IS-5133
UC-20e

Annual

Site Environmental Report

Calendar Year 1997

Ames Laboratory

Iowa State University

Ames, Iowa 50011-3400

Prepared for the
U. S. Department of Energy
Under Contract No. W-7405-Eng-82

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1.0 EXECUTIVE SUMMARY

This report summarizes the environmental status of Ames Laboratory for calendar year 1997. It includes descriptions of the Laboratory site, its mission, the status of its compliance with applicable environmental regulations, its planning and activities to maintain compliance, and a comprehensive review of its environmental protection, surveillance and monitoring programs.

Ames Laboratory is located on the campus of Iowa State University (ISU) and occupies twelve buildings owned by the Department of Energy (DOE). The Laboratory also leases space in ISU owned buildings. Laboratory activities involve less than ten percent of the total chemical use and approximately one percent of the radioisotope use on the ISU campus.

In 1997, the Laboratory accumulated and disposed of wastes under U.S. Environmental Protection Agency (EPA) issued generator numbers. Ames Laboratory submitted a Proposed Site Treatment Plan to EPA in December 1995. This plan complied with the Federal Facilities Compliance Act (FFCA). It was approved by EPA in January 1996. The consent agreement/consent order was issued in February 1996.

Pollution awareness, waste minimization and recycling programs, implemented in 1990 and updated in 1994, continued through 1997. Included in these efforts were a waste white paper and green computer paper recycling program. Ames Laboratory also continued to recycle salvageable metal and used oil, and it recovered freon for recycling.

In 1997, Ames was responsible for a small former chemical disposal site (CDS), located on ISU property near the Applied Sciences Complex (ASC). The site was used from 1957 through 1966 for burying waste chemicals and metal slags. The materials were buried according to standard practice at the time. In 1993-94, the first phase of the site remedial investigation (RI) was completed. The buried materials were removed and shipped to the Envirocare disposal facility in Utah in the fall and winter of 1994-95. The Phase II RI Report and the Focused Feasibility Study Plan were issued in February 1997.

The Iowa Department of Public Health (IDPH), Iowa Department of Natural Resources (IDNR) and Iowa State University (ISU) reviewed the Phase II Remedial Investigation Report and shared concerns that additional data was needed to fully characterize the site as required by IDPH and IDNR. In the spring of 1997 ISU initiated a complete characterization of the CDS. Final Characterization Report is due in 1998.

In calendar year 1997, Ames Laboratory was not required to report to DOE through the Performance Indicator Database System (PIDS) on any environmental performance indicators or measures. Plans for routine air and groundwater monitoring of Ames Laboratory facilities and areas were revised to comply with existing DOE Orders and the pending 10 CFR 834. Implementation of these plans is resource limited. It is anticipated that funding to comply with 10 CFR 834 will be available when needed.

The following page contains the 1997 Ames Laboratory Site Environmental Report Feedback Form. The comment form is provided to solicit public input on the development and improvement of future SER's. Public input is encouraged.

1997 Ames Laboratory Site Environmental Report Feedback Form
(remove and copy as needed; attach additional pages as needed)

Return to: Ames Laboratory
Environment, Safety, Health and Assurance
G40 TASF, Iowa State University
Ames, IA 50011-3400

1. What prompted your interest in environmental activities at Ames Laboratory?

2. In what ways can this report document and/or format be improved?

3. Do you have any questions on specific items or issues in this report?

4. Do you have any other comments?

2.0 INTRODUCTION

2.1 Site Description

Ames Laboratory is a U. S. DOE facility located on the campus of Iowa State University (ISU) at Ames, Iowa. See Figures 2-1 through 2-4 in Appendix A. Ames is a government owned, contractor operated (GOCO) facility. ISU is the contractor. The Technical and Administrative Support Facility (TASF) houses most of the Laboratory management offices. The TASF is located at latitude 42° 01' 30" north by longitude 93° 39' 00" west. The buildings owned by the Department of Energy (DOE) are listed below. See Figure 2-3 in Appendix A.

Building	Gross Square Feet
Spedding Hall	107,630
Metals Development Building	69,663
Wilhelm Hall	56,541
TASF	46,991
Campus Warehouse Building	16,506
Mechanical Maintenance Building	8,540
Maintenance Shops Building	7,503
Paint and Air Conditioning Shops Building	4,998
Construction Storage Shed	4,441
Storage Shed	2,100
Records Storage Building	1,689
Storage Shed	500
---	---
Total DOE Owned	327,102

In addition to the buildings owned by the DOE, Ames Laboratory rented a net total of 14,000 square feet of space from ISU in 1997. In 1987 the DOE transferred ownership of the buildings it owned at the Applied Sciences Complex (ASC) site to ISU. The ASC is located one mile northwest of the ISU main campus. See Figures 2-2 and 2-4 in Appendix A. At the ASC, Ames Laboratory retains beneficial use of the Waste Handling Facility and the High Pressure Test Cell through February 28, 2060. The Waste Handling Facility houses the Alpha Facility, a laboratory which was designed to use small amounts of radionuclides. No work was done in the Alpha Facility in 1997.

The ISU main campus is surrounded by the City of Ames, Iowa. See Figure 2-2 in Appendix A. The 1997 approximate population of Ames was 48,800. An estimated 56,000 people lived within an eight kilometer (five mile) radius of the campus. The student population of ISU was approximately 24,890 during the spring and fall semesters, but less in the summer. The amount of overlap between the permanent resident and student populations varies.

