concern:

pH	6.5 to 9.0
TDS	750 mg/l

Since the ROD was signed on June 28, 1991, there are no new state or federal laws that would be applicable to the remedy for the Lehigh site. However, EPA has promulgated new MCLs for some of the contaminants of concern. The MCL for chromium is now 0.100 mg/l instead of 0.050 mg/l, the MCL for arsenic is now 0.010 mg/l instead of 0.050 mg/l, and lead now has an Action Level at the tap of 0.015 mg/l instead of an MCL of 0.050 mg/l. The language in the UAO indicates that the performance standards are in effect "...unless modified in accordance with the UAO,...". Therefore, if necessary, the performance standards could be modified by modifying the UAO. However, the ROD acknowledged that the compounds whose MCLs have changed do not have completed exposure pathways. The primary water quality parameter of concern is pH. The MCL for pH has not changed since 1990. Although there have been modifications in some MCLs that the performance standards were based on, these modifications do not call into question the protectiveness of the remedy, thus it is not necessary to modify the ROD and UAO to change the performance standards.

Land use on or near the site has not changed nor have human health or ecological routes of exposure or receptors been newly identified or changed in a way that could affect the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No ecological targets were identified during the baseline risk assessment and none were identified during the five-year review. All sediment and surface water samples analyzed found

no contamination of wetlands or surface water. No weather-related events have affected the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

#### VII. Issues

Submittal of quarterly monitoring data by the responsible party to EPA had been sporadic. Data are now submitted on a regular basis after this issue was brought to the attention of the responsible party.

#### VIII. Recommendations and Follow-up Actions

The recommendations at this time are to maintain the low water levels in the sump to provide inward gradients and to continue monitoring groundwater elevation and quality on a regular basis.

#### IX. Protectiveness Statement(s)

The remedy at the LPCC is protective of human health and the environment, exposure pathways that could result in unacceptable risks are being controlled.

#### X. Next Review

The next five-year review will be conducted five years after the completion of this review and will be due in September 2007.

