GROWING GREENER INNOVATIVE TECHNOLOGY GRANT

I. PROJECT SUMMARY/OVERVIEW

The Elk Lake School District applied for an Environmental Stewardship Watershed Protection Grant (Growing Greener) in December of 2000 to solve elevated levels of ammonia/nitrogen in the sewer lagoon system during the cold months of the school year.

The district has tried a number of ways to meet the ammonia/nitrogen requirements. One such method was to install the KLV Aeration Monitoring Boat System in 1992 to keep the ammonia/nitrogen counts to acceptable levels. This system was designed to keep the bacteria as active as possible in the lagoon. This was not an effective remedy and the system was deactivated in the spring of 1999.

After exploring other technologies to come under compliance, the district decided on Lemna Technologies, Inc. of St. Paul, Minnesota. Their system of covering the lagoon proved successful in cold weather states such as New Hampshire, Minnesota and New York. The technology is designed to keep the existing lagoon warm enough to allow the proper bacteria action on the sewage. This in turn reduces cold weather nitrate discharge from existing lagoon type sewage treatment plants to acceptable DEP levels.

The following timeline was followed in the grant process:

April 9, 1999	Preliminary Lemtic Module Cover System Proposal for Elk Lake School Wastewater Lagoon.
December 13, 2000	Three copies of application for Growing Greener Grant sent to Mr. Tony Maisano, Department of Environmental Protection.
June 5, 2001	Notification by David Hess, Secretary, Department of Environmental Protection the district project proposal for a floating module was approved.
July 16, 2001	Board approval to submit the Environmental Stewardship Watershed Protection Grant to the Department of Environmental Protection.
August 15, 2001	Growing Greener – Agreement for Environment Stewardship and Watershed Protection Program Grant. Signed and sent to the Department of Environmental Protection.
September 25, 2001	Official Notice to Proceed with work on Growing Greener New or Innovative Technology project.
November 1, 2001	Department of Environmental Protection received organization's Compliance Review Form STD 21(B).

December 26, 2001	Environmental Stewardship/Watershed Protection Status report stating working drawings and specifications are complete. We expect to receive bids in January 2002.
January 29, 2002	Bids were received and opened.
February 6, 2002	Awarding the contract to the low bidder, Chenango Contracting for the total price of $132,495.00. Recommend additional insulation to keep in more heat to cover the low or no flow on weekends and Christmas break.
February 18, 2002	Awarding of Contract to Chenango Contracting for lagoon cover for Sewage Treatment Plant for Elk Lake School District.
March 25, 2002	Project Status Report was filed stating the working drawings and specifications are complete. Bids have been received and contract awarded.
June 28, 2002	Project Status Report was filed stating the lagoon cover was installed and all work is complete.
June 28, 2002	Requests for reimbursement from the Department of Environmental Protection.

II. WATER/WASTEWATER CHARACTERISTICS AND FLOWS

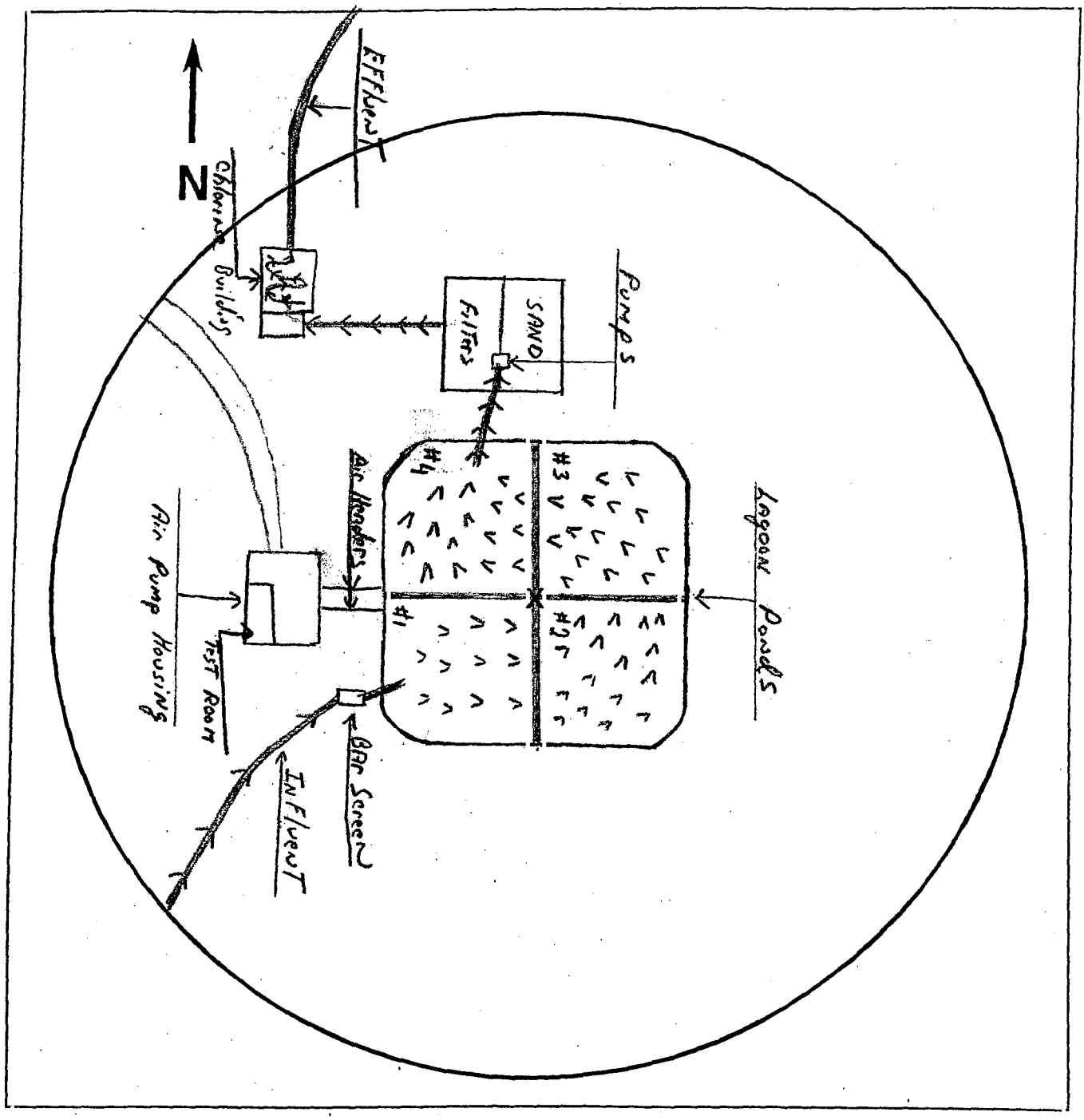
The Elk Lake School District wastewater plant only measures the effluent end of the process. The average PH count range for 2002 was 7.74 and the average for 2003 was 7.50. Our fecal coliform count has always been zero. The biological oxygen demand (B.O.D.) has averaged out at 5.04 for the year 2002-2003. The total suspended solids (T.S.S.) have been maintained at 2.00 for the past 2 sampling years. The average daily flow to the plant is usually around .015 gallons with peak days being when activities occur after school hours.

The number of plant effluent connections is five. Two are from the primary center, two are from the secondary building, and one is from the Susquehanna County Career & Technology Center. All of which are 12" concrete piping, gravity fed.

The district has experienced much success with the current lagoon cover system. The chart below indicates the levels of ammonia/nitrogen the district has experienced as well as the acceptable state requirements.