The climate is temperate continental, and subject to wide temperature and precipitation ranges throughout the year. Mean monthly temperatures vary from a low of negative 7.5 degrees Celsius (18.5° F) in January to a high of 23.8 degrees Celsius (74.8° F) in July. Average rainfall equivalent precipitation varies from 1.8 centimeters (0.7 inches) in January to 13.7 centimeters (5.4 inches) in June.

The region is gently rolling with a slight overall gradient to the southeast. Under the shallow topsoil, the soils are glacial till with a depth of approximately 19.8 meters (65 feet). This material is underlaid by predominantly limestone bedrock. In the central campus area, the depth to first groundwater is approximately 3.0 meters (10 feet). At the ASC site depth to groundwater averages approximately 5.5 meters (18 feet). Surface run-off from both areas goes to Squaw Creek, a tributary of the South Skunk River. The streams have a combined average daily flow of approximately 644 million liters (170 million gallons).

2.2 Organization and Administration

Ames Laboratory is operated by Iowa State University under Contract Number W-7405-Eng-82 with the U.S. DOE. The DOE's Chicago Operations Office oversees operation of the Laboratory. Ames is a member of the Institute for Physical Research and Technology (IPRT), an ISU association of research laboratories. In 1997, the Laboratory employed 553 persons totaling 401 full time equivalents. See Figure 2-5 in Appendix B.

2.3 Mission

The Ames Laboratory conducts fundamental research, which underlies energy resources, environmental technology development and other technical areas essential to national needs. These efforts are maintained to contribute to the achievement of the vision of DOE, to increase the general levels of knowledge and technical capabilities, to prepare engineering and physical sciences students for the future, to develop new technologies and to transfer technology to industry that will contribute to the industrial competitiveness and economic strength of the United States. All operations are conducted in ways that maintain the health and safety of all workers and visitors, and that protect the environment from pollution.

In 1997, the Laboratory's research projects fell within the following 10 program areas.

Physical and Biological Chemistry
Condensed Matter Physics
Environmental Technology Development (including Fossil Energy Section)
Metallurgy and Ceramics (including Materials Preparation Center)
Applied Mathematical Sciences and Computational Sciences
Informatics and Mathematics/Computer Education
Materials Chemistry
Nondestructive Evaluation
Safeguards and Securities
Molecular Processes

In 1997, the Laboratory approached all its operations with the safety and health of all workers as a constant objective and with genuine concern for the natural environment. The Laboratory relied upon its strengths in materials synthesis, processing, materials reliability, chemical analysis, chemical sciences, photosynthesis, materials sciences, metallurgy, high-temperature superconductivity, and applied mathematical sciences to conduct the long term basic and intermediate range applied research needed to solve the complex problems encountered in energy production and utilization as well as environmental restoration and waste management. Our technology transfer and industrial outreach program is aided by joint efforts with ISU's technology development and commercialization enterprise and sustains concerted efforts to implement "Cooperative Research and Development Agreements", industrially sponsored "Work for Others" projects, and scientific collaborations with industrial partners from both large and small businesses. Ames Laboratory continues to maintain a very significant and highly beneficial pre-college math and science education program currently serving both teachers and students at the middle school and high school levels.

2.4 Purpose of Site Environmental Report

The primary purpose of this report is to summarize the performance of Ames Laboratory's environmental programs, present highlights of significant environmental activities, and confirm compliance with environmental regulations and requirements. The summarized data and conclusions from Ames Laboratory environmental monitoring during calendar year 1997 are presented in this annual Site Environmental Report. This report is a working requirement of Department of Energy Order 231.1, "Environment, Safety, and Health Reporting".

3.0 COMPLIANCE SUMMARY

3.1 CALENDAR YEAR 1997 COMPLIANCE STATUS

Ames Laboratory was in compliance with all applicable environmental regulations that were in force during 1997.

3.2 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)

The Supplemental Sampling and Monitoring Plan for the CDS was approved April 1997. The sampling plan was utilized to collect and analyze additional data so that the CDS could be fully characterized as required by the IDPH and IDNR. The additional data is needed before IDPH and IDNR will release the CDS for either unrestricted or restricted use. Six new monitoring wells were installed the Week of May 12, 1997. One well, which never developed, was removed and plugged. Sampling was done quarterly. See attached data tables taken from the Characterization Report as done by Iowa State Universities Environmental Health and Safety Department.

The proper public comment periods have been observed for specified documents associated with the CDS site restoration. The community advisory group (CAG), formed in May 1994, was the primary vehicle for public input to Ames site restoration activities in 1997. The CAG met with the Ames Laboratory Director and other interested parties on an as needed basis. The CAG met with Ames Laboratory and ISU representatives in the Laboratory Director's conference room on March 25, 1996, to discuss the EM-30/40 priority list. The site cleanups being the second priority on the list was acceptable to the CAG and ISU. DOE conducted a public meeting in the Ames Municipal Library on August 20, 1996. The primary topic was the CDS Phase II Remedial Investigation, Focussed Feasibility Study and Proposed Plan.

A small area located at 13th Street and Stange Road in Ames was sampled in August, 1995 under IDPH supervision. This area was known as the Old Iowa State College dump. Uranium and thorium activities were at background levels. No decisions concerning any further actions have been discussed or reached at this point in time. See section 5.4.3.

3.3 Resource Conservation and Recovery Act (RCRA)

Ames Laboratory is a GOCO facility. Therefore, all wastes generated are DOE wastes. In 1997, DOE had three RCRA waste generator identification numbers from the Environmental Protection Agency (EPA) Region VII. See the summary table in section 3.17. Activities associated with the main campus facility number were those of a large quantity generator. In calendar year 1997, 3006 kg of hazardous waste were properly disposed of through a contracted vendor. All reporting requirements were met. Another EPA generator number was for a conditionally exempt small quantity generator for the Waste Handling Facility at the ASC. This waste handling building stages radiological, hazardous and mixed wastes. The last active generator number was for CDS source removal wastes only, a conditionally exempt small quantity generator.

