Approved: 2-3-98
Date

MINUTES OF THE SENATE COMMITTEE ON ENERGY AND NATURAL RESOURCES.

The meeting was called to order by Chairperson David Corbin at 8:00 a.m. on January 29, 1998 in Room 254-E of the Capitol.

All members were present except:

Committee staff present: Raney Gilliland, Legislative Research Department
Mary Ann Torrence, Revisor of Statutes
Lila McClaflin, Committee Secretary

Conferees appearing before the committee:

Craig Volland, President, Spectrum Technologists

Others attending: See attached list

Chairperson David Corbin explained a bill request that would make the water lines of the Rural Water Districts comply with dig safe. Senator Biggs with a second from Senator Schraad moved to have the bill introduced as a committee bill. The motion carried.

Chairperson Corbin called on Craig Volland, President, Spectrum Technologists, Kansas City, Kansas for his critique of proposed Kansas Department of Health and Environments Waste Management regulations. Chairperson Corbin told the Committee, Charles Benjamin, Sierra Club-Kansas Chapter, had requested the scheduling of Mr. Volland.

Mr. Volland presented his critique of proposed KDHE Waste Management regulations (Attachment 1). Mr. Volland asked that a correction be made on page four of his testimony, 2. Respiratory Impact that this be corrected to read "people believe they have more respiratory health problems". He also gave a critique of the preliminary report from the Kansas State Lagoon Research Project (Attachment 2).

Responding to questions he told the Committee he is a civil engineer, he has thirty years experience with a water and waste water company and is certified as an environmental expert. He is an environment advisor for the Sierra Club and for an organization from Southwest Kansas the Stewards of the Land.

The meeting adjourned at 8:55 a.m.

The next meeting is scheduled for February 3, 1998.

SENATE ENERGY & NATURAL RESOURCES COMMITTEE GUEST LIST

DATE: 1-29-98

NAME	REPRESENTING
Jim Allen	Seaboard
Carole Jordan	Ks Dpt of Ag
GREG FOLEY	KDHE
Larrie Ann Brown	
EDWARD ROWE	League of Women Voters/Ks.
Charles Benjamin	KS Sierra Club/KNRC
Doug Wareham	Ks Grain & Feed Assn. Ks. Fertilizer & Chemical Assn.
Tim Stroda	KS Pork Producers Council
Rich McKee	KLA
Lee Masenthin	KDOC&H
Tom STINSON	Murphy Family Farms
Mike Jensen	Ks Pork Council
Dave Holtzman	Western Resources
Sarah Cunningham	Harris News
Lt Myp	Senate
Julie Hein	Hein + Weir

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Revised 1-28-98

KDHE's New Animal Waste Regulations Won't Solve the Hog Problem

Odor. Aside from enforcing existing, inadequate setbacks, the new regulations explicitly avoid addressing odor reduction through facility design. The hog controversy cannot be resolved without addressing this problem in a meaningful way, including emissions from barns, lagoons, waste application and sludge piles. KDHE feels they don't have authority to regulate odor unless a health impact has been demonstrated. Recent research suggests such an impact near hog farms. See attachments.

Lagoon Construction. KDHE continues to allow self certification and keeps the weak, 0.25 inch/day seepage standard. The new design standards allow operators to dig lagoons and count the top one foot of remaining soil as an "in situ" liner. No compaction standard is specified, and no post construction permeability test is required. This technique is allowed in soils that contain substantial sand and gravel. Due to difficulty in achieving adequate compaction, this cannot be considered a true liner. The scientific literature does not verify that "biosealing" consistently prevents contamination of groundwater. Two examples of contamination from swine lagoons are attached. Also, analysis of strata down to the water table is not required.

Waste Application. KDHE says they will now require waste nutrient analysis and surface soil testing. Unfortunately operators won't have to provide soil tests before construction to confirm that all the waste can be absorbed. The attached swine wastewater analysis from Servitech Laboratories in Dodge City note that the liquid is "poor quality irrigation water." KDHE gives waste disposal priority over waste utilization by allowing operators to apply nitrogen at 120% of crop needs and phosphate at 200%.

Groundwater Monitoring. KDHE says they "may" require monitoring of groundwater near animal waste lagoons and application areas. "May" should be changed to "shall." The unwillingness of KDHE to require monitoring in the past is why we have so little data on the performance of waste control systems in Kansas. KDHE has required monitoring near slaughterhouse waste treatment systems, and that's how we discovered that clay lined lagoons were leaking and contaminating groundwater.

Double Standard. New slaughterhouse lagoons must have dual, plastic liners with leak detection while animal waste lagoons must have only a compacted soil liner. See attached KDHE Policy Directive. We can find no scientific justification for this double standard. KDHE has also started to require monitoring of slaughterhouse wastewater irrigation. The same should be done for large animal waste operations.

Setbacks. Waste application areas are not considered part of the facility for the purpose of determining separation distances. Yet they may be an important source of odor. Also Animal feeding facilities can be placed, and waste applied, as close as 100 feet from a drinking water well. If contamination reaches the Ogalalla aquifer, water users under these circumstances need wait only three to six months for the stuff to reach them. Ominously, the KDHE extends this distance to 200 feet when the operator uses the previously described "in-situ" liner technique for his lagoon. This is not just a problem of nitrates. See enclosed example of a cattle feedlot lagoon causing excessive chloride contamination.

Facility Closure. The new rules do not ensure that taxpayers will avoid picking up the tab for the clean up of abandoned facilities. The rules merely say that a "plan" must be submitted when the time comes. At no time are operators required to post a bond or financial guarantee.

Senate Energy & Natural Resources

Attachment: 1
1-1

1/29/98

EXECUTIVE SUMMARY
LEGISLATIVE DIVISION OF POST AUDIT

Question 1: Have the Department of Health and Environment's Actions to Permit, Monitor, and Regulate Confined Livestock Feeding Operations Been Sufficient To Protect Kansas Water from Pollution?

The Department's design standards are less stringent than comparison states in two key areas. *Kansas' "seepage" standard specifies that the liquid from the bottom of a lagoon can't seep into the ground by more than 1/4 inch per day. Six of the eight other states allow a seepage rate of less than that—generally 1/16 inch to 1/56 inch per day. Also, Kansas requires 100 feet between a waste-control facility and a well, while most other states have a variable standard based on the quality of the well's construction.* ..... page 10

We found some significant problems with the Department's animal waste regulatory program. *Although our reviews, testwork, and interviews showed the Department had adopted many good permitting, monitoring, and enforcement procedures in regulating animal wastes, they also showed the program had serious problems that weaken its effectiveness in protecting the State's water sources from pollution.* ..... page 12

In 93% of the 41 cases we reviewed, the Department didn't follow its procedures or requirements for regulating animal waste-control facilities. *The Department often allowed facilities to operate even though their permits had expired—often years before—or hadn't met all the requirements for obtaining a permit. For example, some facilities had never submitted required seepage tests to ensure lagoons wouldn't leak excessively. Other facilities didn't meet design standards or special permit conditions. In one case, a facility has operated for nine years after test results showed a waste lagoon could seep at more than 20 times the allowed standard if it hadn't sealed effectively. The Department has no way to identify facilities that may pose a significant water pollution potential and need to be regulated. In addition, in trying to address a large backlog of renewal permits, the Department is shortcutting some potentially important steps.* ..... page 14

We also found the Department hadn't performed the required one-, two-, or three-year inspections for nearly half the facilities in our sample; one facility hadn't been inspected since 1973, and two others hadn't been inspected since the mid-to-late 1980s. The Department also inappropriately handled complaints more than 40% of the time. When inspections or complaint investigations uncovered violations of regulations,

KDHE'S RESPONSE TO POST AUDIT REPORT ON ODOR & DUST from CAFOs

Comments Regarding Pages 29 - 32

In regard to the performance audit's assessment of KDHE's authority to regulate dust and odors, the Department agrees, in general, that its statutory authority to regulate sources of air pollution in Kansas is broad. The need for broad authority in this area results from the complexity of the federal air quality program and the authorities required to assure that Kansas maintains a federally-approved state air program. There are, however, several important statutory qualifications to these authorities that have relevance to the development of dust and odor programs that were not specifically discussed in the audit report.