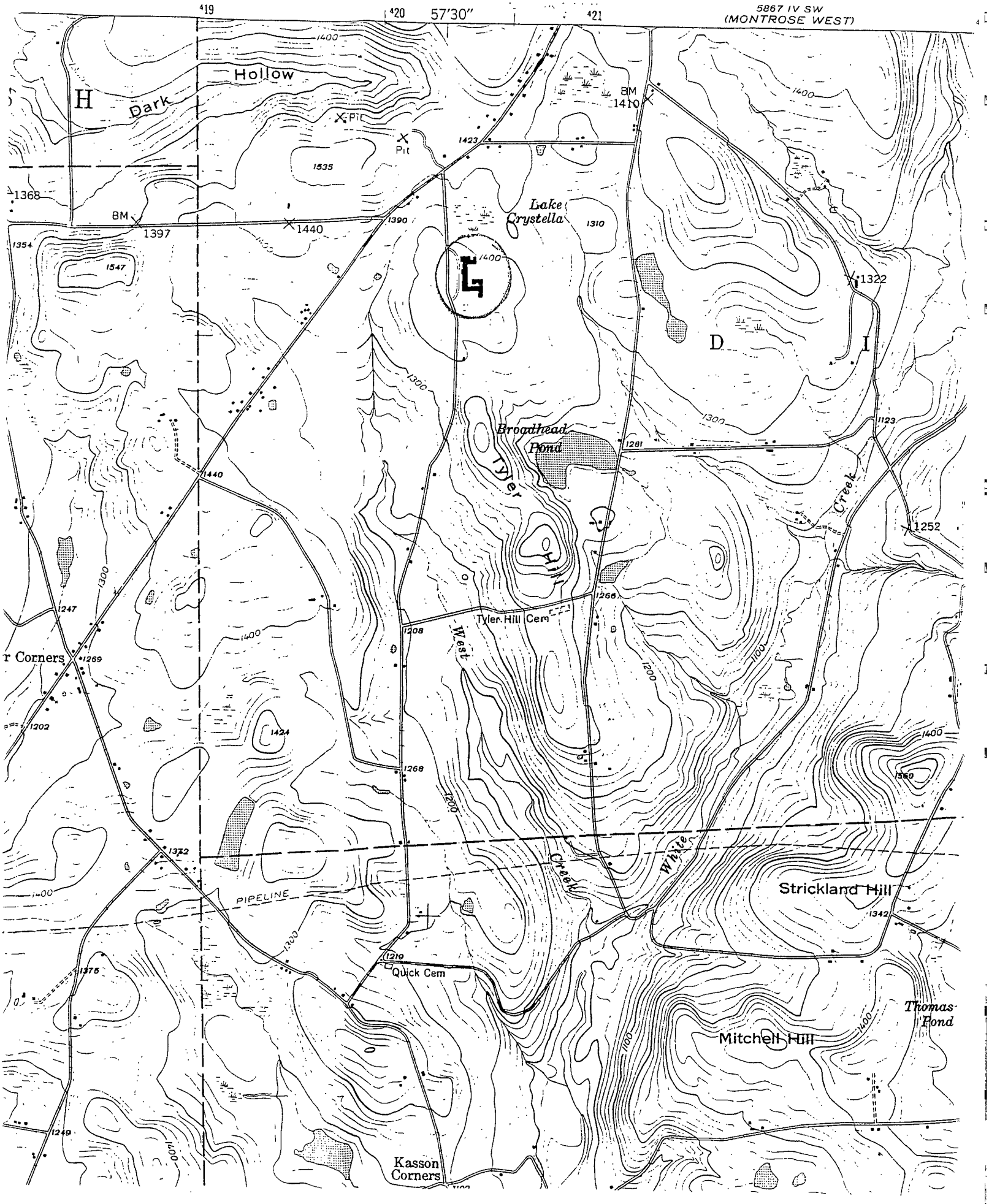
Ammonia/ Nitrogen	November	December	January	February	March	**State Requirements**
2001	0.93	8.82				**13.5**
2002 (Installation)	4.08	10.50	32.75	31.10	11.40	
2003	1.96	30.75	11.85	15.85	23.70	
2004			12.90	6.76		

Also attached is a picture of a Site Map and Topographical Map of the sewer lagoon and surrounding area.


N
Effluent
Chlorine Building
Filters
Sand
Pumps
Air Headers
#4
#3
#1
#2
Lagoon Ponds
Air Pump Housings
Test Room
Bar Screen
Influent
Scale (ft.)
0
800