#### Attachments:

- Site Maps

- Tables and Figures Documenting Remedy Performance and Changes in Standards

- Trip Report

- Appendix

  - Comments received from Support Agencies and/or the community

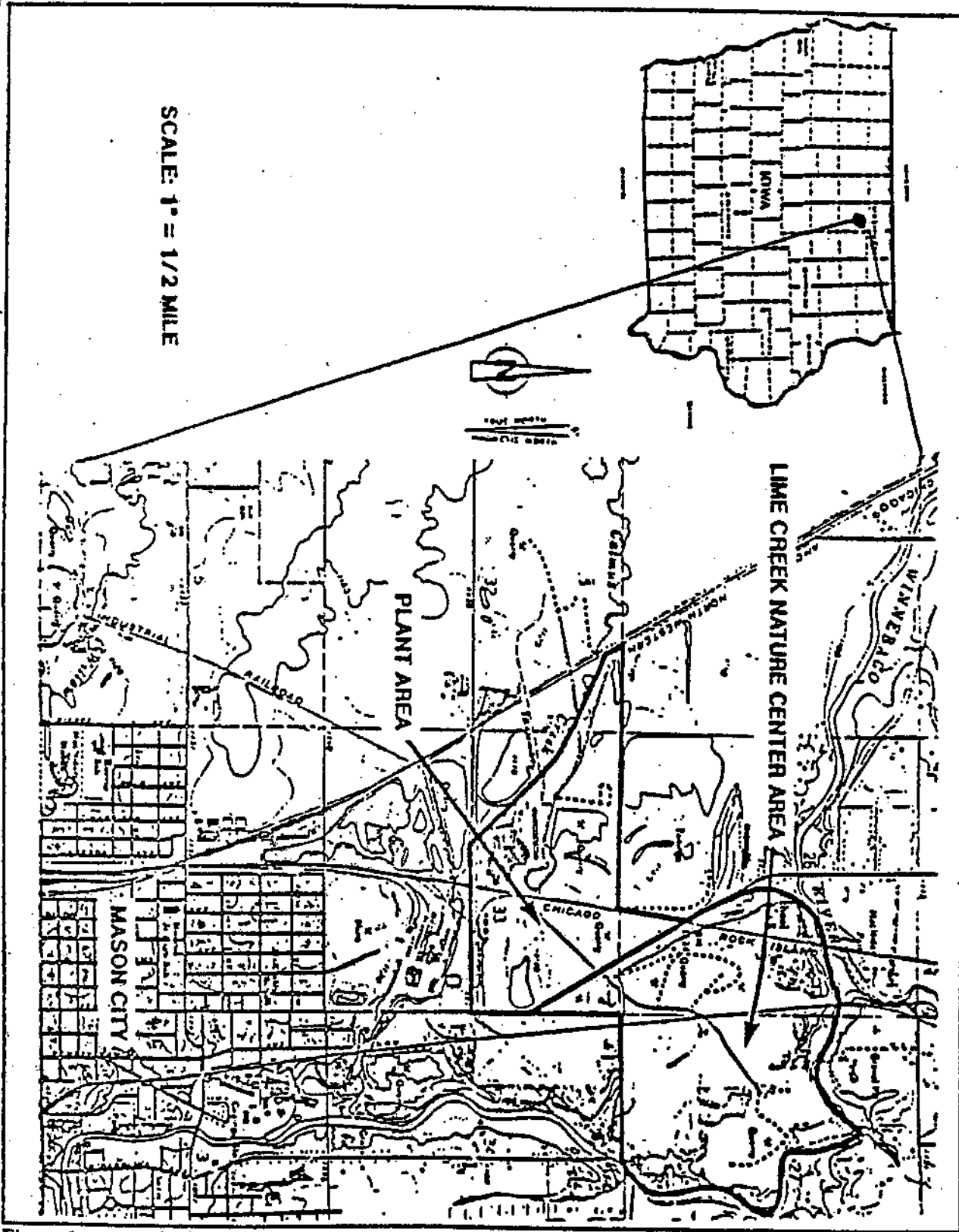


Figure 1: Site Location Map



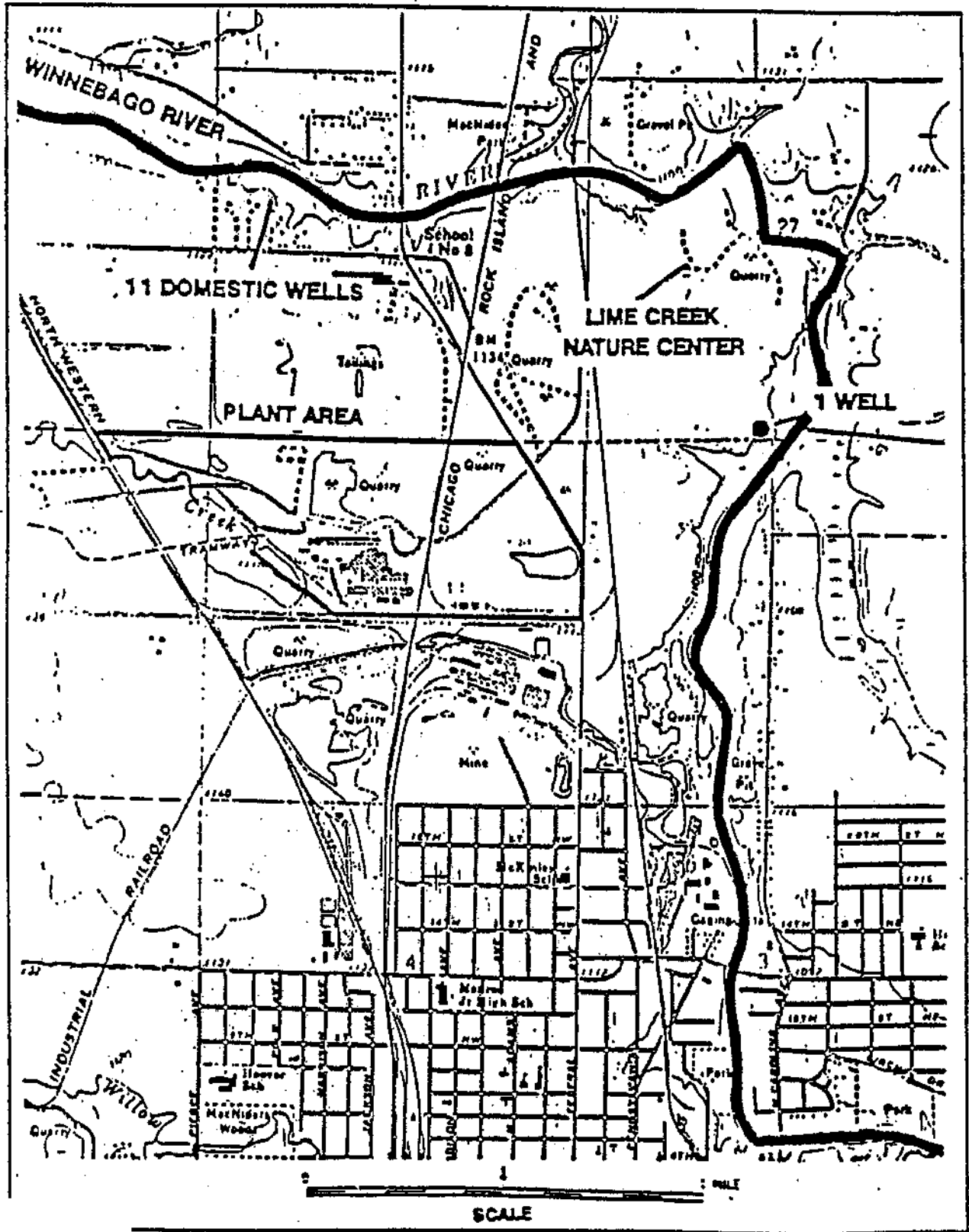