This activity was completed in 1995, but the regulators have not released the site.

The Laboratory was in compliance with all applicable requirements of 40 CFR 262 for all of 1997. A surprise inspection from EPA Region VII on April 12-14, 1994, resulted in findings concerning waste storage. The local EPA inspector forwarded the findings to EPA Region VII. Through all of 1995, 1996 and 1997 EPA did not issue a formal notice of violation (NOV). EPA indicated verbally in 1995 that a response would be sent to the Laboratory after completion of activities associated with the Federal Facilities Compliance Act (FFCA). No further actions were taken on the findings through 1997.

The Laboratory uses the Idaho National Engineering Lab (INEL) Waste Tracking System. The EPA Biennial Report for calendar year 1997 was completed and submitted on time in February 1998. The report is required of all large quantity generators and is a record of wastes removed from the facility.

Ames Laboratory maintained its conservative waste disposal policy in which materials that are not regulated by RCRA, yet which might pose or be perceived to pose any kind of a potential hazard, are handled and sent for disposal as though they are RCRA regulated wastes. See section 3.4. The Laboratory disposed wastes at an out of state EPA permitted facility under two generator numbers. It remained the Laboratory's practice to have these RCRA regulated wastes incinerated rather than put into a permitted landfill when feasible. Incineration ensured the complete destruction of the hazardous constituents and eliminated any potential for members of the public being exposed in the future. Hazardous wastes were shipped out quarterly, and radioactive wastes were shipped out annually, except radioactively contaminated lead. It is shipped biennially. In 1997, 3006 kg of hazardous and 6.2 cubic meters of radioactive wastes were properly disposed.

The Laboratory had no underground storage tanks (UST's) in 1997. The last UST (emergency generator diesel fuel) was removed in August 1995. An aboveground, double walled diesel tank with interstitial leak detection replaced it. The tank did not experience any problems in 1997.

3.4 Federal Facilities Compliance Act (FFCA)

The FFCA is part of 42 USC 6901 and amends a part of RCRA. FFCA requires the preparation of site treatment plans for the handling of mixed wastes. Ames' Conceptual Site Treatment Plan (STP) was written in 1994 as a first step in compliance with the Federal Facilities Compliance Act (FFCA). It was expanded into a Draft Site Treatment Plan which received regulatory and public comments. In 1995, the draft plan was revised into a proposed plan and submitted to EPA December 20, 1995. The STP was approved by EPA in January 1996. The FFCA prescribes that EPA issue an order requiring compliance with the approved Site Treatment Plan.

DOE-CH received the complaint, compliance order and notice of opportunity for hearing from EPA on March 4, 1996, and the consent agreement and consent order (CA/CO) on March 13, 1996. The CA/CO stated that within one year of the CA/CO issue date of 02-27-96, Ames Laboratory must provide EPA a report on the completed treatability study. Once the treatability study report is

approved, EPA is to provide Ames Laboratory with a notice of termination, indicating all actions have been fully performed in accordance with the CA. The treatability study report was submitted to EPA on 2/5/97. To date EPA has not responded.

All mixed wastes not in compliance with land disposal restriction (LDR) requirements were removed from the facility by September 1995. The transuranic (TRU) waste stream was eliminated from the STP because it had not been generated yet. Contaminated lead was eliminated as a mixed waste stream because it did not meet the criteria. All mixed waste streams generated at the Laboratory were included in the Mixed Waste Inventory Report and were managed in accordance with the Site Treatment Plan. Ames properly incinerated 0.02 cubic meters of mixed waste in 1997 at Diversified Scientific Services, Inc. (DSSI).

3.5 National Environmental Policy Act (NEPA)

The Laboratory had no categorical exclusion (CX) or other NEPA determinations in 1997.

3.6 Clean Air Act (CAA) and National Emissions Standards for Hazardous Air Pollutants (NESHAP)

U.S. EPA Region VII delegated CAA authority to the State of Iowa Department of Natural Resources (IDNR). IDNR does not require either construction or operating permits for laboratory fume hoods. In December 1996, IDNR issued construction permits for two existing sources of air emissions at Ames Laboratory. One is a paint booth and the other is a sand blaster. A construction permit application was submitted by ISU Environmental Health and Safety on September 11, 1996 for an Ames Laboratory source, a graphics paint hood. ISU wrote to IDNR on December 10 to change the point of contact for that application from ISU to Ames Laboratory.

The Laboratory used only small quantities of chemicals and radionuclides, lab bench quantities, for its research and development activities in 1997. Any air emissions generated by Ames Laboratory research activities were sporadic and in very small quantities. Ames Laboratory does not have a power plant, but obtains its electricity from the City of Ames. The Laboratory was in compliance with all CAA requirements including the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations for radionuclide emissions from DOE facilities. In 1997, the work involving radionuclides did not produce small enough particles in sufficient quantities to become airborne contaminants or radioactive emissions to the environment. See Table 5-1 in Appendix A. Historically any use of radionuclides is inside glove boxes and/or fume hoods. These hoods and boxes are high efficiency particulate air (HEPA) filtered. Using the CAP88 model calculated emissions for 1997 were a small fraction of the 0.1 mSv (10 mrem) per year limit, typically 10^{-10} to 10^{-13} mSv (10^{-8} to 10^{-11} mrem) per year.

There were no radionuclide emissions to the environment at Ames Laboratory in 1997.