The first involves the authority of the Department to require the abatement of nuisances under the provisions of K.S.A. 65-159. This statute does not apply generally to nuisances, but requires that the Department demonstrate such nuisances to be "injurious to the health (emphasis added) of the inhabitants. . . ." While odors may be more or less offensive to individuals, injury to health from odors is difficult if not impossible to demonstrate. Fugitive dust may be detrimental to health of some particularly sensitive or predisposed persons, but again it is extremely difficult to support a nuisance action on this basis. Where such action is supportable and necessary, the Department will not hesitate to use the authority. However, its application is much more limited and restricted than the report language implies.

Secondly, the provisions of the Kansas Air Quality Act (K.S.A. 65-3001, et seq.) were enacted primarily for the purpose of assuring compliance with the federal Clean Air Act in Kansas. The federal air program requirements applicable to the states do not require the development of nuisance dust and odor programs. While such state-specific air programs are not prohibited under the Kansas Air Quality Act, the Department has, traditionally, been held to a high standard through the administrative regulation process for justifying the need to expand the Kansas air program requirements into areas that extend beyond the federal program. The Kansas Air Quality Act also contains provisions that "encourage local units of government to handle air pollution problems within their respective jurisdictions" where many nuisance dust and odor problems can be most effectively resolved. In its initial enactment of the Kansas Air Quality Control Act in 1967, the Legislature included a "Declaration of policy and purpose" that remained a part of the Act until 1993. We understand its deletion then resulted from a general intent to eliminate policy and purpose statements from statutes. The Declaration may still be a reliable indicator of legislative intent. Except for protection of human health and safety, the policy adopted seems to mitigate against an expansive application of the statute and calls for a balancing of potentially competing interests and a balancing of state versus local authority and responsibility. Finally, K.S.A. 47-1505 provides that feedlots operated in accordance with the standards and regulations of the livestock commissioner are deemed to present prima facie evidence that a nuisance does not exist.

The statutory and legal issues surrounding regulation of dust and odors noted here, when combined with the extreme technical difficulties discussed in the report, render such control and regulation essentially impossible except where there is a clear, demonstrable threat to human health of inhabitants. These are the reasons why neither Kansas nor any of the other states surveyed regulate odors or dust in the CAFO programs. We concur with the conclusion that further study regarding dust and odors is necessary. That study and the development of useful technology and standards may make regulation feasible in the future. We do not agree that the statutory authority, except for situations threatening to human health, is available as described in the report and future legislation may be required after feasibility questions are answered.

From the NC Hog Roundtable- A coalition of 40 grassroots organizations and environmental groups concerned with the impact of NC's Hog Industry on the health of the people and the environment. Information was gathered for the Hog Roundtable by Melva Okun with the UNC-CH School of Public Health. 9/97

Health Information Related to Residents Who Live Near Hog Intensive Livestock Operations

Few studies have been conducted to study the potential impacts for near-by residents of hog intensive livestock operations. Most studies have focused on workers who are employed in the hog growing houses or at the slaughter houses. Studies show that nearby residents to hog intensive livestock operations experience similar, however less severe, health effects to workers employed in the hog growing houses.

Summary Health Information

1. Mental Health

Schiffman, Susan S., Sattely, Elizabeth A., Suggs, Mark S., and Graham, Brevick G. (1995). The effect of environmental odors emanating from commercial swine operations on the mood of nearby residents. Brain Research Bulletin, Vol. 37, No. 4, pp. 369-375. Dr. Schiffman's research showed a significant difference in mood states between people who live near intensive swine operations who experienced the odors and similar people who live outside of the odor area. Effects included increased rates for depression, tension, anger, lack of vigor, fatigue, and confusion. Males studied showed higher rates of anger and females were found to be more depressed.

2. Respiratory Impact

Thu, K., Donham, K., Ziegenhorn, R., Reynolds, S., Thorne, P.S., Subramanian, P., Whitten, p., & Stookesberry, J. (1997). A control study of the physical and mental health of residents living near a large-scale operation. Journal of Agricultural Safety and Health, 3(1), 13-26.

Residents living within a two-mile radius of a 4000 swine production facility were compared to similar rural residents but those that didn't live near the facility. Results indicate that the neighbors of the large-scale operation reported significantly higher rates of four types of respiratory tract problems, which represent toxic or inflammatory effects. The symptoms have been well documented among swine confinement workers. The study found increased rates for headaches, respiratory problems, eye irritation, nausea, weakness, and chest tightness. Subjects did not show increased mental health problems, however, they were not selected by those who were downwind of the hog operations and so were not effected by noxious odors. Respondents did indicate the view that large scale operations are creating social and class divisions in the neighborhood and community. Most believed that the construction and presence of the facility violated core rural values of being a good 'neighbor' and that the facility was viewed as eroding the cornerstones of agrarian life. The issues confronting rural residents in this study reflect an intertwining of personal, environmental, economic, and social health.

AMMONIA

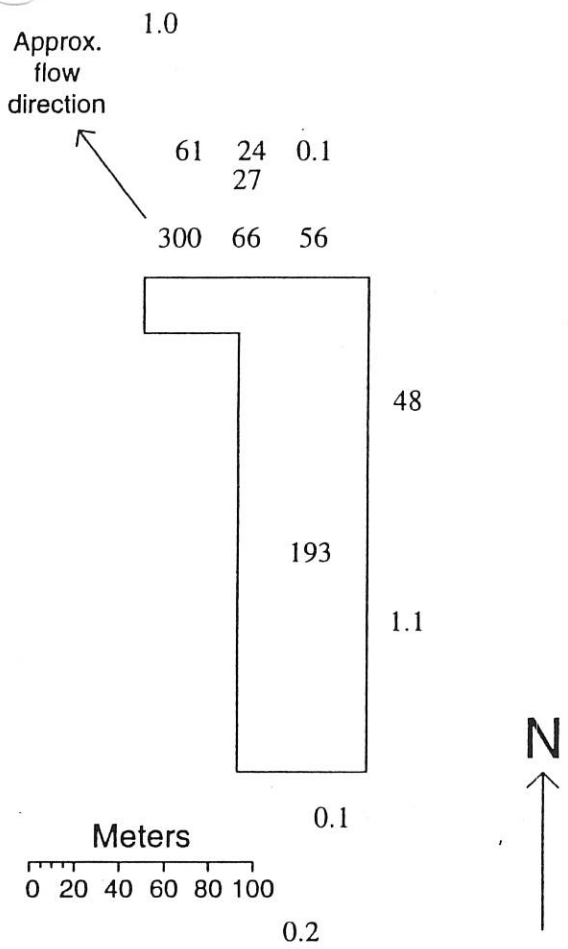


Figure 5–Ammonia-N concentrations (mg/L) in the lagoon and selected monitoring wells at Site P5, sampled 2 November 1993.