FIGURE 2 Location of Domestic Wells

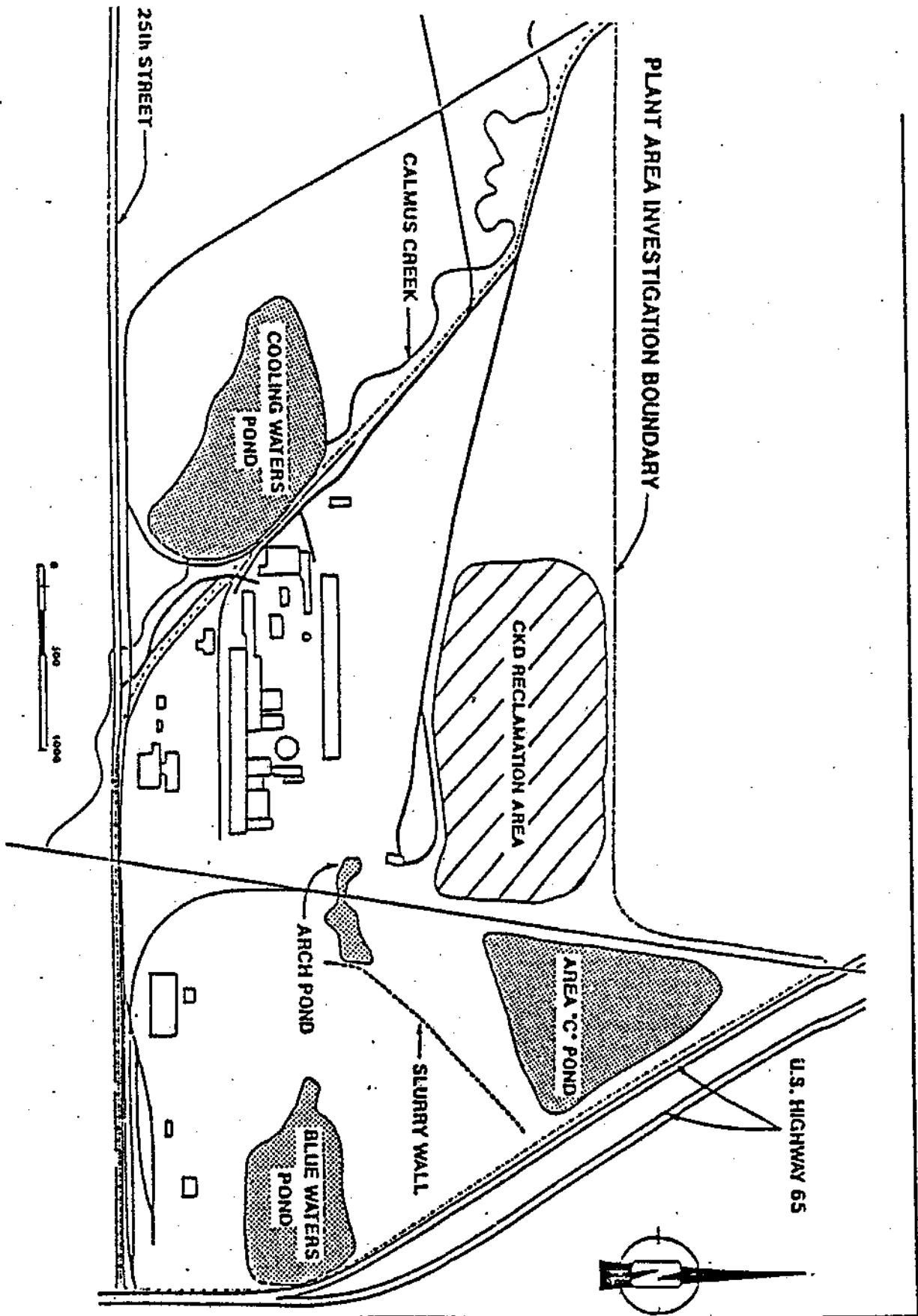


FIGURE 3 Site Features, Lehigh

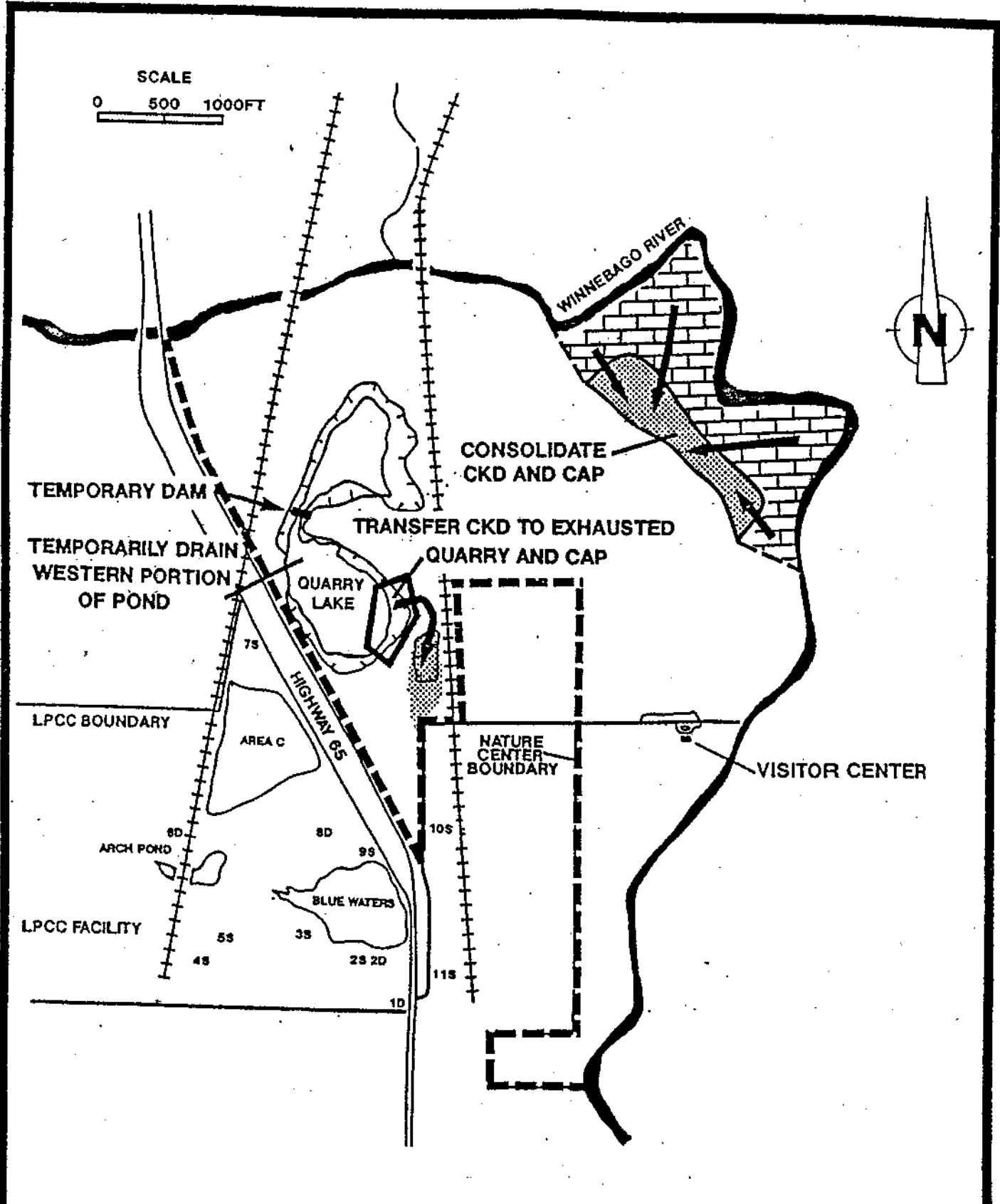