Site Map

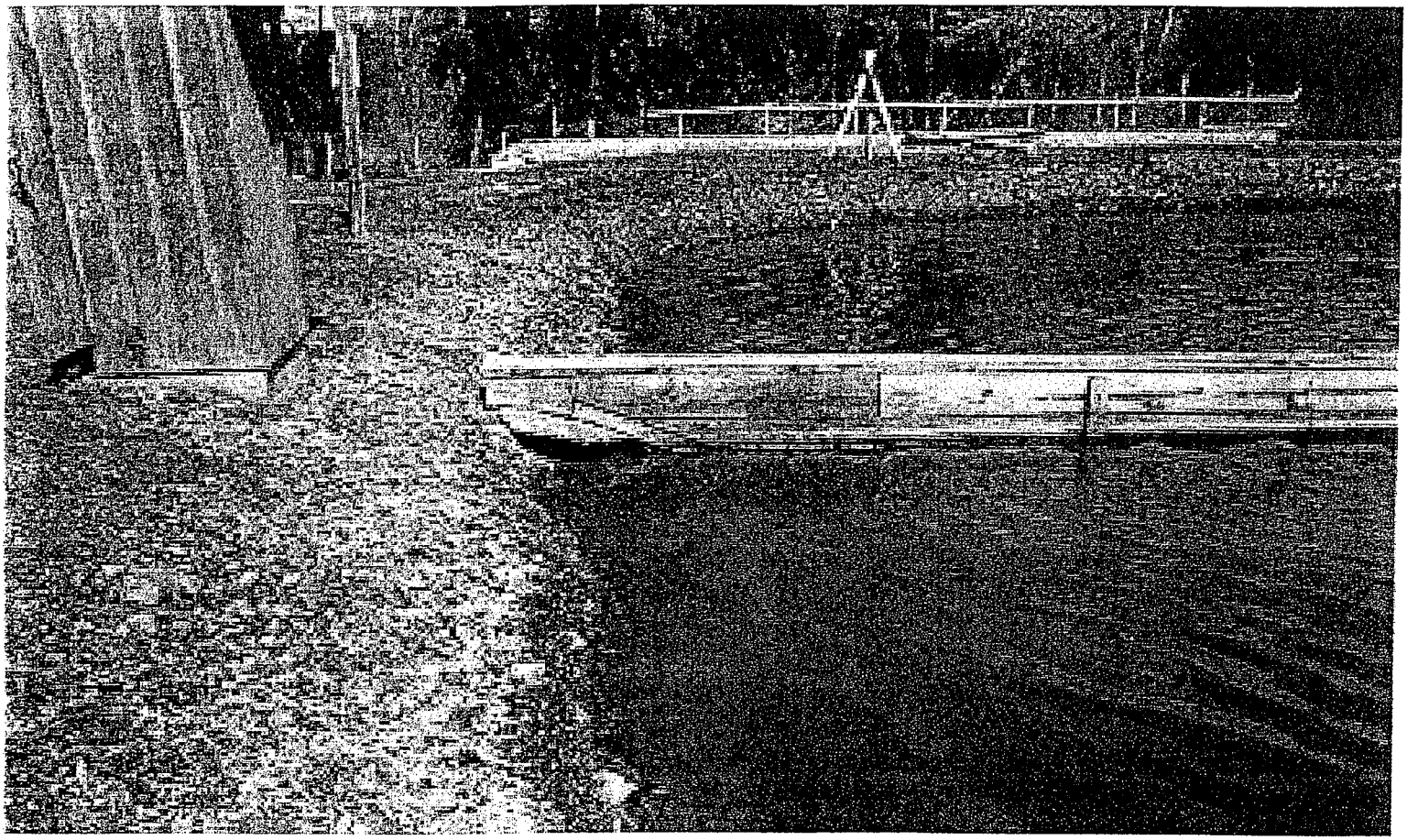
INTERIOR
JRVEY



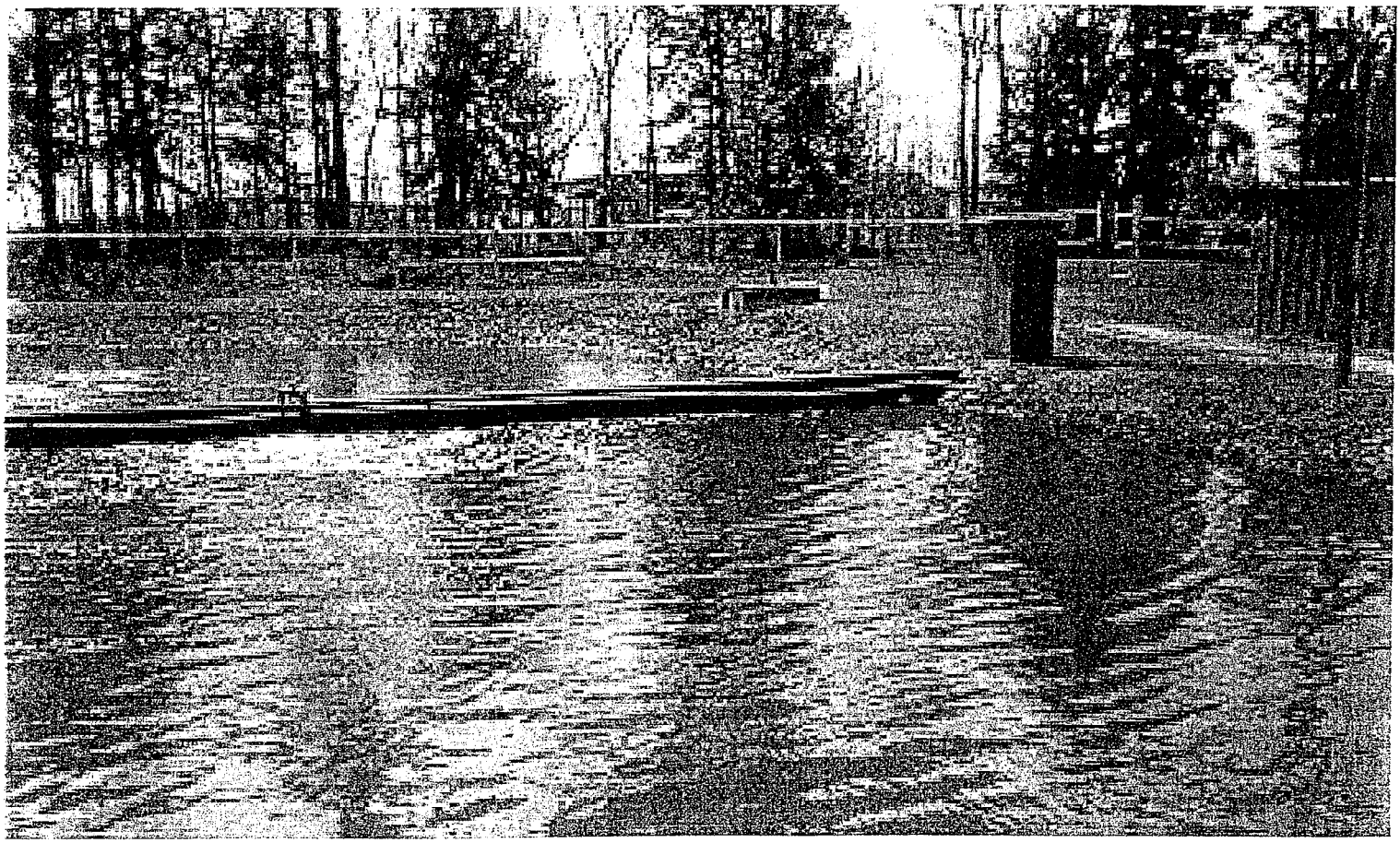
III. SITE DESCRIPTION

When the school district was built in 1957, its sewer system consisted of a series of sewer tanks and fields located near the high school building. As the district continued to grow throughout the 1970's, plans were developed in 1976 to add a primary center. In following state guidelines and requirements, the existing lagoon system was completed with the opening of the primary system in the fall of 1979. The system was designed to include the entire school district, but it has only utilized approximately 50% of its capacity.

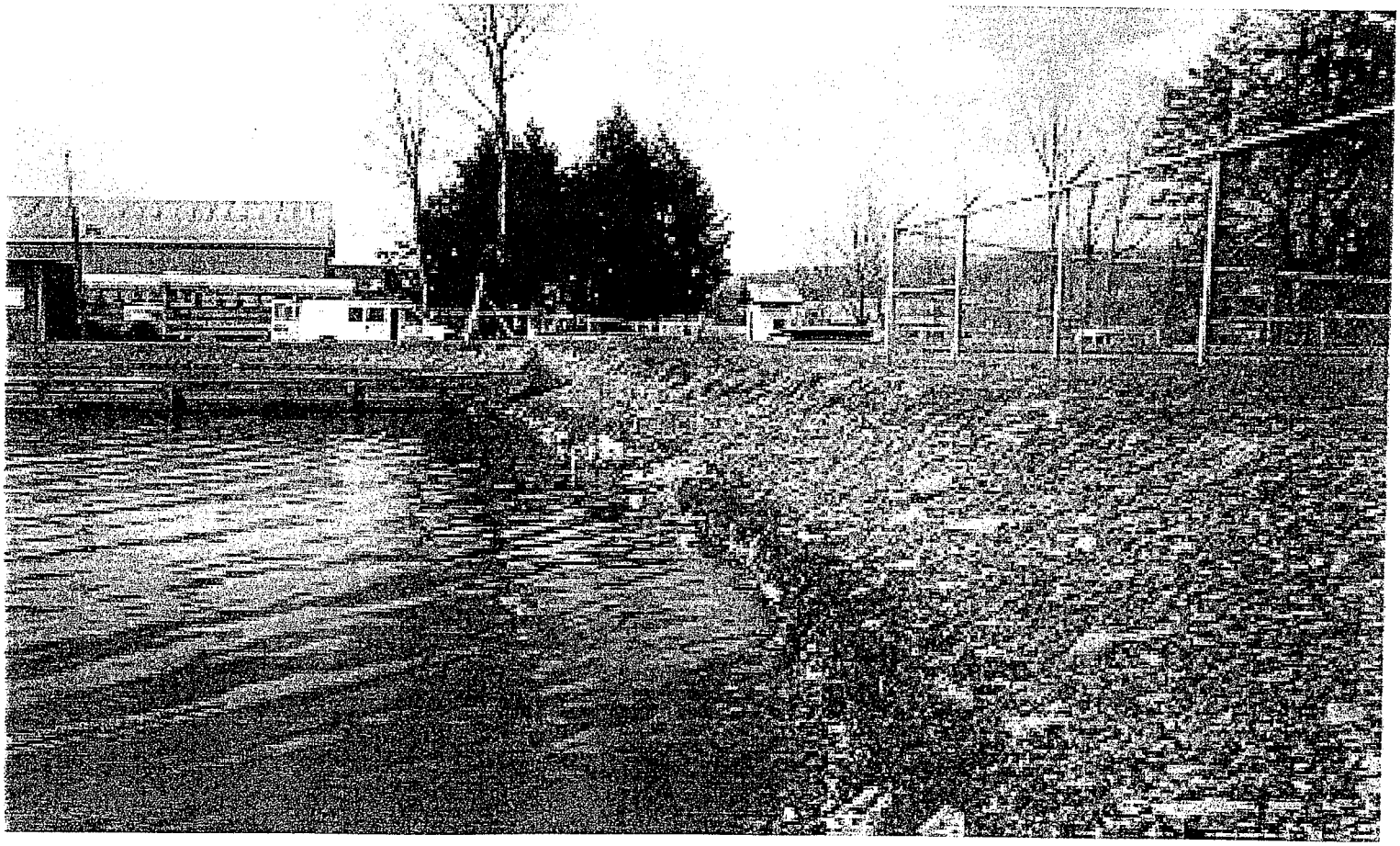
Once the lagoon system was installed the district had difficulty meeting the state requirements for ammonia/nitrogen levels. Attached are pictures of the existing lagoon system and after Lemna Technologies Lagoon Cover System was installed.