3.7 Clean Water Act (CWA)

Ames Laboratory does not have any regulated point source effluents. Neither Ames Laboratory nor ISU have any National Pollutant Discharge Elimination System (NPDES) permits. The Laboratory discharged approximately 65,661,378 liters (14,443,770 gallons) of wastewater to the ISU sanitary sewer system in 1997. This was 6.9% of the total discharged from ISU's central campus. The University central campus discharged 945,754,386 liters (208,041,000 gallons) of wastewater to the City of Ames sewer system. Central campus does not include the dormitory complex or the ASC. Ames Laboratory discharges were approximately one percent of the total wastewater processed by the City of Ames wastewater treatment facility. The City of Ames has an NPDES permit. The City of Ames has an agreement for wastewater pre-treatment with ISU, which includes Ames Laboratory wastewater. Both the City of Ames and the University sampled ISU wastewater effluent in 1997 as part of this agreement. No stormwater permits were necessary for 1997 Laboratory operations. A stormwater permit held by ISU covered DOE construction activities on ISU land.

3.8 Safe Drinking Water Act (SDWA)

Drinking water for the Laboratory is supplied by the City of Ames public water system through the University's water mains. The Ames public water system is tested by the city to verify the SDWA standards are being met. The Laboratory used 65,661,378 liters (14,443,770 gallons) of potable water in 1997, or 4.8% of the 1,369,126,316 liters (301,171,649 gallons) used by the ISU central campus.

Three Ames Laboratory drinking fountains were sampled for lead and copper in 1997 by Ames Laboratory Facilities Services. Fountains in Wilhelm Hall, Metals Development and Spedding Hall were monitored in accordance with the Laboratory's Policy for Monitoring Lead in Potable Water. Samples are drawn and tested annually, but the frequency is subject to adjustment based on a history of the results. An independent laboratory did the analyses. All samples were within regulatory limits for lead and copper. The results are summarized in Table 3-1 in Appendix A.

3.9 Superfund Amendments and Reauthorization Act (SARA) Title III and Iowa Administrative Code, Rule 567, Chapter 131, Spill Reporting

In 1997 the Laboratory was exempt from the emergency reporting of the Superfund Amendments and Reauthorization Act (SARA) in Title III the Emergency Planning and Community Right to Know Act (EPCRA) under 40 CFR 370.40. However, the Laboratory does maintain memorandums of understanding with the Iowa State Department of Public Safety and City of Ames Fire Department. The Laboratory did not store any chemicals in excess of the threshold planning quantities (TPQ) in 1997. If a chemical is found to exceed the TPQ, the Laboratory will submit a Tier II report to the appropriate agencies.

Spills to the environment are reported to the Iowa Department of Natural Resources in accordance with the Iowa Administrative Code, Rule 567, Chapter 131. Spills are cleaned up in accordance with the Iowa Administrative Code, Rule 567, Chapter 133. There is no minimum reportable quantity under Chapter 131. There were no reportable releases at Ames Laboratory during 1997.

3.10 Toxic Substances Control Act (TSCA)

Approximately 4445 kg of asbestos and asbestos containing material were properly removed and disposed in 1997. Ames Laboratory asbestos was disposed in the Ames-Story Environmental Landfill. The landfill is permitted to accept asbestos under IDNR issued permit number 85-SDP-13-91P. The Laboratory complied with the State of Iowa Solid Waste Disposal Rule #102.14 and 40 CFR 61, Subpart M (asbestos NESHAP).

All Ames equipment has been declassified for polychlorinated biphenols (PCB's). All Laboratory PCB's were incinerated at the Aptus facilities near Coffeyville, KS and Aragonite, UT. In 1997, Ames shipped 400 kg of PCB's for incineration.

3.11 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

Not Applicable. Ames Laboratory does not purchase or use pesticides regulated by FIFRA

3.12 Endangered Species Act (ESA)

Not Applicable. No endangered species have been identified on or near Ames Laboratory facilities or Laboratory controlled areas.

3.13 National Historic Preservation Act (NHPA)

Not Applicable. No historic resources have been identified on any of the Ames Laboratory facilities or Laboratory controlled areas. No archeological resources have been identified on or near the facilities or controlled areas.

3.14 Executive Order 11988, "Floodplain Management"

Not Applicable. All Laboratory facilities are well outside the 100 year flood line as mapped by the U.S. Geological Survey (USGS) and the Iowa Geological Survey Bureau (GSB).

3.15 Executive Order 11990, "Protection of Wetlands"

Not Applicable. No wetlands are affected by any Ames Laboratory activities.

3.16 Summary of Permits

In 1997, Ames Laboratory had two air emission source construction permits, but no environmental discharge, operational, storage, treatment or disposal permits for gaseous, liquid or solid effluents. See Sections 3.3, 3.6, 3.7, 3.8, 3.10, and 3.16. DOE held three waste generator identification numbers associated with Ames Laboratory in 1997. Though the buried waste was removed from the CDS in 1994-1995, the generator number cannot be closed until the regulatory agencies are satisfied with the entire site cleanup.

DOE Air Emissions Source Construction Permit Numbers

Permit Number	Type	Ames Laboratory Facility/Area	Expiration
96-A-1282	Air	Ames Lab Paint Booth	None
96-A-1283	Air	Ames Lab Sand Blaster	None

DOE RCRA Generator Identification Numbers

RCRA Generator ID#	Type	Ames Laboratory Facility/Area	Expiration
IA6890008950	LQG	Ames Lab #3-DOE (main campus)	None
IAD984617605	CESQG	Ames Lab #1-DOE (Waste Handling Facility)	None
IA0000365973	SQG	Ames Lab #2-Chemical Disposal Site-DOE/ISU	None

4.0 ENVIRONMENTAL PROGRAM

4.1 Pollution Awareness, Waste Minimization and Recycling Programs

Waste minimization plan and program, was originally implemented in 1990, updated in 1994, and continued through 1997. The plan conforms to Executive Order 12873, Section 701. As required by DOE Order 5400.1, elements of the plan include:

- A statement of management support and commitment.