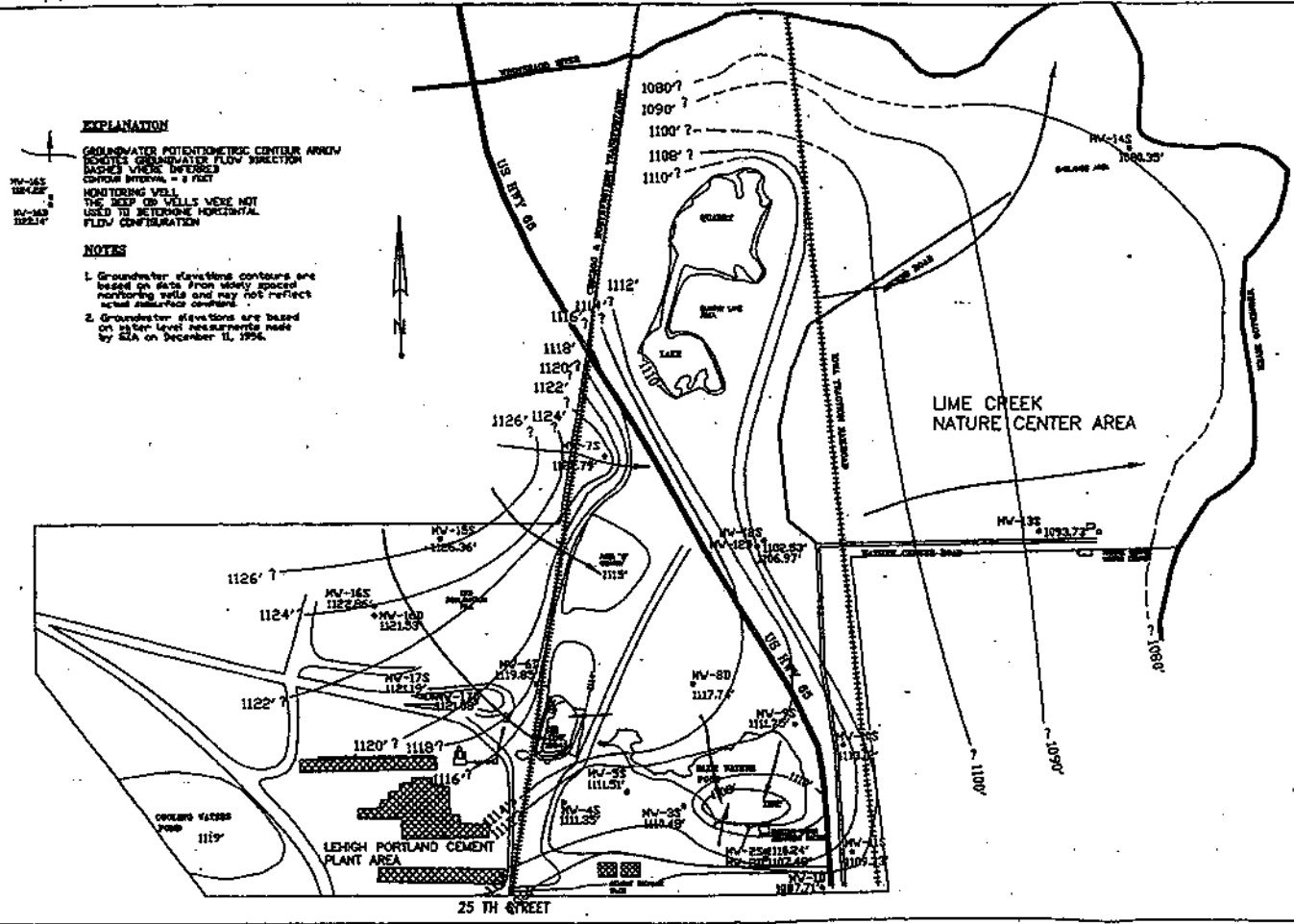
FIGURE 4

**Layne** GeoSciences, Inc.

A Subsidiary of LAYNE-WESTERN COMPANY, INC.

**RECOMMENDED REMEDIAL ACTION**  
**LIME CREEK