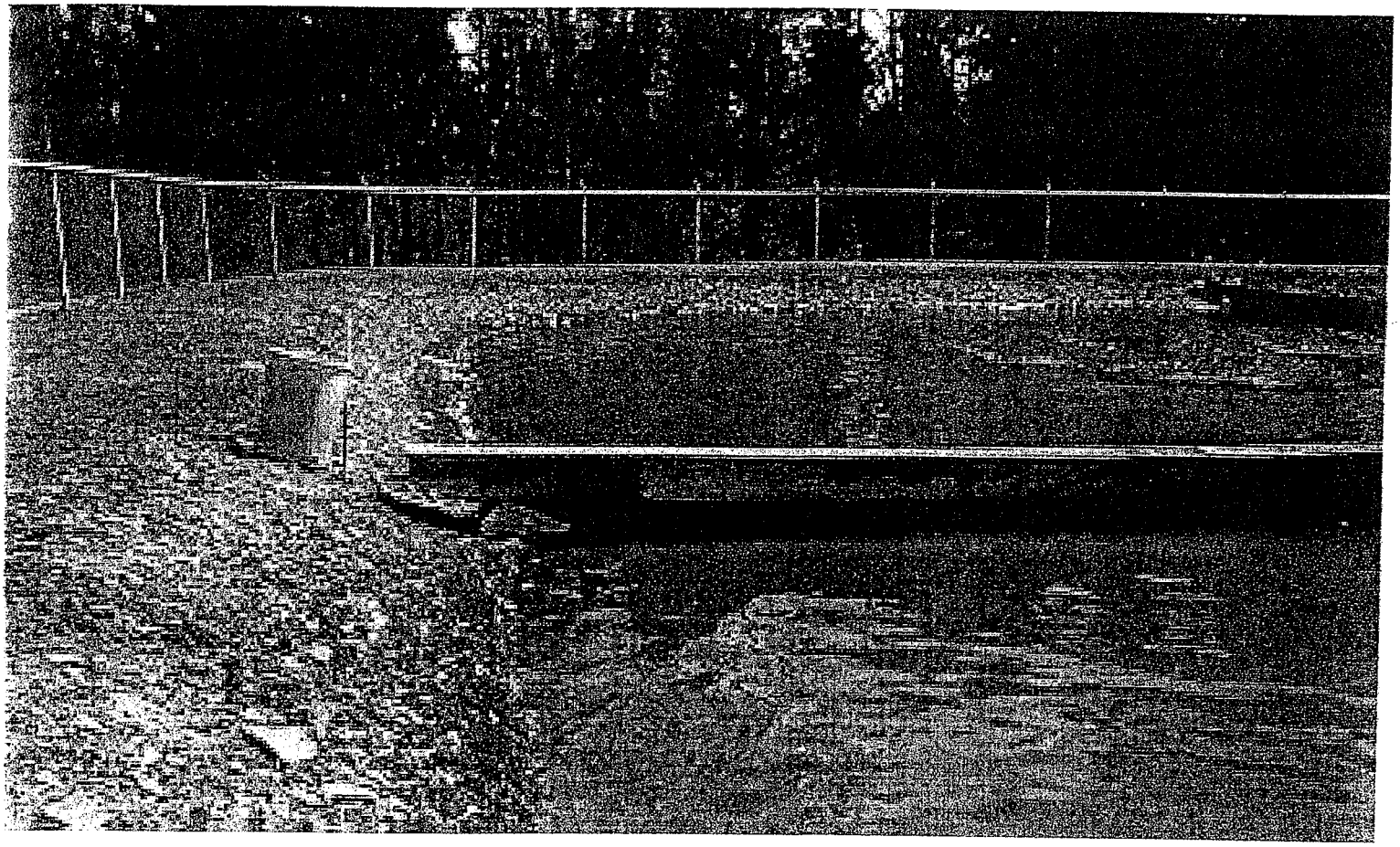
Lagoon Cover, Elk Lake School
Before Picture
Grant agreement # 351022



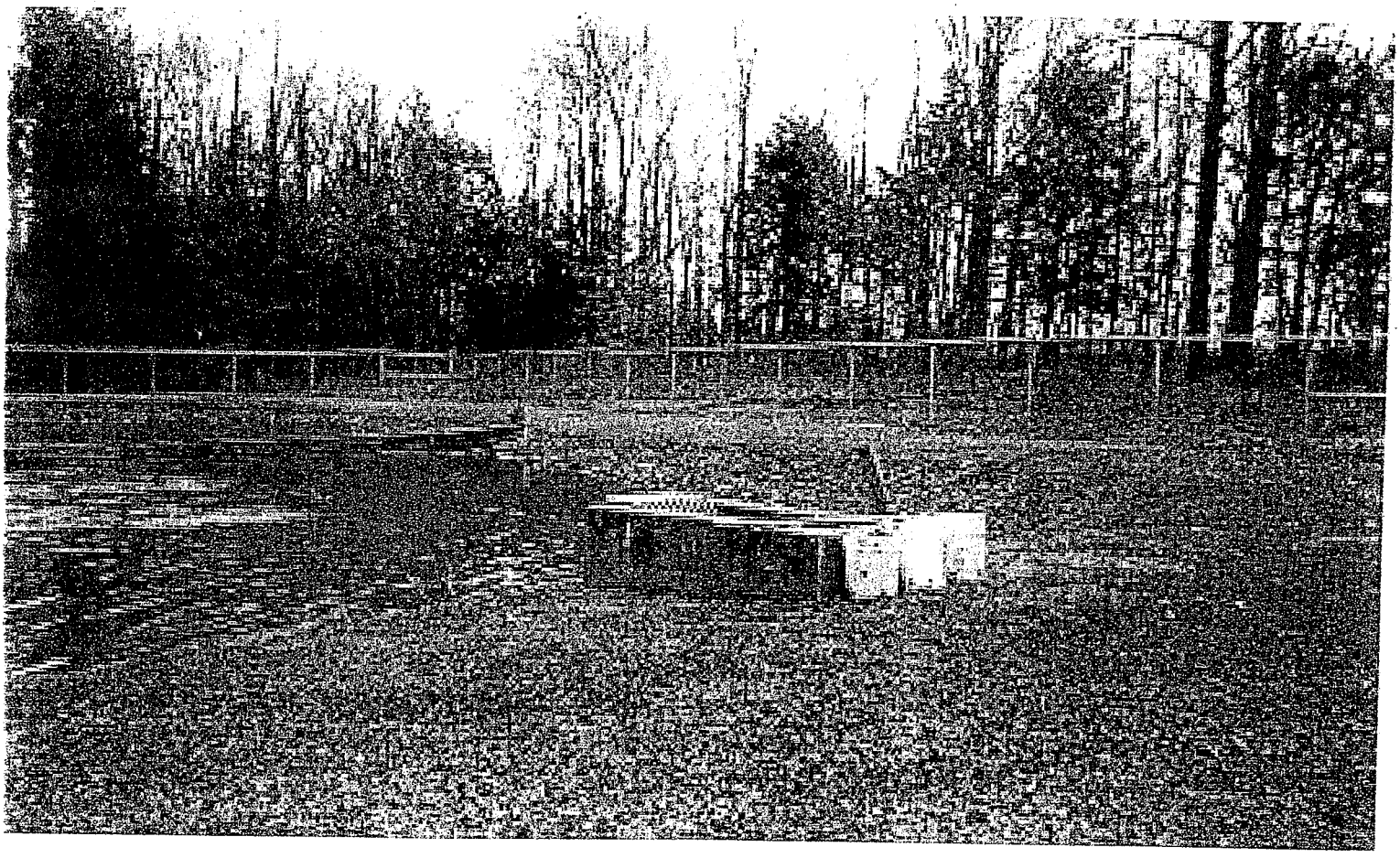
Lagoon Cove, Elk Lake School
Before Restore
Grant agreement # 351022