CHLORIDES

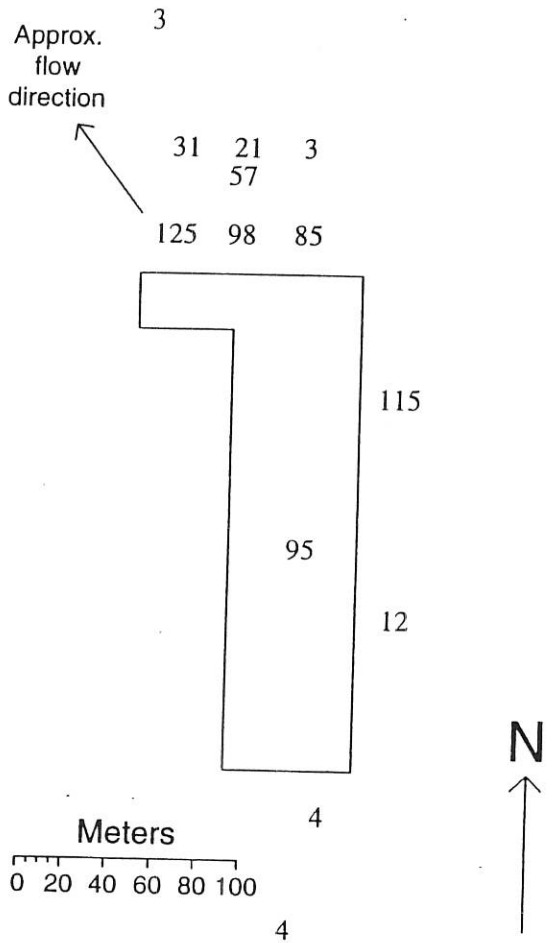


Figure 6–Chloride concentrations (mg/L) in the lagoon and selected monitoring wells at Site P5, sampled 2 November 1993.

NITRATE-N

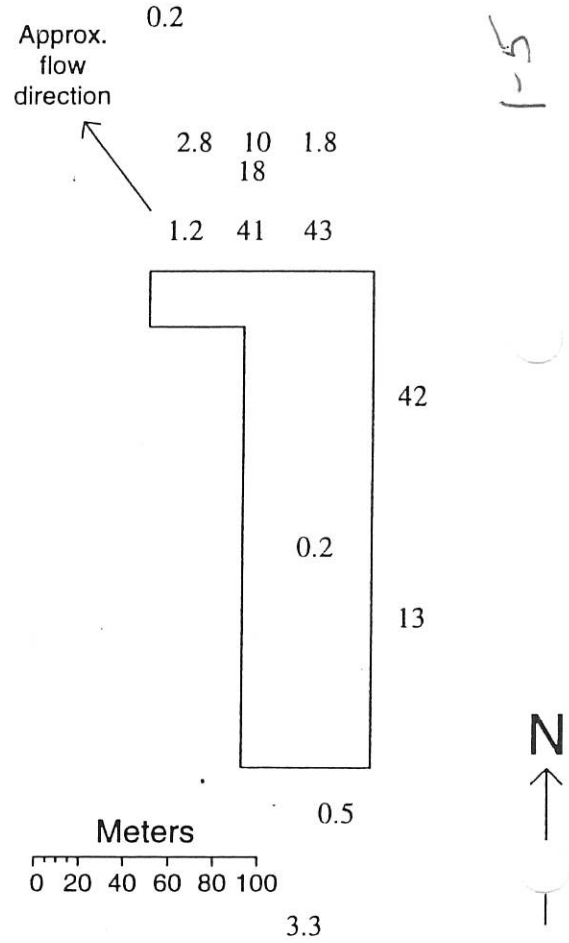


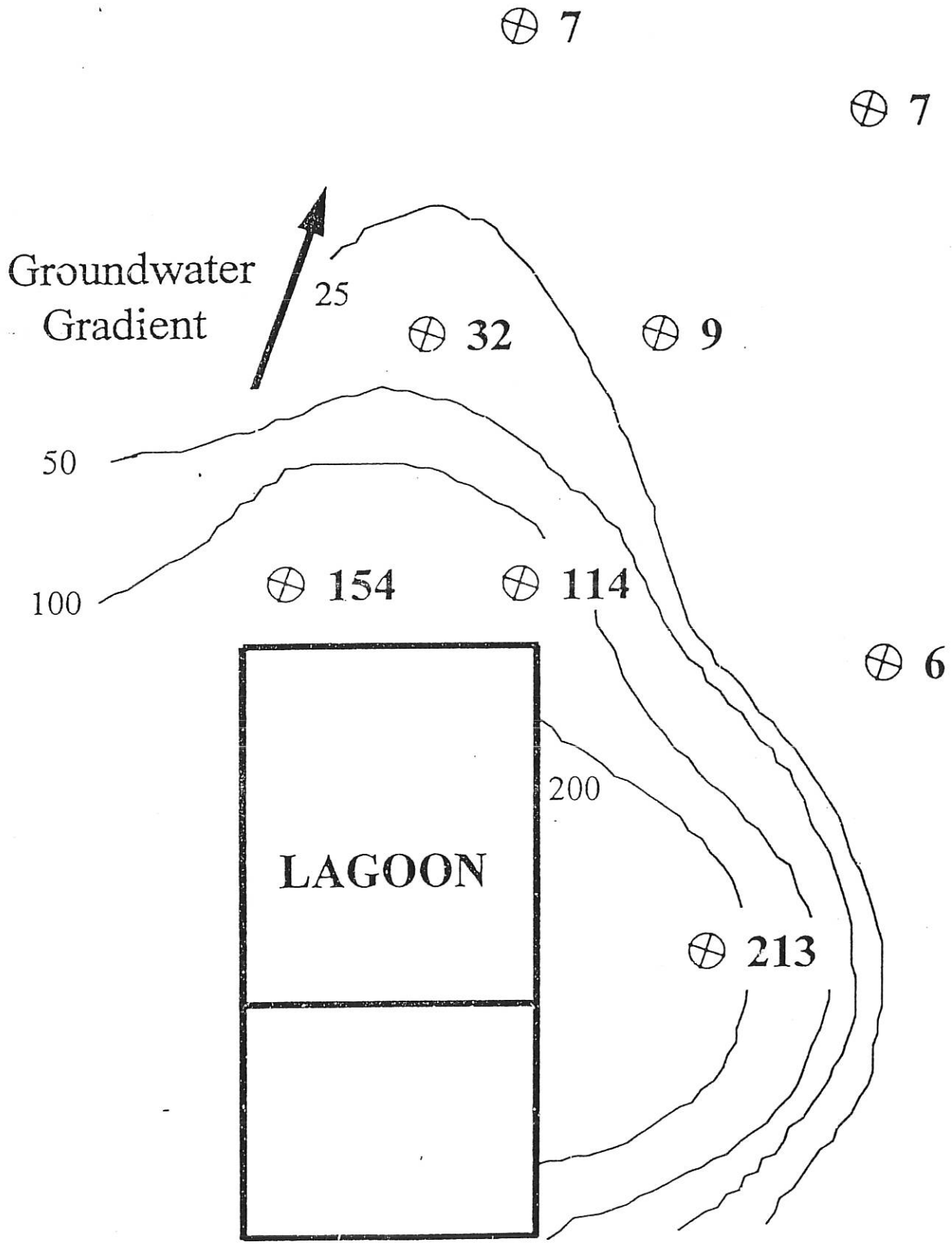
Figure 7–Nitrate-N concentrations (mg/L) in the lagoon and selected monitoring wells at Site P5, sampled 2 November 1993.