- A waste minimization policy for the Laboratory.
- Objectives and numerical goals.
- Methods of tracking waste production.
- Employee awareness, training and incentive programs.
- Program performance, evaluation and quality assurance.
- Affirmative procurement program.

The Laboratory was engaged in many waste minimization activities and procedures in 1997. The procedures reduced the quantities of non-hazardous and hazardous wastes generated by the Laboratory's research efforts. Examples include:

- Work Authorization System (WAS) reviews.
- The project Readiness Review Procedure.
- Review of Purchase Orders to prevent duplication or over-supply.
- Collection of surplus mercury for resale.
- White paper and computer paper are separated and recycled.
- Chemical surplus redistribution.

All other non-hazardous waste generated by the Laboratory, e.g., paper, garbage, trash, was collected and transported to the City of Ames' Resource Recovery Plant where it was processed. Combustible waste is used as fuel in the city's electrical utility power plant. Some scrap metal was sold for re-use. Used oil was recycled for re-use. Ames recovered R-12 refrigerants, except from vehicles, and R-22 refrigerants with one recovery unit, but could not recycle them. The Laboratory recovered blended refrigerants with a second recovery unit, but could not recycle them. Onsite contractual recovery and recycling with Iowa State University (ISU) was used as needed for all listed ozone depleting substances (ODS's). ISU and Ames Laboratory have separate Facilities Services and ES&H units, but ISU is the management and operating contractor for DOE. Therefore, the ODS's did not change owners. There are one or more performance measures being developed that will address waste minimization and recycling efforts. See section 4.2.

For affirmative procurement in 1997, 67% of Ames' non-GSA paper products purchased were recycled material.

4.2 Performance Measures

In calendar year 1997, Ames Laboratory was not required to report to DOE through the Performance Indicator Database System (PIDS) on any environmental performance indicators or measures. There were no specific environmental performance measures written into the Ames Laboratory contract, that expired December 31, 1996.

The current Ames Laboratory contract requires PIDS reporting. The Laboratory tracked data in 1997 to report against ES&H performance measures, in the new contract, in the following areas.

1. Acknowledge and promptly resolve employees' ES&H concerns.
2. Strive to minimize the number of work-related injuries and illnesses.
3. Maintain an effective environmental protection program by minimizing impacts to the public and the environment.

The Laboratory complied with applicable federal, state and local rules and regulations and DOE orders. See section 3.0.

5.0 ENVIRONMENTAL RADIOLOGICAL PROGRAM

5.1 Radiation Emissions and Doses

In 1997, airborne releases from the Ames Laboratory complex were minimized or eliminated by experiment design and/or source limitations. Historically, radioactive materials handled at Ames Laboratory have included lab bench experiment quantities of normal and depleted uranium, uranium-235 and thorium. The only use of radioactive materials in 1997 was the electropolishing of uranium and/or thorium. This procedure is not continuous and is only done on a as needed basis. No venting of the process was necessary and the process generated no airborne radioactivity contaminants.

Using the guidance found in 40 CFR 61.94, the annual radionuclide NESHAPS report was prepared in June 1997 as required. According to the guidance, and based on the isotope inventory in Curies per year used at the Laboratory, air emissions were not required to be monitored. IDNR and IDPH do not require permits or monitoring for Laboratory fume hoods. However, Appendix D to 40 CFR Part 61 does provide a method for estimating the radionuclide emissions for a year for reporting purposes, based on the amount of radionuclides in Curies used at the facility. The required parameters were used to calculate potential dose equivalent to the public due to estimated radionuclide emissions from the Laboratory. The effective dose equivalent values were calculated using the EPA-approved computer model CAP88-PC v. 1.0. The dose estimates are reported in Table 5-1 in Appendix A.

No liquid effluent releases were made directly to the environment. Ames Laboratory routinely

analyzes laundry machine wastewater from the Waste Handling Facility before it is released to the sanitary sewer. ISU and the City of Ames are notified directly of the sample results before any discharge. There were no such discharges in 1997. CDS well development water is handled in the same manner. The University in accordance with ISU's pretreatment agreements with the City of Ames periodically analyzes normal wastewater flow through the ISU sanitary sewer system, which discharges into the City of Ames sewer system. See sections 6.1 and 7.0.

5.2 Unplanned Releases

There were no unplanned or accidental radiological releases from Ames Laboratory during 1997.

5.3 Environmental Monitoring

Liquid aqueous wastes (laundry machine water), when generated at the Waste Handling Facility (Figure 2-4 in Appendix A) are analyzed for radioactivity as required by DOE Order 5480.1 (1) before release to the sanitary sewer. The wastewater is analyzed for radioactive content using gamma ray spectroscopy, gas proportional counting for gross beta and gross alpha activity, and liquid scintillation for tritium. No releases of liquid aqueous wastes were made during 1997. The level of radioactivity released in the past has always been below 10 CFR 20.2003 and DOE Order 5400.5 (Chapters II and III) limits. When wastewater is generated, results of the sample analyses and water quantities released are reported to the City of Ames, ISU, the DOE Chicago Operations Office and the DOE Idaho Operations Office. No sampling of storm and sanitary sewer water was accomplished in 1997. CDS groundwater was sampled, and a sump in Wilhelm Hall was sampled. The water in the sump was well below the Part 20 action level. Sections 5.4 and 7.0 discuss groundwater.