Lagoon Cover, Elk Lake School
Before Pictures
Grant Agreement # 351022



Lagoon Cover, Elk Lake School
Before Restore
Grant Agreement # 351022



Lagoon Cove, Elk Lake School
Before Picture
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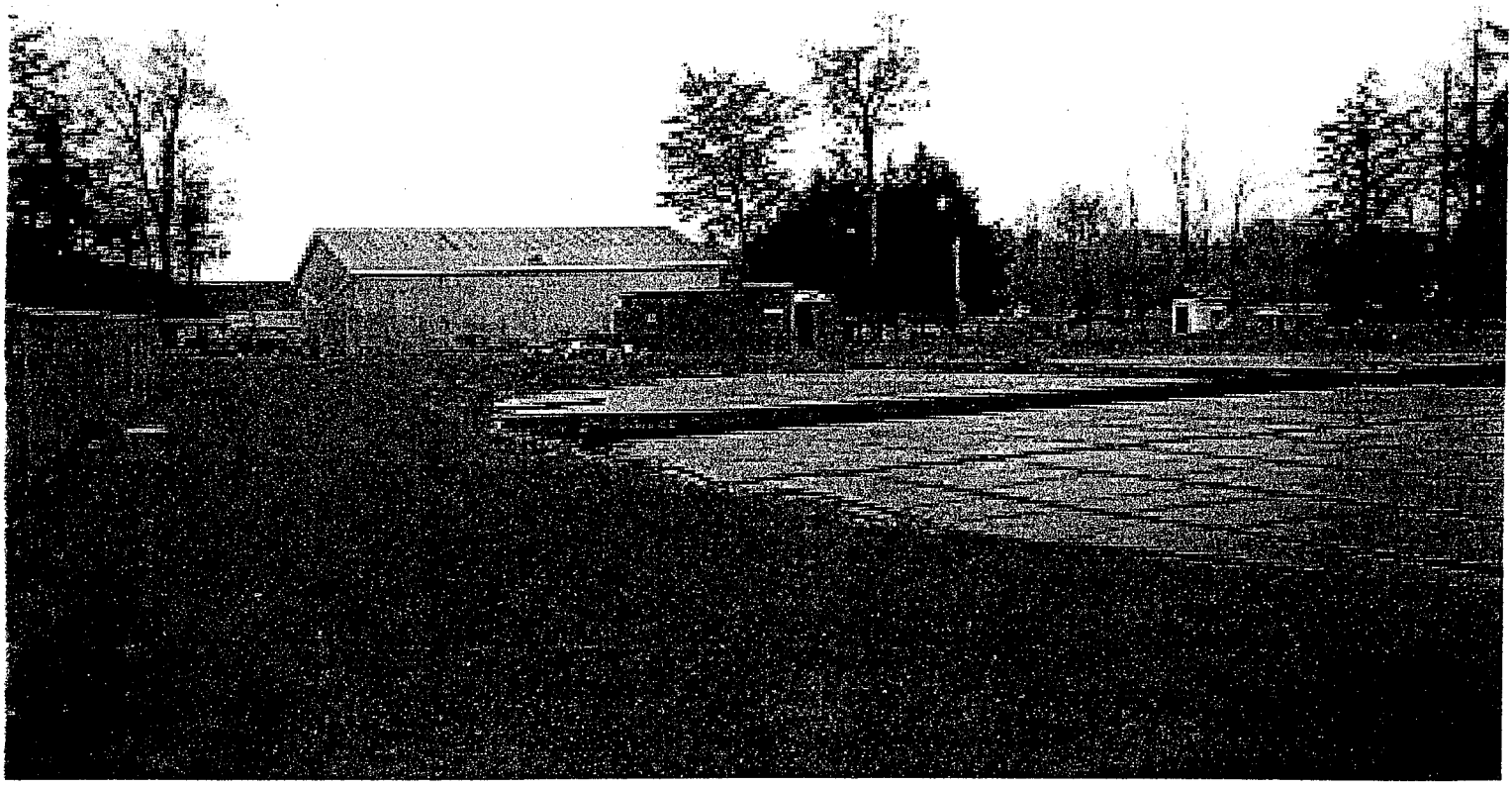