Example of Lagoon Seepage
North Carolina Site. Age 4 years. Unlined (compacted with construction equipment

SOURCE: P.W. Westerman, R.L. Huffman, J.S. Feng
"Swine-Lagoon Seepage in Sandy Soils
Transactions of ASAE Vol 38(6): 1749-1760

CHLORIDE

EXAMPLE OF LAGOON SEEPAGE
LINED LAGOON

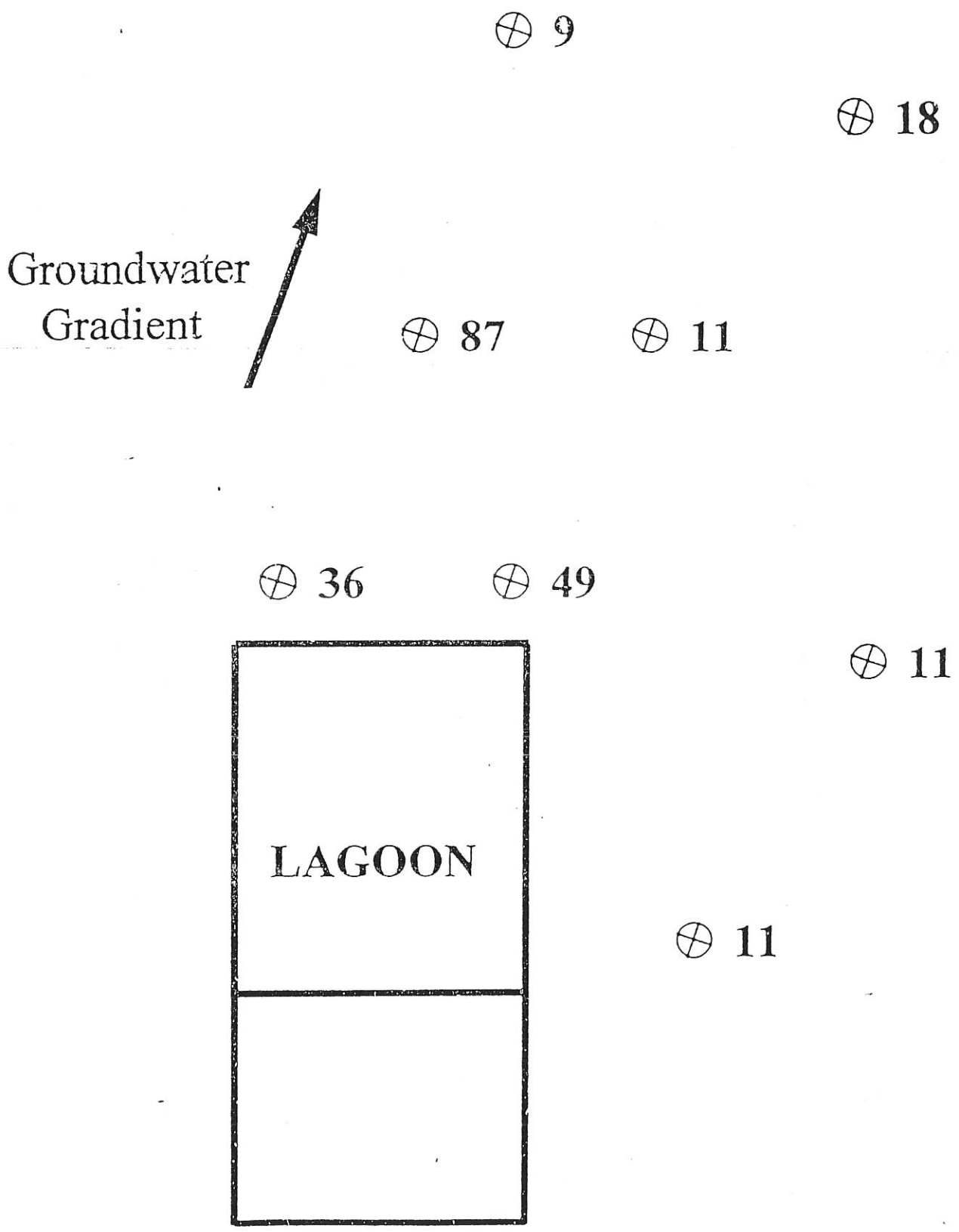


SITE #15: Cl⁻ CONC (ppm) - Aug 21/95

Source: See Site #15 Nitrates

NITRATE

EXAMPLE OF LAGOON SEEPAGE
LINED LAGOON



SITE #15: NO_3^- CONC (ppm) - July 14/95 1-7

Constructed in predominantly silty till (SC to CL): Lined with 20 inches of compacted soil; 200 sow farrow to finish, Lagoon Age = 5yr.
Health std = 45 ppm (as N = 10)
SOURCE: "Performance of Saskatchewan Soils for Construction of Earthen Hog Manure Lagoons" Univ. of Saskatchewan, UMA Engrg Ltd.

State of Kansas
Mike Hayden, Governor

Department of Health and Environment
Division of Environment

Stanley C. Grant, Ph.D., Secretary

Forbes Field, Bldg. 740, Topeka, KS 66620-0002

(913) 296-1535
FAX (913) 296-6247

Policy Memorandum #90-2
September 1990

FROM: Karl W. Mueldener, P.E.
Director, Bureau of Water

SUBJECT: INDUSTRIAL WASTEWATER POND LINER POLICY

PURPOSE:

This document states the Bureau of Water (Bureau) policy for requirements relating to industrial wastewater ponds. This policy is intended to protect the water and soil resources from a significant risk of contamination posed by earthen lagoons utilized for the containment/treatment of industrial wastewater and to provide minimum standards for the design and construction of new industrial wastewater ponds and the retrofitting of existing earthen lagoons.

BACKGROUND:

The Bureau of Water administers the Kansas Water Pollution Control Permit program established by K.S.A. 65-164 and 65-165. Wastewater ponds which discharge to surface waters or total retention through the use of evaporation, irrigation or recycle are addressed by this program. The Department has responsibilities under K.S.A. 65-171d to prevent subsurface water pollution and soil pollution. An increased emphasis, at both the state and federal level, has been placed on addressing source control as a mechanism for preventing or minimizing groundwater contamination. Since groundwater contamination from earthen ponds has been documented, the Bureau concludes construction of new industrial wastewater ponds without impermeable liner/leak detection systems represent an unnecessary risk of polluting groundwater and soils.

POLICY:

Any new or modified wastewater ponds designed and constructed for the containment or treatment of industrial wastewater, for other than non-contact cooling water or conventional domestic-type wastewater shall meet the following requirements:

1. The pond shall have a primary and secondary liner with an intermediate leak detection system.

2. The primary liner shall be at least 30 mil in thickness.

3. The secondary liner shall also be at least 30 mil in thickness, or, depending on the situation, other alternatives may be approved on a case by case basis.

4. Compaction of the pond embankments and upper 12 inches of the interior bottoms below the secondary liner shall be a minimum of 95% of the maximum standard proctor density. The maximum thickness of the layers of material to be compacted shall be 6 inches. The moisture content range shall be optimum moisture to optimum moisture + 3%. The maximum size of dirt clods in the compacted soil shall be less than one inch diameter.

servi tech

Servi-Tech Laboratories
1816 E. Wyatt Earp • P.O. Box 1397 • Dodge City, Kansas 67801
Phone: 316-227-7123 • FAX: 316-227-2047

WATER ANALYSIS REPORT

ent To: 15647 7685	CQ HATLEY, MARK 212 NE 19TH GUYMON, OK 73942	Lab No.: Invoice No.: Date Received: Date Reported:	2507 D17766 06/28/94 06/29/94

esults For:	HITCH FARMS
nalysis Description:	WASTEWATER IRRIGATION SUITABILITY
mple Identification:	N. LAGOON SOURCE: PIG LAGOON
AMPLED: 06/24	

ANALYSIS	UNIT		CONC.	lbs/A-FT	meq/l
Nitrogen:					
Total	mg/l	TKN	322.2	1,410.9	33.90
Ammonia	mg/l	NH3-N	474.5	1,281.3	<0.01
Nitrate	mg/l	NO3-N	<0.1	<0.1	
Phosphorus:					
Phosphorus	mg/l	P	47.00	125.9	
as P2O5 (Calc.)	mg/l	P2O5	107.5	290.8	
Chloride	mg/l	Cl	129	348.3	3.62
Carbonate	mg/l	CO3	<1	<2.7	<0.03
Bicarbonate	mg/l	HCO3	2,684.	7,246.8	44.00
Calcium	mg/l	Ca	131	353.7	6.55
Magnesium	mg/l	Mg	78	210.6	6.39
Sodium	mg/l	Na	294	793.8	13.04
Potassium	mg/l	K	354	955.8	9.54
as K2O (Calc.)	mg/l	K2O	352.8	952.6	
Sulfur	mg/l	S	6.0		
Boron	mg/l	B	0.770	2.1	
Total Dis. Solids (Calc.)	mg/l		3,264		
Hardness (Calc.)	mg/l	CaCO3	648.5		
Hardness (Calc.)	grains/gal	CaCO3	37.9		
Alkalinity (Calc.)	mg/l	CaCO3	2,200.9		
Electrical Conductivity	mmho/cm	EC	5.10		
Sodium Adsorption Ratio (SAR)			1.6		
Adj. Sodium Adsorption Ratio (SARa)			4.8		
Sodium, % Of Cations			7.0		
Water pH			7.50		
Water pHc			6.34		

POOR QUALITY IRRIGATION WATER.