NATURE CENTER**  
**MASON CITY, IOWA**

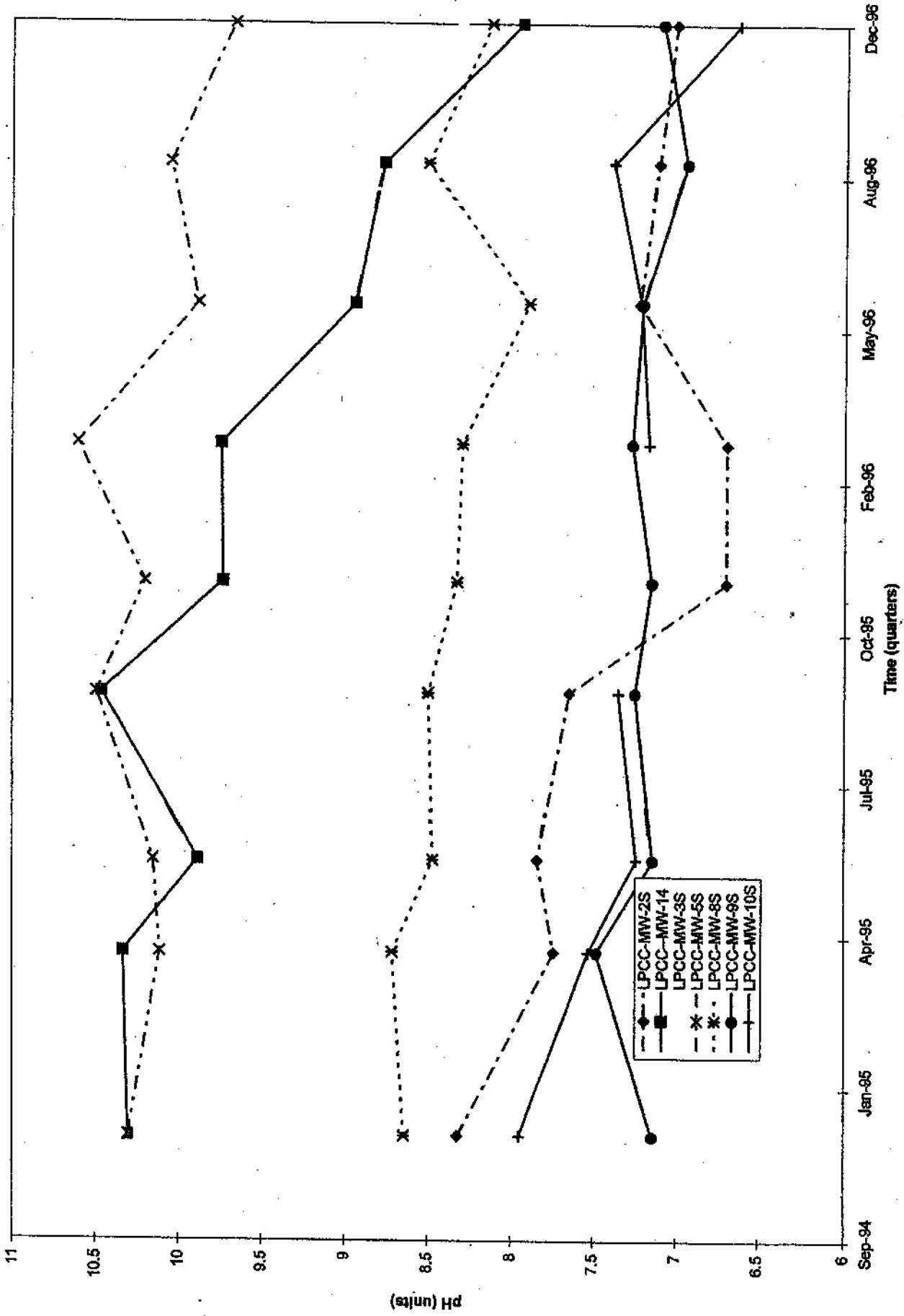
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	1-25-94	Approved by:	MB	"	