5.4 Areas of Concern

Areas of concern are small local areas in or near the City of Ames that were, or could have been, contaminated by Ames Laboratory or ISU Manhattan Project activities. Areas of concern include inactive waste sites, spill sites and other areas that had a potential to be contaminated.

5.4.1 Chemical Disposal Site (CDS)

The CDS is a small former chemical burial site, located on ISU property, which was used from 1957-1966 for disposal of hazardous wastes and wastes from yttrium, thorium and uranium production. A Phase I RI was conducted at the CDS in 1992-1993. A source removal was done during the fall of 1994, with final waste shipments completed in March 1995. The nine Phase I RI wells were abandoned during the source removal.

The Phase II RI field work was done in 1995 and 1996, including an ecological study. The 1996 network of 15 monitoring wells was installed in April 1995. See Figure 5-1. Groundwater samples were collected for the Phase II RI in August and October 1995, and in January and April 1996. The samples were analyzed for twenty three different parameters. Uranium and volatiles contamination was detected in the wells closest to the excavated area.

A Phase II RI final draft report was issued July 24, 1996. A draft Focussed Feasibility Study and a draft Proposed Plan were issued concurrently with the RI report. A public meeting was held August 20 to discuss the documents and future plans for the site. The public comment period was extended from 30 days to 60. The documents generated numerous comments. To address these comments, a draft Responsiveness Summary was issued December 5, 1996. Spring of 1997 ISU conducted a "site characterization", as advised by the IDPH. See appendix B for analytical results.

Final groundwater cleanup concentrations were not established for the site in 1996. Refer to the site work plans and investigation reports for detailed information concerning the CDS. Copies of all final reports were placed in the Ames Laboratory Public Repository at the Ames Public Library.

5.4.2 Inactive Waste Sites (IWS)

Regulatory release of eight IWS's was obtained January 11, 1996 (See Appendix C. Letter from IDPH dated January 11, 1996). Nine areas of concern were investigated for potential radiological contamination. Field work was completed in 1993-1994. After some follow-up work, the old Ames Water Pollution Control (sewage treatment) Plant, was released for unrestricted use February 17, 1995. See the Ames Laboratory 1993-1995 Site Environmental Reports for details. The status of the sites released follows.

Site	**Release Status**
Old Sewage Plant	Unrestricted (1995)
Grand Avenue Underpass	Unrestricted
Ames Municipal Cemetery	Unrestricted
Applied Sciences Complex	Unrestricted
Block House	Unrestricted
Little Ankeny Debris	Unrestricted
Annex I	Approved for current use
Annex II	Approved for current use
Ames Municipal Airport	Approved for current use

In response to a letter from an Ames resident, the Iowa Attorney General sent an investigator to tour the Block House and Little Ankeny Debris sites. Richard Heathcote from the IAG's office toured the sites September 9, 1996. Mr. Heathcote did not issuè a report on his Ames trip.

5.4.3 Old Iowa State College Dump

Another area of concern was discussed in 1996. It is a five acre tract at 13th Street and Stange Road in Ames, known as the old Iowa State College Dump. See Figure 2-2 in Appendix A. Some Manhattan Project and Ames Laboratory wastes were disposed there in the early 1940's. In 1946, 250 tons of uranium extraction wastes were removed from the site for reprocessing.

In response to a public meeting comment, it was determined the radiological waste portion of the site would be sampled to determine if it posed a threat to human health or the environment. Sampling was conducted in August 1995. The samples were below action levels for thorium, uranium and their decay products, indicating no threat to human health or the environment. DOE sent the results to IDPH in September 1995, indicating that DOE considers the radiological investigation closed. IDPH did not formally respond to the sampling report, but forwarded it to ISU. The November 2, 1995 cover letter stated that IDPH is waiting for ISU as the "licensee" to review the data and issue to IDPH a written synopsis of ISU's conclusion. IDPH will then issue a written determination of the status of the site. Discussions between DOE, ISU and IDPH concerning this site continued during 1997, but no decisions concerning any further actions were reached.

5.4.4 Fire Service Institute Training Area

Discussions between DOE, ISU and IDPH concerning ISU's Fire Service Institute training area continued in 1997. The site is on campus, under ISU control and responsibility. It is on the northeast corner of the intersection of Haber Road and the Chicago Northwestern Railroad. See Figure 2-2. ISU made a radiological survey of the site in April 1995 and found seven small areas of activity above background. The University fenced those areas to minimize human contact. Soil samples collected in July and October 1995 detected some thorium contamination. The samples ranged from 14.9 to 662.9 Pci/g Th-232. Limited non-radiological sampling was also conducted. The samples were analyzed for TCLP metals, volatiles and pesticides. The results were within regulatory limits. ISU issued a summary of their site sampling activities on November 22, 1996.

Chase Environmental Group, Inc, under contract from ISU, conducted radiological surveys and sampling November 6-11, 1997. The survey was done to determine the radionuclides involved, and to, determine the depth of contamination. Final report is due in May 1998. Due to the possibility of some of the thorium contamination being linked to former Atomic Energy Commission activities at Ames Laboratory, DOE is implicated as one of the potentially responsible parties.

A few years ago, the University removed underground storage tanks near this area, and it has a 33 well monitoring network in place. The east end of the area continued to be used for coal storage in 1996. As site owner, ISU has lead responsibility in any further site investigation.