PERMEABILITY HAZARD: MEDIUM. Use with caution on fine or medium textured soils. Routine applications of gypsum and moderate leaching may be needed to maintain soil permeability. Annually monitor soil and water for changes in sodium content.

SALINITY HAZARD: VERY HIGH. May affect growth of salt tolerant crops (e.g. barley, cotton, sugarbeets). heavy leaching will be necessary to [illegible]. Annually monitor soil and water for soluble [illegible]

Groundwater Quality Near a Ford Co. Cattle Feedlot[1]
milligrams per liter-Average

Chemical	Wells #1&2 Background	Wells # 3&13 Down gradient at Lagoon	Well # 4 ------ 440 feet	Well # 11 Downgradient 1020 feet	Well #12 ------- 1890 feet
sodium	79.5	276.9	208.6	134	74
chloride	54.9	561.3	409.6	182	28.7
ammonia	0.1	27.7	7.2	0.2	0.1
nitrate-N	13.3[3]	1.7	5.6	5.0	24.8[3]

1. Source: "Impact on Groundwater from Livestock Waste Lagoons," Leon Hobson Masters Thesis, Kansas State Univ., April '91.

2. The maximum contaminant limit for chloride is 250 mg/l

3. Non detects included at .02 mg/l ammonia and .11 mg/l nitrate.

4. This analysis assumes the groundwater flow direstion is due east and parallel to the river as estimated by author. However a slight gradient to the southeast and toward the river is likely. This would mean background nitrate may not flow under lagoon and well number 12 may be impacted by another lagoon to the northwest or by inorganic fertilizers. This potential error would be less likely to affect the other monitoring wells.

SPECTRUM *Technologists*

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CRITIQUE OF THE PRELIMINARY REPORT FROM THE KS STATE LAGOON RESEARCH PROJECT

I. Laboratory Investigation, Preliminary results:

A."*.. it was found that the KDHE regulation of 0.25 inch/day could be met if standard field construction practices are followed (and) the thickness of the liner ranges from 1 to 3 feet.*"

Clarifications and Corrections:

* Laboratory permeability tests do not accurately simulate field conditions and performance. Soil samples are compacted and maintained in the lab under ideal conditions. Lab tests can underestimate field seepage by 10 to 1000 times. In Kansas lagoon liners can dry, crack or erode before the wastewater reaches operating depth.

* K State did not mention that two soil samples fail the seepage limit when the *liner thickness is assumed to be one foot,* the proposed KDHE standard. To our knowledge nobody installs animal waste lagoon liners 3 feet thick in Kansas. 6% Bentonite was added to three other samples. Bentonite is rarely used for this purpose in Kansas.

* "Standard field construction practices" not defined. New KDHE design manual neither identifies a compaction standard nor requires a post-construction permeability test.

B. "*For the animal waste studied, chemical analysis on seepage indicated presence of ammonia in high concentrations.*"

Clarifications and Corrections

* Per attached graph, ammonia passed through the compacted samples in as few as four days. This suggests SW Kansas soils have limited capacity to attenuate passage of ammonia and that, through diffusion, ammonia and other soluble contaminants may seep through at a faster rate than the liquid itself.

* Ammonia concentration in sample effluent was much greater than the 300- 600 ppm in the typical swine lagoon. A high strength waste was obtained from Iowa State Univ. and not from a lagoon in Kansas. High solids content may distort seepage results.

* Researchers neglected to mention that microbes also readily passed through the compacted samples. See attached graph. If bacteria can pass through, so can viruses. Viruses are not being measured in this project.

* Low levels of nitrates were found in effluent samples, because swine wastewater contains little or no nitrate. Nitrate is formed later in soil or in water.

II. Field Seepage Tests: preliminary results (Per K State News Release of Nov. 14, 1997):

"*A field test of an existing feedlot lagoon found that seepage (.09 inches per day) was well below KDHE's limit of .25 inches per day. This indicates that older, established lagoons can still meet current design standards after many years of use under varied management ..*"

Clarification and Corrections

* Only five days of data was presented, *October 16 through Oct 20,* 1997. The typical water balance test lasts 30 days. Interestingly, the new animal waste regulations were issued for comment on *Oct.24*, 1997.

* The news release failed to mention that the subject lagoon held only 3' 11" of water. Standard KDHE procedures require that the results of a permeability test (0.094 inch/day in this case) be projected to the maximum depth of the lagoon which is 10' 8". This calculation yields **a 0.256 inches/day seepage rate. Therefore this lagoon is not operating well below the standard as claimed.** See photo of lagoon and equipment.

III. Groundwater Quality: Preliminary results:

Statewide: "*There appears to be no widespread* NO_3 (nitrate) *contamination of groundwater*"

*Correction: This statement is contradicted by the attached two studies focusing on private, farmstead wells. Nitrates exceeded the drinking water standard in *29% and 24% of samples respectively*. These studies would be more geographically representative than those cited by K State, which focused primarily on public wells.

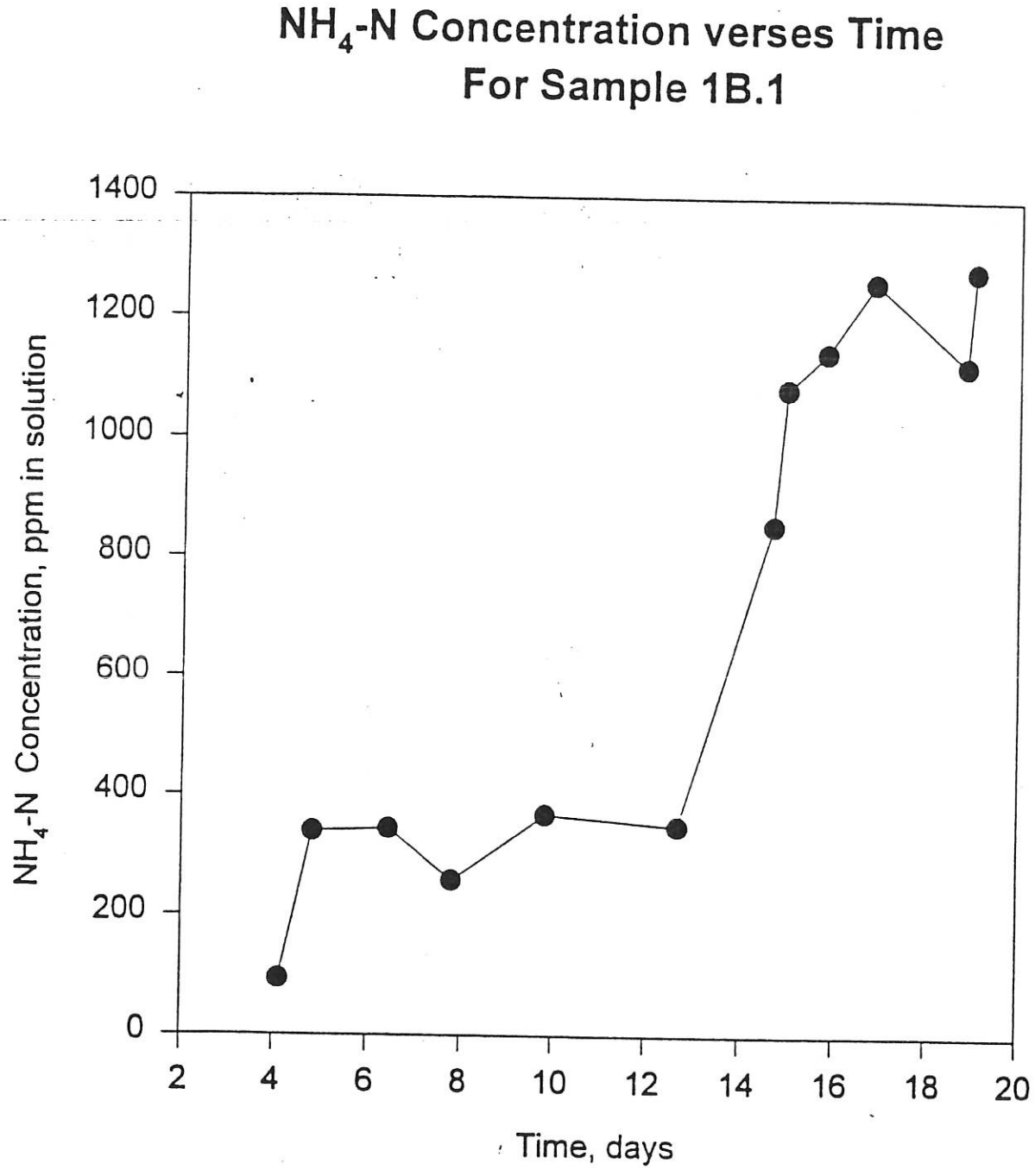
Feed Yard Lagoon Study (Hobson report): *Researcher told the legislative committee "no sign of groundwater contamination."*