Lagoon Cover, Elk Lake School
after Picture
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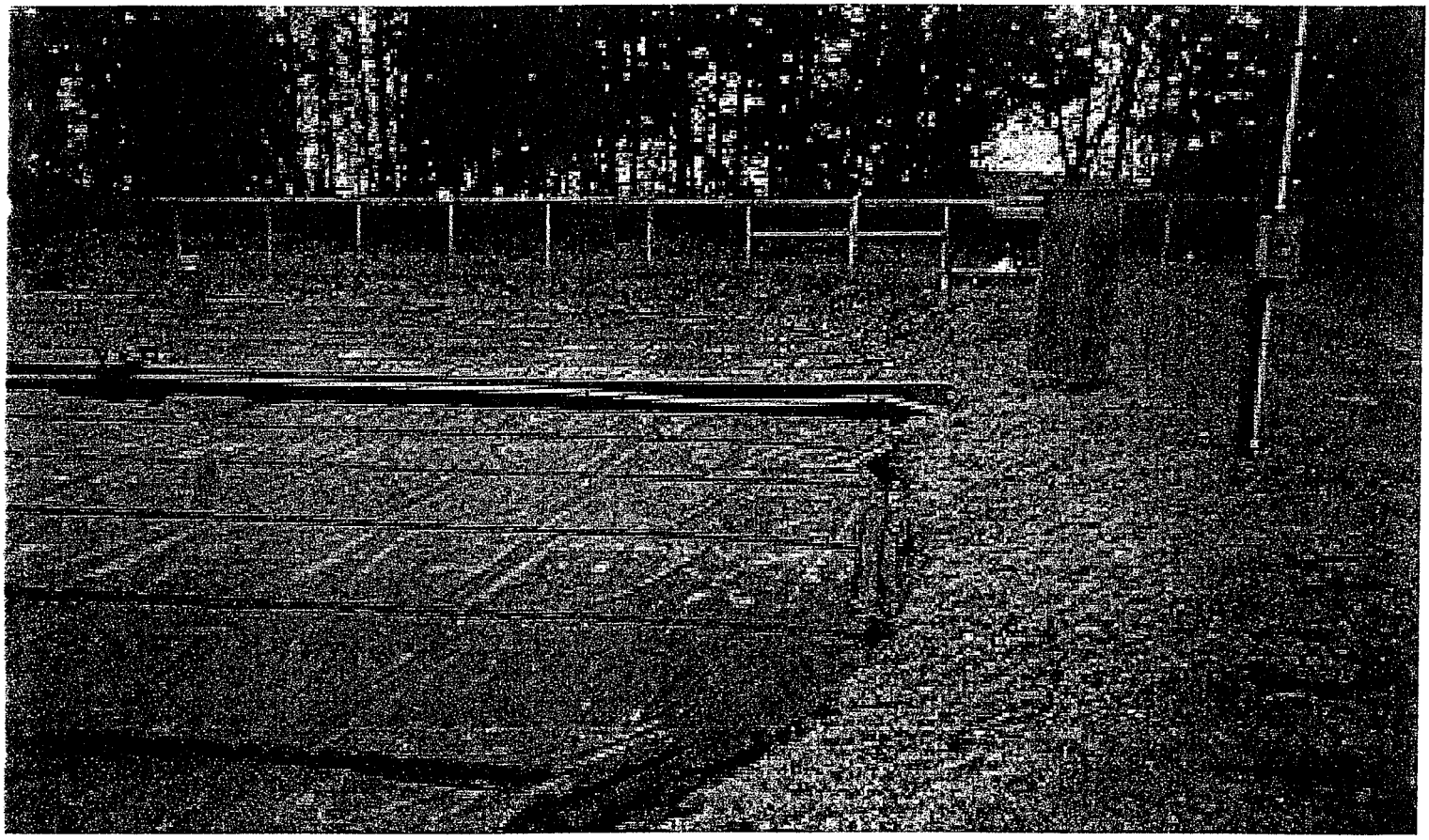
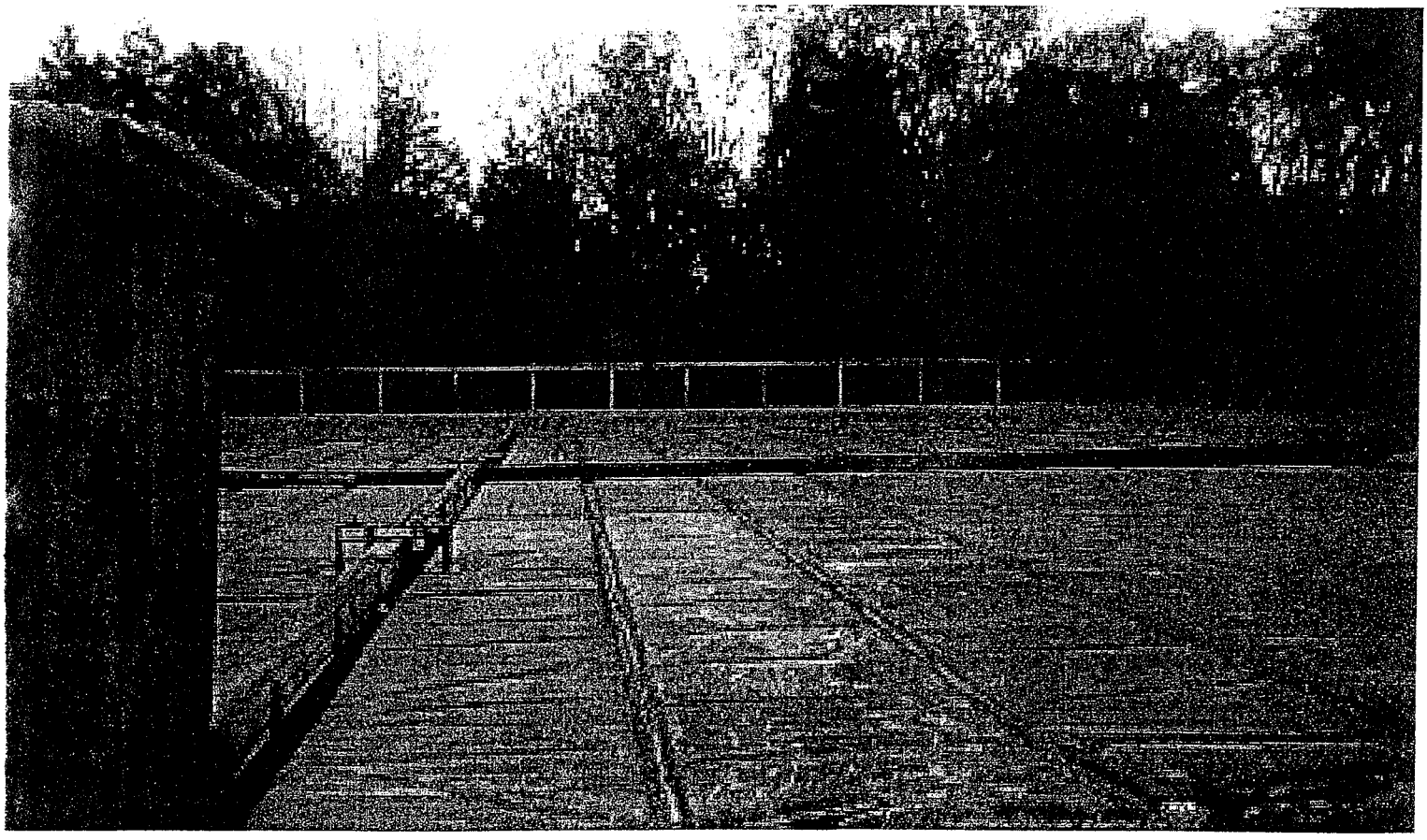
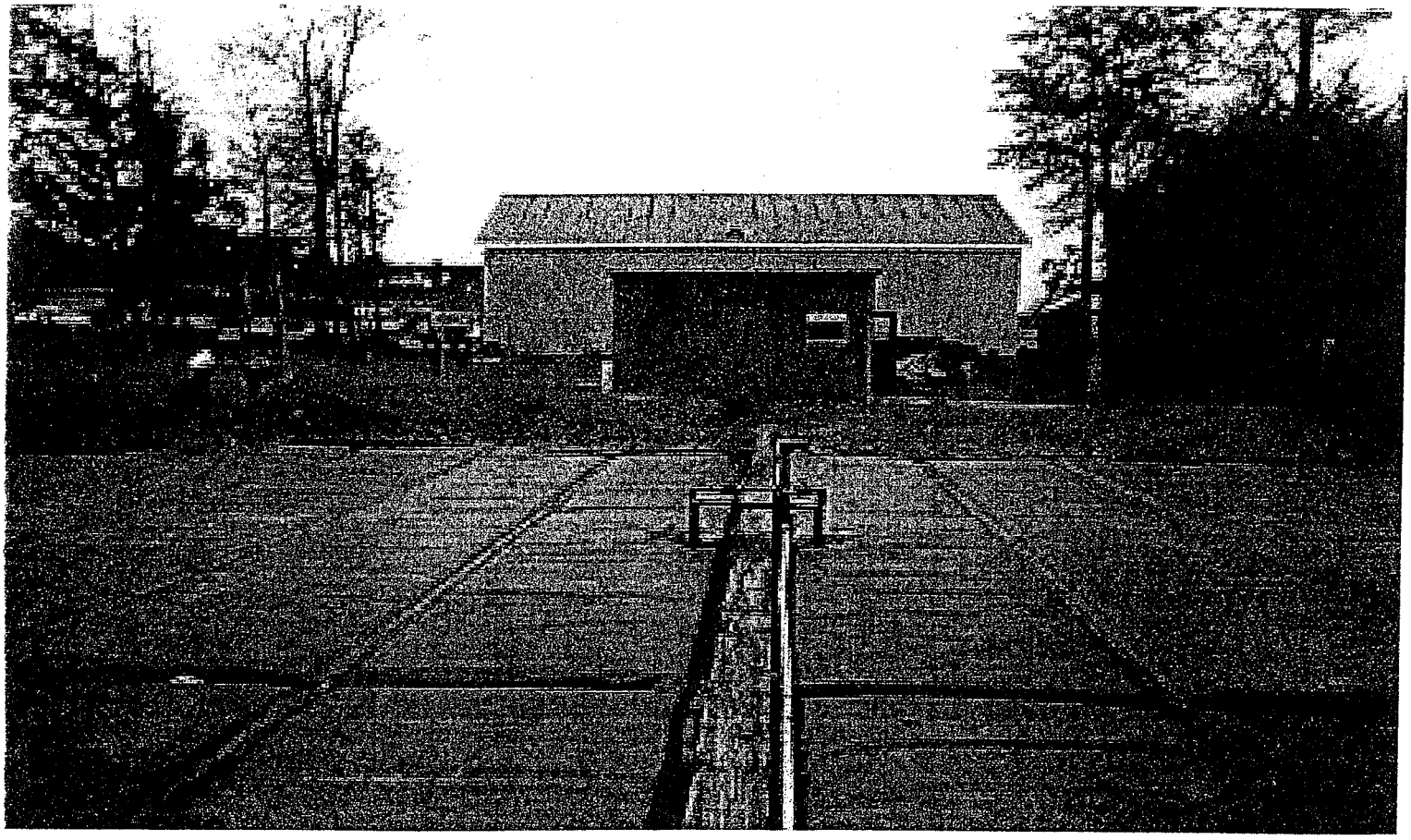