6.0 ENVIRONMENTAL NON-RADIOLOGICAL PROGRAM

6.1 National Pollutant Discharge Elimination System (NPDES) Data

Ames Laboratory does not have or need any NPDES permits since there are no direct sanitary discharges or surface runoff to the environment. The Laboratory discharges all liquid wastes to the ISU sanitary sewer system, which discharges into the City of Ames sanitary sewer system. The Laboratory's wastewater is included in the University's pretreatment agreement with the City of Ames. The Laboratory contributes an estimated 6.9% of the ISU central campus sanitary waste. ISU central campus wastewater comprises 12-15% of the sanitary wastes received in the summer, and 15-20% of the wastewater received during the academic year, by the Ames Water Pollution Control Plant. Since the DOE buildings are on ISU land, ISU holds any necessary storm water permits. See section 3.7.

6.2 Other Emissions Monitoring

It is the policy of Iowa DNR to exempt laboratory fume hoods from permitting and monitoring. Ames Laboratory described its system to DNR. DNR issued an official ruling for the Laboratory on July 18, 1994 stating that no permitting and no monitoring are required for the 144 fume hoods and 34 associated exhausts. DNR issued construction permits for the Laboratory's paint booth and sand blaster December 17, 1996. A construction permit application for a graphics paint hood was submitted in 1996 by ISU. The permitting status of this source has not been determined by DNR in 1996. There were no federal or local permits or compliance agreements for emissions or effluents in force in 1997.

6.3 Continuous Release Reporting

Ames Laboratory had no continuous release sources in 1997.

6.4 Environmental Occurrences

No occurrence to report in 1997.

6.5 SARA Title III Reporting Requirements

There were no chemicals stocked at Ames Laboratory at or above the threshold planning quantity (TPQ) in 1997. The Laboratory was in compliance with Executive Order 12856 (Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements) in 1997. If a chemical is found to exceed the TPQ, the Laboratory will submit a Tier II report to the appropriate agencies.

7.0 GROUNDWATER MONITORING AND PROTECTION PROGRAM

A revised combined Groundwater Protection Management Plan and Groundwater Monitoring Plan have been in place at the Laboratory since May 1995. The combined groundwater plan addresses sitewide groundwater protection. The plan is required by DOE Order 5400.1.

Ames Laboratory had a 26 well system for monitoring groundwater during 1996. The inactive chemical disposal site (CDS) was monitored by a system of 21 monitoring wells. Thirteen were downgradient of the source removal area and two were off site, upgradient wells. See Figure 4 in Appendix A. On the main campus, the groundwater-monitoring network consisted of five wells. See Figure 7-1 in Appenix A. One well was upgradient, for background data. Four wells were downgradient (east-southeast) of the Laboratory's main campus facilities. Two of the downgradient wells belonged to ISU. The ISU wells were farther downgradient than the DOE owned wells, and they are screened into a deeper aquifer. The combination of shallow and deep wells is an attempt to detect both floating and sinking contaminants.

The CDS area will be monitored as prescribed by the IDNR, IDPH, and U.S. EPA until the regulatory agencies release the site. It will then be monitored on the same schedule in effect for the main campus, when 10 CFR 834 becomes effective. Only the CDS wells were sampled in 1997. CDS groundwater was collected for the Phase II RI in August and October 1995 and in January and April 1996. The samples were analyzed for twenty-three different parameters. Uranium and volatiles contamination has been detected in the wells closest to the excavated area, plus trace limits in a well in the east ravine. Spring of 1997 ISU conducted a "site characterization", as advised by the IDPH. See appendix B for analytical results.

8.0 QUALITY ASSURANCE PROGRAMS

Ames Laboratory used its existing Environmental Monitoring Quality Assurance Program Plan in 1997. The plan complies with DOE Orders 5400.1, CH5700.6B and 5700.6C. Radioactive sources and solutions that are used for calibration of radiation detection instrumentation are obtained with quantitative calibration that is directly traceable to the National Institute of Standards and Technology. Ames Laboratory quality assurance relied on established U.S. EPA, IDNR, IDPH, and DOE regulations, standards and methods. This applied to both radioactive and non-radioactive environmental sampling and analyses. See the Ames Environmental Monitoring Plan, the Groundwater Protection Management Plan, the Environmental Protection Implementation Plan, the Environmental Monitoring Quality Assurance Plan, and the previous Site Environmental Reports. Ames Laboratory practiced the QA measures described in this report and the referenced plans and reports in 1997.

The Laboratory also participated in the DOE Environmental Measurements Laboratory's Quality Assessment Program (QAP). The program included testing of water, pulverized soil, pulverized vegetation and air filter samples. Elements of the program involving measurement of radioactivity were the responsibility of the Environment, Safety, Health and Assurance office.

The Ames Laboratory Air Emissions Program Plan (Policy and Procedure) ensured that Laboratory activities did not degrade local air quality in violation of the CAA. This was accomplished through control of emissions and rapid remediation of any air quality problems. All applicable DOE Orders, federal, state, and local regulations were complied with. The primary regulatory authority is the IDNR. The IDPH and EPA Region VII also play significant roles. Ames' air plan relies on the use of standard EPA protocols and methods.

Ames Laboratory's air quality assurance procedure consisted of maintaining an exhaust hood inventory, maintaining a radiological material balance, tracking chemicals, and waste collection and management. These measures determine if we have a source that needs monitoring or permitting, in accordance with IDNR guidance. The Laboratory used the CAP88 modeling program to produce the annual NESHAP report.