* Clarification: There was some, but not conclusive, evidence of denitrification in this shallow groundwater, low oxygen environment; however elevated levels of ammonia and salts were found more than 1000 feet from the Ford Co. cattle feedlot lagoon.

Beef Processing Plant: "*Sources of nitrate included livestock feedlots up-gradient from the area, homes with inadequate sewage facilities, poorly constructed or maintained wells, and hydrogeological conditions which may have allowed nitrate to enter the groundwater.*"

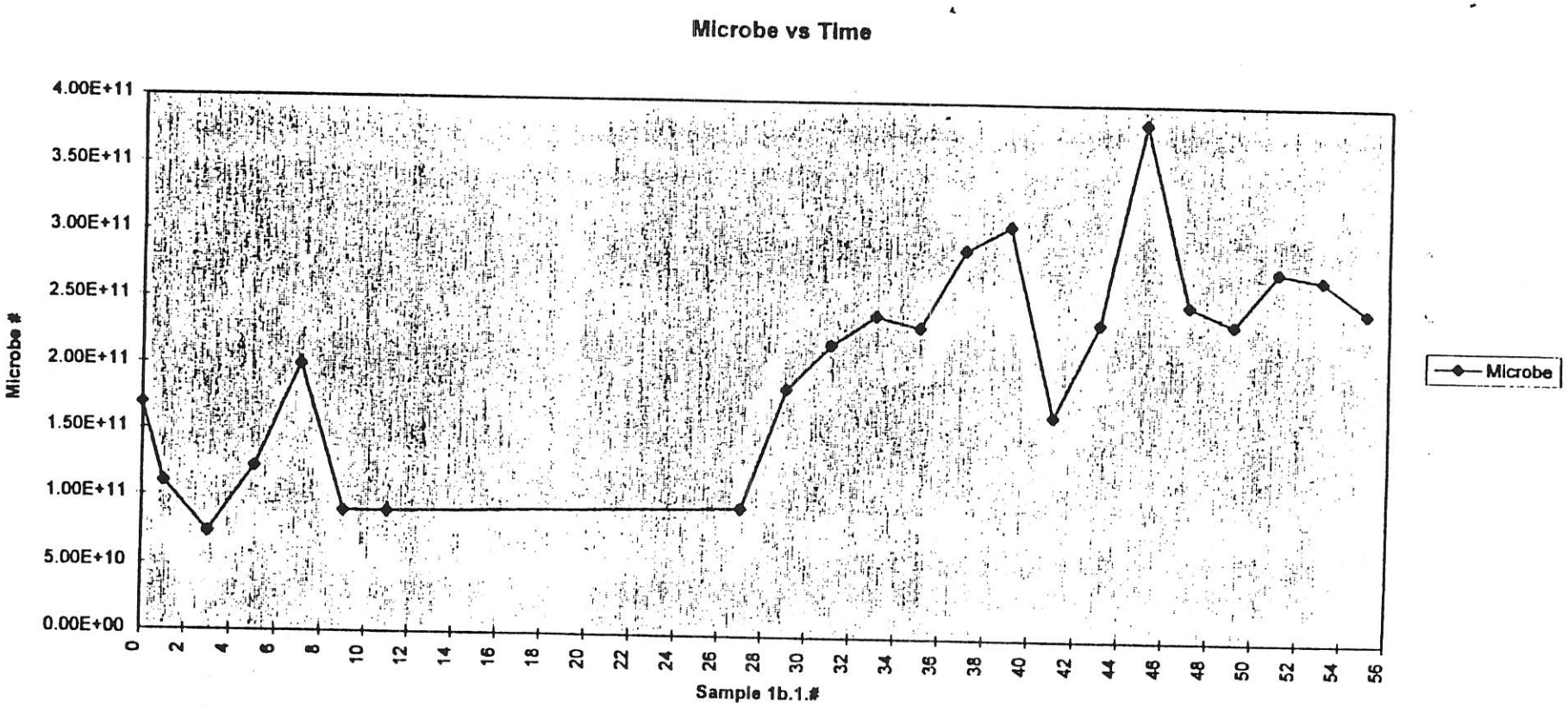
* Correction: Nitrate contamination appeared shortly after anaerobic lagoons were constructed. Few if any homes and septic tanks are in this heavily industrialized area. Reference to cattle feedlot as the likely source is ironic, since in the same report, K State researchers are claiming cattle feedlots have not been found to cause nitrate pollution.

* **CONCLUSIONS: It's much too early to conclude anything from this preliminary data. In addition, this data tells us little or nothing about the performance of existing swine lagoons in Kansas. Nitrate pollution is a serious problem in Kansas.**



diffusion!

Figure 9.


Microbe vs Time
Microbe #
4.00E+11
3.50E+11
3.00E+11
2.50E+11
2.00E+11
1.50E+11
1.00E+11
5.00E+10
0.00E+00
0
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Sample 1b.1.#
Microbe

Figure 16.