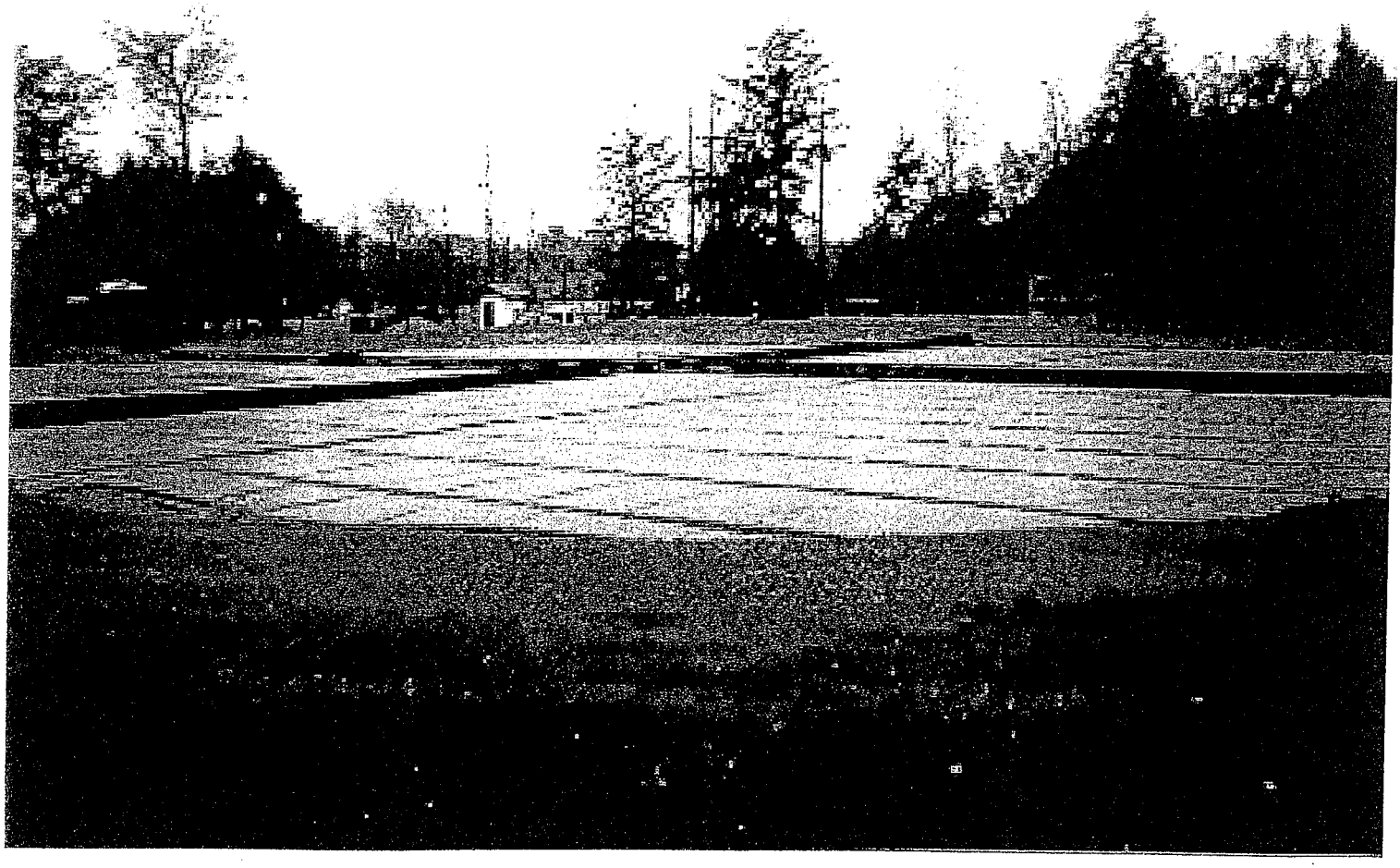
Lagoon Cover, Eek Lake School
after Picture
Grant Agreement # 351022



Lagoon Cover, Elk Lake School
after Rectore
Grant agreement #351022



Lagoon Cover, Elk Lake School
after Restore
Grant Agreement # 351022



Lagoon Cover, Eek Lake School
after Picture
Grant Agreement # 351022

IV. INNOVATIVE TECHNOLOGY DESCRIPTION

The district wrote for a Growing Greener Grant that was accessible to all school districts to remedy the long-standing problem of elevated levels of ammonia/nitrogen.

A lagoon cover was installed by Lemna Technologies to keep the temperature of the lagoon elevated to reduce the high levels of ammonia/nitrogen during the coldest months (December, January and February) of the year.

The district benefited from the installation of the lagoon cover system, although there are still some months in which the ammonia/nitrogen levels are elevated beyond state requirements.

The lagoon cover encloses the current sewer lagoon system. This keeps the lagoon water temperature high enough to allow the bacteria to continue to work during the cold weather months.

The overall benefit of this project was to bring the district into state compliance regarding ammonia/nitrogen levels.

I. INTRODUCTION

The LemTec™ Modular Cover System utilizes a patented floating modular cover comprised of individual casings of closed-cell insulation sealed between two sheets of durable geomembrane. This cover system shields the water column from sunlight to prevent algae growth, controls odors, and provides an insulated environment for heat retention to enhance biological reaction rates. This warmer environment provides conditions conducive to the reduction of biochemical oxygen demand (BOD) and total suspended solids (TSS).