PREPARED BY: GZA CHECKED BY: GZA REVIEWED BY: GZA DATE: 11/7/96	DRAWN BY: GZA DATE: 11/7/96
SCALE IN FEET 0 750 1500 APPROXIMATE	
EHIGH PORTLAND CEMENT COMPANY MASON CITY, IOWA GROUNDWATER FLOW MAP DECEMBER, 1996	
GZA Geoscientists & Environmental, Inc.	

FIGURE 5

**FIGURE NO. 6**  
**pH Decrease Over Time in Selected Wells**  
**Lehigh Portland Cement Company**  
**Mason City, Iowa**



MEMORANDUM

DATE: May 13, 2002

FROM: Victor Walkenhorst, SEE Program, MOKS Branch

TO: Paul Roerman, RPM, MOKS Branch  
Steve Kovac, Chief, MOKS Branch  
Verne Stuessy, Plant Manager Lehigh Cement Company  
David Eckhardt, Environmental Affairs Coordinator, Lehigh Cement Company

SUBJECT: Report of Site Inspection Trip, Lehigh Portland Cement Company Site,  
Mason City, IA

Travel from Kansas City, Kansas to Mason City, Iowa was completed on Wednesday, April 25, 2002. Paul Roerman, Remedial Project Manager(RPM) had previously contacted Verne Stuessy, Leigh Plant Manager to arrange a site review meeting with Verne Stuessy. However, Vern Stuessy was not available April 24, 25, or 26. He suggested that a meeting be arranged with David Eckhardt, Environmental Affairs Coordinator (EAC), Lehigh Portland Cement Company

David Eckhardt was not available to tour the site on Thursday, April 26. I suggested that we meet at 8:00 am on Friday, April 26, 2002 at the Lehigh Plant main office. He agreed with this time and date. Dave Eckhardt also made arrangements with Steve Molstad, Charleson Excavators, the maintenance contractor for Lehigh, to be available on Thursday, April 26 at 8:00 am to meet with the Environmental Protection Agency (EPA) representatives to review the CKD caps on Leigh property and the CKD caps on Lime Creek Nature Center (LCNC) property on the east side of US Highway 65.

Steve Molstad and I met at 8:00 am on Thursday morning at the Lehigh office building. We inspected the CKD capped areas on the plant property and then traveled to the LCNC and inspected the CKD capped areas at the Nature Center. The Lime Creek Nature Center is owned and maintained by the county as a public outdoors viewing area.

The CKD Reclamation cap, the Area "C" cap, the Arch Pond Basin, and the Blue Waters Pond areas are all on Leigh Plant property and were all inspected. The vegetation on the CKD cap and the Area "C" area are all in good condition. The steep slope on the Area "C" cap requires repair maintenance caused by surface water drainage from the steep slope down to the edge of the cap at the floor of the quarry area.