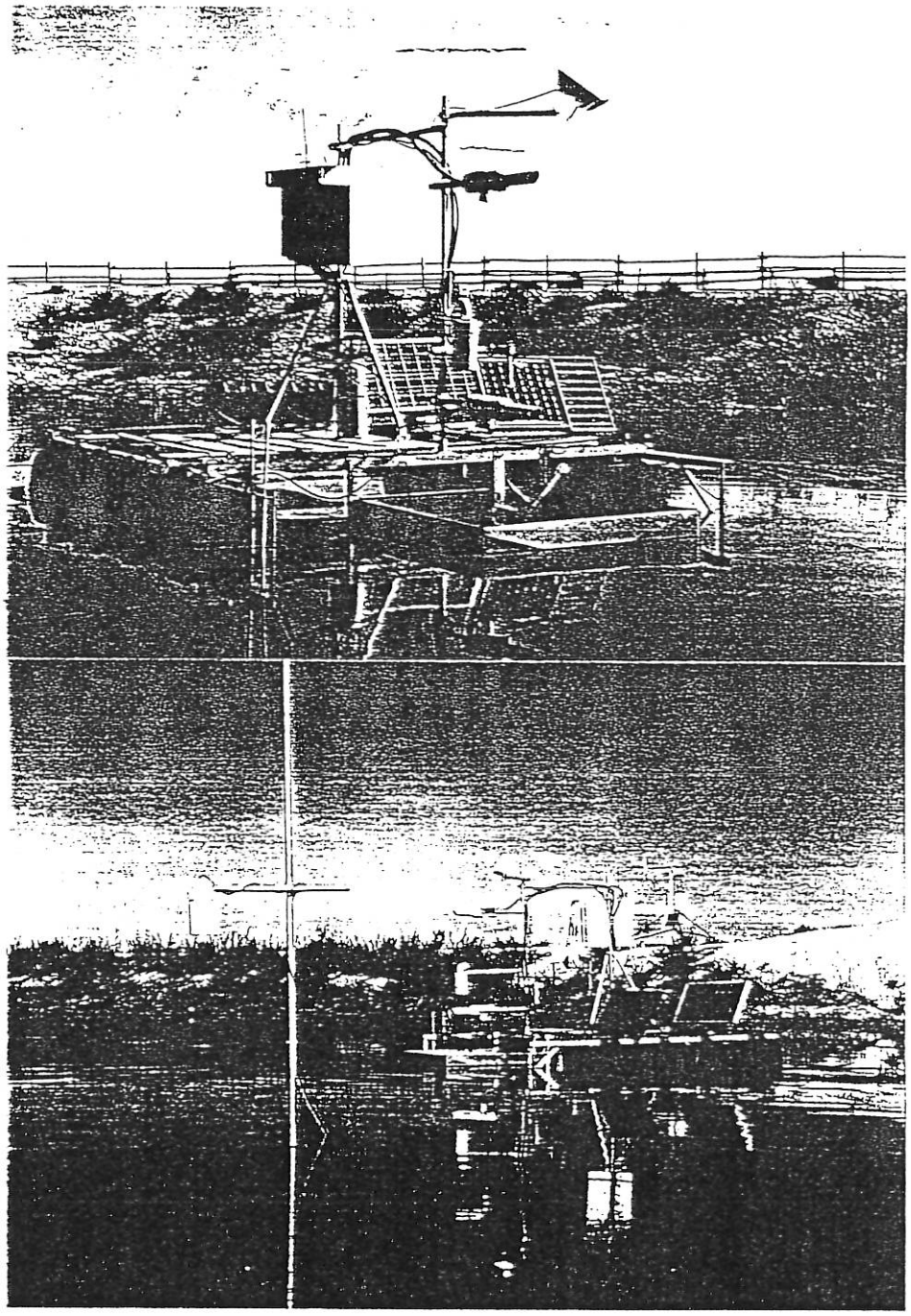


Figure 1. Photographs of floating platforms and instrumentation used in determining seepage rates from livestock waste lagoons.

RESULTS KANSAS FARMSTEAD WELL WATER QU .TY STUDY

Alan Heiman, James Steichen, James Koelliker,
Doris Grosh and Robert Yearout

Departments of Agricultural Engineering, Civil Engineering,
Industrial Engineering and Statistics

Kansas State University, Manhattan, KS 66506

ABSTRACT

Water from 103 farmstead wells selected throughout the state of Kansas to be representative of the overall rural well population was sampled and analyzed for volatile organic compounds (VOCs), pesticides and inorganic compounds by the Kansas Department of Health and Environment. Wells selected for sampling were picked ramdomly by county on the basis of farmstead well density within the state. Participants were picked if they were: using the sampled well for use in the household, performing active farming operations in the vicinity and familiar with activities near the well for the past ten years. Each participant then completed a questionnaire about their farming enterprise and history of the well.

Sampling dates occurred between December 1985 and February 1986. Wells containing detectable amounts of VOCs and pesticides numbered 2±3 and 9±6 per cent respectively. Inorganic constituents in excess of Maximum Contaminant Levels for public water supplies follow: nitrate at 29%, selenium at 9% and fluoride at 2%. All estimates are in the range of ±3 percent at a statistical significance level of alpha = 0.05.

After processing the data, the independent variables, nitrate, selenium, pesticides, VOCs were selected as variables of interest. Analysis of variance was performed upon these variables according to geological, geographical and precipitation regions.

Wells in the north east, north central and south central regions of Kansas have a higher probability of nitrate contamination. Multiple regression was performed on all predictor variables with a "all models" approach. The best model for nitrate has the variables: age of well, land use around the well and the distance to any possible source of organic contamination.

For selenium it can be concluded that south west and north central regions have a higher probability of contamination. Areas with average rainfall less than 30 inches are more likely to be contaminated.

SUMMARY

The results in a random state-wide survey of 103 farmstead wells revealed that nitrate-N above 10ppm is a widespread problem. Nitrate concentrations in excess of MCL was observed in 29 wells. Half of these high nitrate wells were over two times MCL. Other inorganic contaminants in exceedance of MCL were found in 9 of the wells.

Wells in the north east, north central and south central regions of Kansas have a higher probability of nitrate contamination. Multiple regression was performed on all predictor variables with a "all models" approach. The best model for nitrate has the variables: age of well, land use around the well and the distance to any possible source of organic contamination.

SOURCE: Proceedings of the Conference on Hazardous Waste Research, L.E. Erickson ed. K. STATE UNIV. Manhattan p. 38-51

1994 KANSAS WATER WELL SURVEY SUMMARY

BY CATEGORY	1994 RESULTS	
Total Samples Required		
Wells (R,D,S,B,O)	75%	825/1097
Duplicate Samples	15%	160/1097
Wells not tested	10%	112/1097
Total Well Samples:		
Drilled Wells (R)	59%	648/1097
Dug Wells (D)	13%	146/1097
Sandpoint (S)	1%	10/1097
Buried Slab (B)	1%	1/1097
Other (O)	2%	20/1097
Duplicate Wells	15%	160/1097
Wells not tested	10%	112/1097
Total Coliform Positive:		
Total Wells Tested	51%	424/825
Drilled Wells (R)	43%	280/648
Dug Wells (D)	85%	124/146
Sandpoint (S)	20%	2/10
Buried Slab (B)	100%	1/1
Other (O)	85%	17/20

BY CATEGORY	1994 RESULTS	
E. Coli Positive:		
Total Wells Tested	18%	151/825
Drilled Wells (R)	8%	55/648
Dug Wells (D)	60%	87/146
Sandpoint (S)	0%	0/10
Buried Slab (B)	0%	0/1
Other (O)	45%	9/20
Nitrate >= 10 mg/L		
Total Wells Tested	24%	196/825
Drilled Wells (R)	21%	136/648
Dug Wells (D)	35%	51/146
Sandpoint (S)	20%	2/10
Buried Slab (B)	100%	1/1
Other (O)	30%	6/20
Atrazine >= 3 ppb		
Total Wells Tested	5%	4/825
Drilled Wells (R)	0%	0/648
Dug Wells (D)	3%	4/146
Sandpoint (S)	0%	0/10
Buried Slab (B)	0%	0/1
Other (O)	0%	0/20
Lead Positive >= 0.015 mg		
Total Wells Tested	6%	53/825
Drilled Wells (R)	6%	7/648
Dug Wells (D)	10%	14/146
Sandpoint (S)	10%	1/10
Buried Slab (B)	0%	0/1
Other (O)	5%	1/20