The LemTec Modular Cover System will provide several benefits to the Elk Lake School including:

- **Odor Control**: Odors normally result from transmission across the air/water interface. The LemTec Modular Cover System eliminates the air/water interface and blocks the transmission of odors.
- **Installation**: Installation of the LemTec Modular Cover System requires few people and minimal equipment, and can be installed with the basin full or empty. No field welding is required since the LemTec Modular Cover System is assembled in a controlled environment.
- **Treatment Advantages**: The closed cell insulation design of the LemTec Modular Cover System keeps the water column at a consistent temperature, thereby promoting biological activity and in more efficient treatment.
- **Customization**: The LemTec Modular Cover System can conform to unusual pond and tank shapes, and can accommodate aerators, pumps, walkways, piping penetrations, and other such protrusions.
- **No Ballooning/Gas Pockets**: Gasses escape between the casings of the LemTec Modular Cover System, preventing the occurrence of ballooning or gas pockets.

- **No Rainwater Ponding:** Rainwater and melting snow easily pass between the individual modular cover casings; therefore, water collection and water removal equipment are not required.

This proposal includes the scope of supply and budget pricing for the LemTec Modular Cover System.

II. FACILITY DESIGN

a. Lemna Technologies was asked to design a LemTec Modular Cover System to insulate the wastewater lagoon at the Elk Lake School in Dimock, PA. Problems with winter temperatures allow the wastewater lagoon influent to be cooled during the winter months, preventing proper nitrification. Repeated NH3 samples have exceeded the State of PA limits, requiring the school to correct the problem.

b. The basin will be covered with the LemTec Modular Cover System, consisting of two sheets of 40-mil HDPE geomembrane and extruded polystyrene insulation. The LemTec Modular Cover casings will be fastened together with PVC coated stainless steel cable and will cover a total of approximately 16700 square feet.

c. Openings and hatches can also be provided upon request for an additional cost. Budget prices submitted here assume there are no openings required and no other penetrations or obstructions for the cover system to accommodate. The cover will be mounted to the shore of the basin and to the wooden baffle structure in the lagoon.

d. A basin survey, supplied by Lemna, is required in order to provide accurate dimensions for layout and fabrication of the cover system. Dimensions and locations of all anticipated obstructions and penetrations are required prior to final drawings. In order to provide the most cost-effective design, Lemna requires video and photos of the site prior to preparation of final drawings.

III. SCOPE OF SUPPLY AND BUDGET PRICING

A. Lemna Technologies, Inc. will supply the following equipment and services:
B. LemTec Modular Cover casings to cover a total of 16,700 square feet
C. Cabling and fasteners to attach the cover sections together
D. Anchoring system (posts and cable) to secure the cover to the shoreline and the internal lagoon wooden baffle.
E. Layout and fabrication of the cover system
F. Basin survey (to provide accurate dimensions)
G. Installation supervision
H. Freight

Total Lot Price:	**Option 1 – R-15 Cover (3 inches):**	**$83,539.00**
	Option 2 – R-20 Cover(4 inches):	**$98,467.00**

Prices are estimates only and are valid for 60 days. Prices are U.S. Funds, FOB Minneapolis, MN, taxes excluded. All sales are subject to Lemna Technologies' terms and conditions. Shipment date is dependent on many factors, including the size of project, complexity of design, shop-loading at time of order, customer requirements, etc. Typically, shipment will occur 6-12 weeks after approval of submittal drawings. Final price is subject to change based on the survey, final design, and final verification of the project scope.

IV. ITEMS NOT BY LEMNA TECHNOLOGIES, INC.

Other items that may be required for installation of the LemTec Modular Cover System include (but are not limited to):

- Concrete work
- Installation: Local unskilled general labor can be used. Lemna Technologies estimates that the proposed LemTec Modular Cover System will require 64 labor-hours for installation.
- Engineering fees
- Building fees
- Sales tax

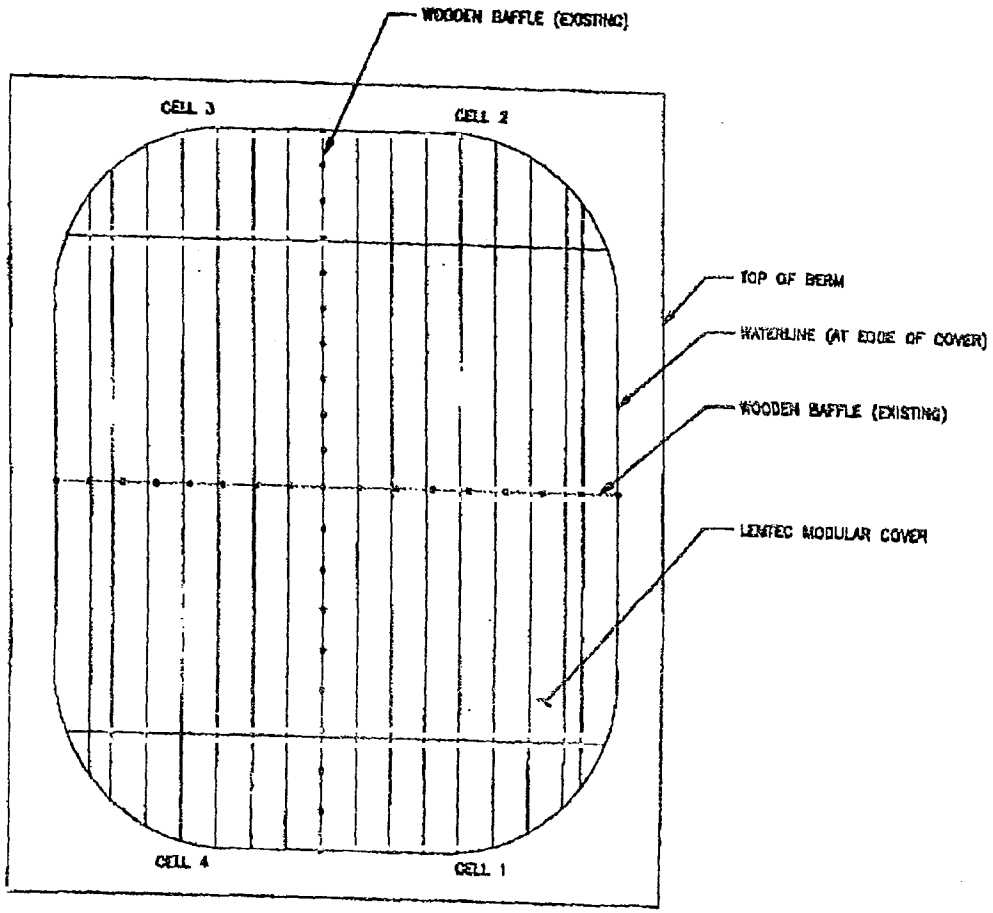
V. TECHNICAL SUPPORT SERVICES

A. Installation Supervision. To insure proper installation of Lemna-supplied equipment, supervision by trained Lemna field service staff is included in this proposal.

B. Technical Consultation. Following the initial start-up, technical consultation services can be contracted with Lemna Technologies.

VI. WARRANTY

The LemTec Modular Cover System components shall be supplied free of defects. Lemna Technologies provides a standard, one-year, limited warranty (from date of shipment) on the materials and workmanship of all Lemna-supplied components and a standard, 10-year, limited warranty on the UV resistance of the LemTec Modular Cover System. No process warranty is offered on systems where the LemTec Modular Cover System is installed.



LEMTEC MODULAR COVER
FOR
ELK LAKESCHOOL DIST., PENNSYLVANIA

LEMNA TECHNOLOGIES INC.
1408 Northland Drive
Suite 310
St. Paul, MN 55120-1013
Tel (651) 688-0838
Fax (651) 688-9813

DRAWN BY	D.A.D.
APPROVED BY	J.R.C.
SCALE	NOT TO SCALE
DATE	APRIL 6 1999
SHEET No.	1 OF 1