The rock filled drainage ditches, on the CKD Reclamation Cap have too much vegetation growing in the drainage area. This will require an application of weed killer to eradicate the grass and weeds in the rock ditches. Steve Molstad commented that additional rock will be placed this year to increase the width and length of some of the drainage ditches. The activity at the rock crusher building area has been decreased and the potential of piled rock being pushed

onto the cap area has been reduced.

The sediment that accumulates in the area at the arch under the railroad tracks at the west end of the Arch Pond Basin, has been cleaned out and the dam to create a pond under the railroad arch has been repaired. The surface water flowing from the plant area is held back at this area to let the sediment settle out of the surface water before the sediment is carried into the Arch Pond Basin and settles in the Arch Pond Sump.

The northwest portion of the capped CKD Reclamation Area is at the edge of the surplus storagets area. Since there is no physical barrier at the edge of the capped CKD Reclamation Area, at times the equipment used to move the surplus parts is driven onto the capped area. Also at times surplus equipment is placed on the cap. This is one area where the cap could be damaged by equipment being driven on the cap and surplus parts being stored on the cap. This condition has been a concern since the cap was completed and surplus parts stored in this area.

The bottom elevation of the Arch Pond sump has been excavated deeper to place the extraction pump at a lower elevation. The standing water from the Blue Waters pond now drains into the Arch Sump. The extraction pump in the Arch Pond Sump pumps the water from the sump to the new Treatment Building where the water is monitored and carbon dioxide treatment is added to treat the water as required by the Iowa Department of Natural Resources (IDNR). The treated water is then pumped through the discharge pipeline through the original Treatment Building, where the water is again monitored, and the pumped water flows through the pipeline to the Winnebago River.

The excavated rock from the ditch from Blue Waters Pond Basin to the Arch Pond Basin was placed along the edge of the excavated ditch to an approximate height of 15 feet. Lehigh is planning on removing this high rock pile and placing it on the floor of Blue Waters Pond

The cap inspection continued to the Lime Creek Nature Center (LCNC). The review of the capped CKD areas at the Quarry Lake Area, the Southeast Badlands Area, and the Northwest Badlands Area was completed. These capped areas all were in very good condition. The vegetation on all the caps is mowed once per year, usually in late May or early June. These capped areas did not show evidence of erosion from the flow surface water drainage down the slopes.

Dave Eckhardt and I had a closeout meeting on Friday Morning. We discussed the tour of the CKD capped areas that I had with Steve Molstadt on Thursday. Dave Eckhardt agreed that the cap vegetation required cutting as soon as weather permitted and that maintenance work was required at the rock filled drainage ditches on the CKD Reclamation Area. He also agreed that the operation of the surplus parts storage area did at times encroach on the cap area. Also, Lehigh management was considering removing the rock pile at the Blue Waters Pond area but no funds were available at this time.

This completed my site inspection of the CKD capped areas at the Lehigh Cement Plant, Mason City, Iowa. My return trip to Kansas City, Kansas was completed on Friday, April 26,

2002.





## STATE OF IOWA

THOMAS J. VILSACK, GOVERNOR  
SALLY J. PEDERSON, LT. GOVERNOR

DEPARTMENT OF NATURAL RESOURCES  
JEFFREY R. VONK, DIRECTOR

September 16, 2002

Paul Roemer  
Remedial Project Manager  
Superfund Division  
U.S. Environmental Protection Agency  
Region VI  
901 North 5<sup>th</sup> Street  
Kansas City, KS 66101

RE: First Five-Year Review  
Lehigh Portland Cement Superfund Site  
Mason City, Iowa

Dear Paul:

We have reviewed the draft Five-Year Review Report for the Lehigh Portland Cement Superfund Site that you e-mailed to me on September 3, 2002. As I have informed you by phone, this department concurs with the findings and recommendations of the report.

Please feel free to call me at (515) 281-8900 if you have any questions.

Yours truly,

A handwritten signature in cursive script that reads "Bob Drustrup".

Bob Drustrup  
Contaminated Sites Section

cc: Cal Lundberg, Supervisor, DNR Contaminated Sites Section  
Jeff Vansteenburg, DNR Field Office #2