8-7

2-7

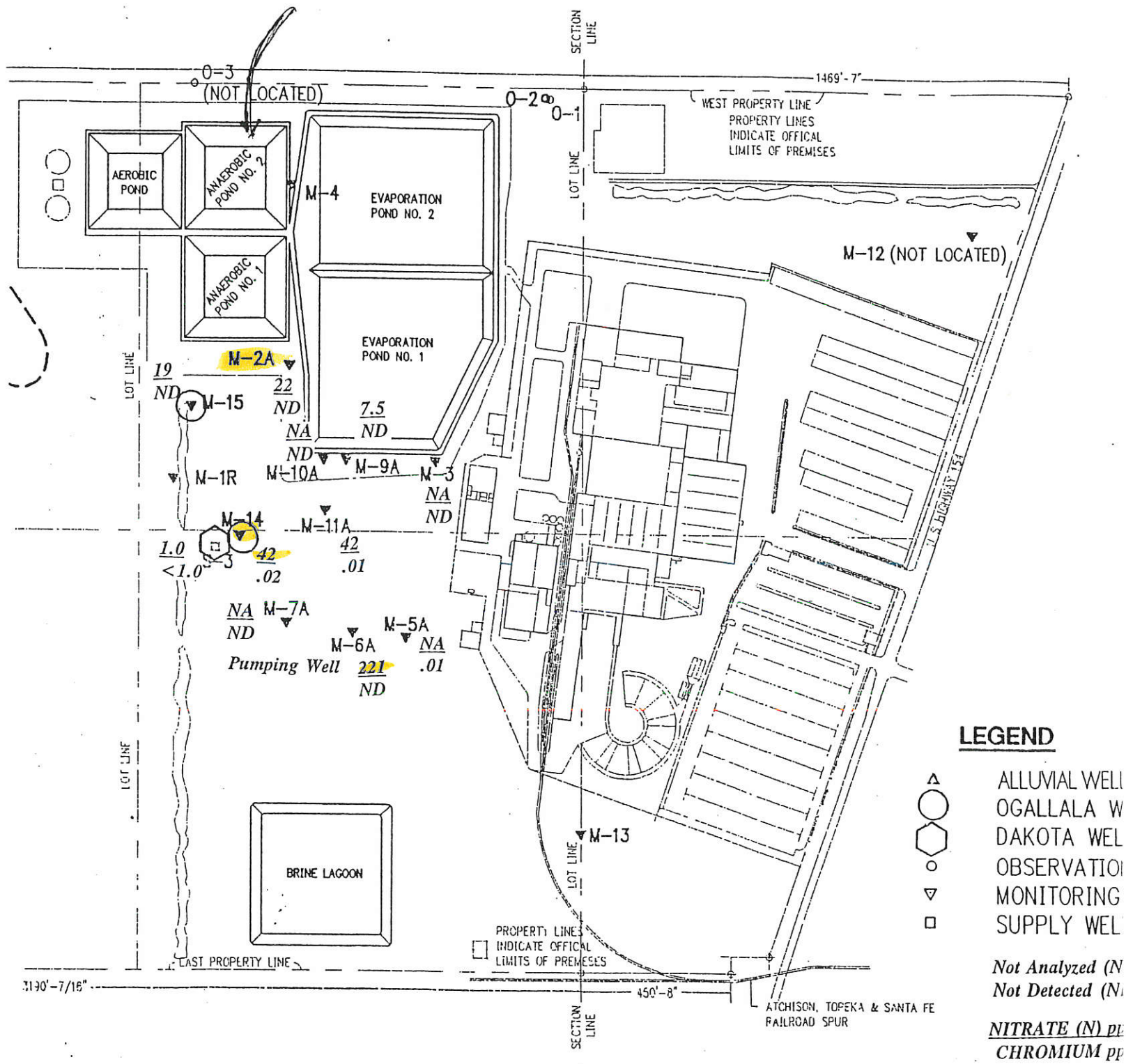
Nov. '95
BUREAU of ENVIRONMENTAL HEALTH SERVICES - KDHE

SAMPLE = 825 private wells selected from a ten mile intersecting grid throughout the state.

Health standard = 10 mg/L

Monitoring & Supply WELLS | Beef Packing Plant

LAGOON Built 1980, clay lined 1/8"/day seepage std.



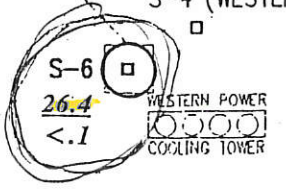
LEGEND

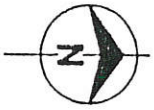
- ALLUVIAL WELL
- OGALLALA W
- DAKOTA WEL
- OBSERVATIO
- MONITORING
- SUPPLY WEL

Not Analyzed (N
Not Detected (N

NITRATE (N) pp
CHROMIUM pp

100' X 100' LEASED PROPERTY W/LEASED ACCESS



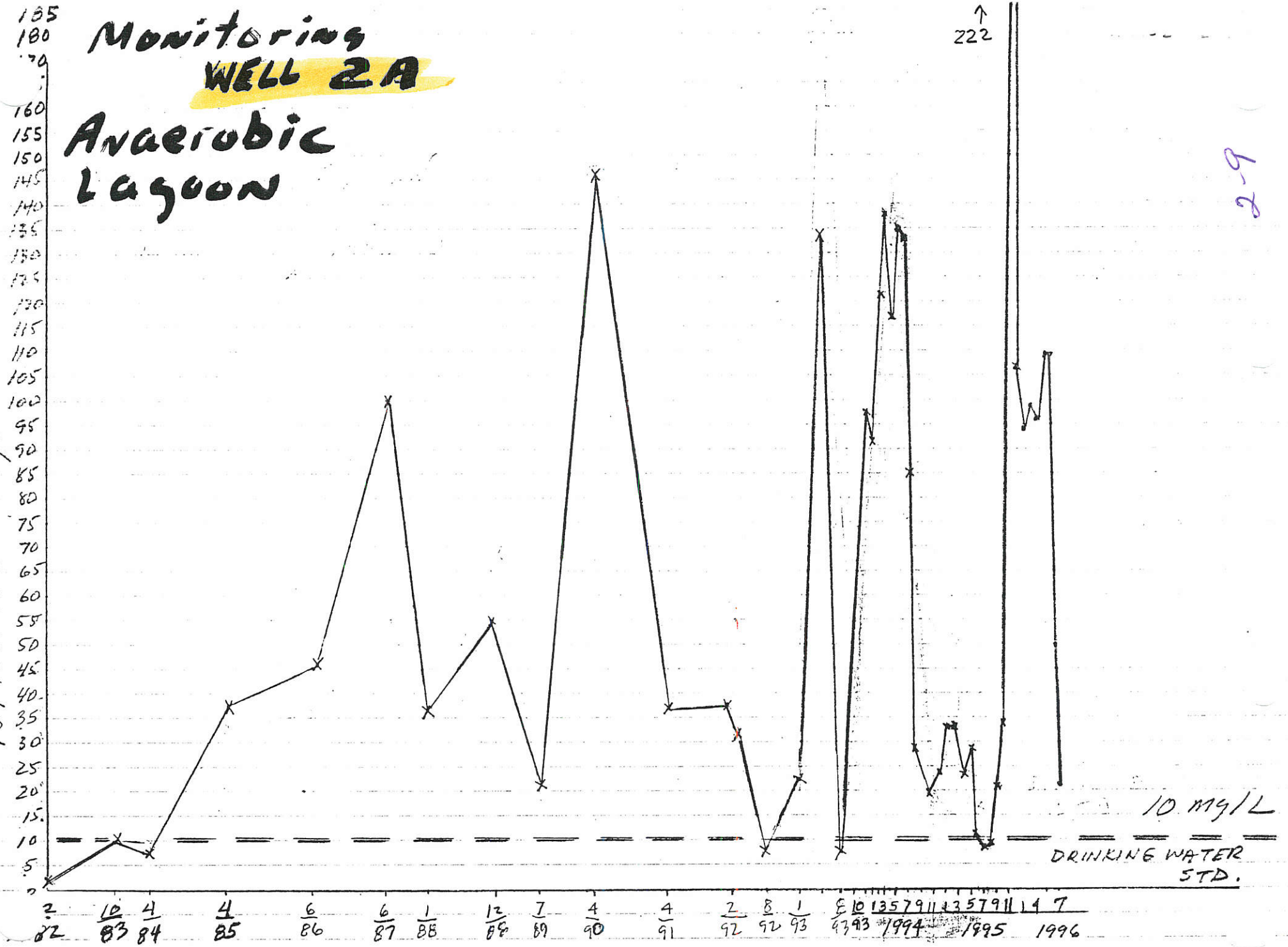


Burns & McDonnell Waste Consultants, Inc.

Figure 2
LOCATION OF E
MONITORING
EXCEL CORPO
DODGE CITY, K

Monitoring WELL 2A

Anaerobic Lagoon



Lagoon Constructed 1980

updated 10-06-96