The Safe Drinking Water Act establishes drinking water quality standards, wellhead protection requirements, monitoring requirements, treatment standards, and the regulation of underground injection activities. Drinking water for Ames Laboratory was supplied by ISU, which obtains its water from the City of Ames public water system. The Laboratory has a Policy for Monitoring Lead in Potable Water. Potable water at Ames facilities was not monitored in calendar year 1996. Samples are scheduled to be drawn and tested in 1998.

Ames Laboratory did not have any regulated point source discharges in 1997. Neither the Laboratory nor ISU had an NPDES wastewater permit. The City of Ames has an NPDES permit. The City of Ames had an agreement for wastewater pre-treatment with ISU, which included Ames Laboratory wastewater. Both the City of Ames and the University sampled ISU wastewater effluent using EPA protocols and methods. The Laboratory notifies the City of Ames and ISU directly, before any discharge, of all discharges of analyzed wash water from the storage tanks at the Waste Handling Facility. ISU had a storm water permit for construction activities. Since the existing DOE buildings are on land leased from ISU, the ISU storm water permit covered Ames Laboratory activities.

The Ames Laboratory Combined Groundwater Protection Management Plan and Groundwater Monitoring Plan ensured groundwater quality through pollution prevention and rapid remediation. All applicable DOE Orders, federal, state, and local regulations were complied with. This policy depends on the use of standard EPA protocols and methods that are analyte specific. Sampling methodologies, containerization, and analyses complied with EPA standards. Sample shipments and handling complied with standards of the U.S. Department of Transportation and the International Air Transporters Association. The strategy for groundwater protection was to actively clean up and/or monitor all contaminated sites, and to perform routine monitoring of wells at the main campus and ASC locations. On the main campus, a combination of shallow and deep wells between the Laboratory facilities and Squaw Creek were available for sampling as resources permit. The CDS

was monitored as prescribed by the regulators. Inactive waste sites were sampled as necessary or as directed by regulatory agencies.

Ames Laboratory ESH&A developed an instrument calibration policy in 1993 to ensure the accuracy of measurements made at the Laboratory. This policy was followed in 1997. Equipment enrolled in the calibration program was and is marked by stickers. A direct charge system pays for calibration work. Some equipment was calibrated by the manufacturers, and some was calibrated in-house in 1997.

In 1997, the Laboratory followed its Readiness Review Procedure for new or significantly modified research activities. This procedure is for risk identification, categorization, and ESH&A readiness review of activities. Another purpose of the Readiness Review Procedure is to prevent and/or control releases of hazardous materials to the environment. It was developed to ensure that an appropriate level of rigor, commensurate to the risk associated with an activity's hazards, is applied to the activity's ES&H review. Eighteen readiness reviews were closed in 1997.

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40. Water Quality Report, Event 4 - April 1996, Ames Chemical Disposal Site, Rust E&I, June 1996.

41. Work Smart Standards Set for Ames Laboratory and Supporting Documentation.

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47. 40 CFR, "Clean Water Act."

48. 40 CFR, "Comprehensive Environmental Response, Compensation and Liability Act."

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51. 40 CFR, "Safe Drinking Water Act."

52. 40 CFR, "Toxic Substances Control Act."

10.0 LIST OF ACRONYMS

ASC: Applied Sciences Complex of Iowa State University

Bq: Becquerel, one disintegration per second

CAA: Clean Air Act and Amendments

CAG: Community Advisory Group for Ames Laboratory environmental activities

CDS: closed chemical disposal site at the ASC

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act

CESQG: conditionally exempt small quantity generator

CFR: Code of Federal Regulations

CG: concentration guide, DOE derived

CH: Chicago Operations Office of the U.S. Department of Energy

Ci: Curie, 3.7E10 disintegrations per second

COE: U.S. Army Corps of Engineers

CWA: Clean Water Act

CX: categorical exclusion, a class of activities determined to have no environmental impact

DOE: U.S. Department of Energy

DSSI: Diversified Scientific Services, Incorporated

EA: environmental assessment

EE/CA: engineering evaluation/cost analysis

EIS: environmental impact statement

EPA: U.S. Environmental Protection Agency

EPCRA: Emergency Planning and Community Right to Know Act

ESA: Endangered Species Act

ESH&A: Environment, Safety, Health and Assurance office of Ames Laboratory

FFCA: Federal Facilities Compliance Act

FIFRA: Federal Insecticide, Fungicide and Rodenticide Act

FS: feasibility study

FSP: field sampling plan

g: gram, of mass

GOCO: a government (DOE) owned, contractor operated facility

GSB: Geological Survey Bureau of the Iowa DNR

HASP: health and safety plan

HEPA: high efficiency particulate air, a filter element or filtration system.

HQ: Headquarters of U.S. Department of Energy

IAC: Iowa Administrative Code

ICP: inductively coupled plasma

IDNR: Iowa Department of Natural Resources

IDPH: Iowa Department of Public Health

INEL: Idaho National Engineering Laboratory, U.S. DOE

IPRT: Institute for Physical Research and Technology, ISU

ISU: Iowa State University

IWS: inactive waste site

LDR: land disposal restriction

LQG: large quantity generator

MCL: maximum contaminant level

mg/L: milligrams per liter; equivalent to ppm or PPM

mrem: millirem

mSv: milisievert, 10^{-3} Sieverts

NEPA: National Environmental Policy Act

NESHAP: National Emission Standards for Hazardous Air Pollutants

NHPA: National Historic Preservation Act

NOV: notice of violation

NPDES: National Pollutant Discharge Elimination System

NRC: Nuclear Regulatory Commission

ODS: ozone depleting substance

ORISE: Oak Ridge Institute for Science and Education

PCB: polychlorinated biphenols

pCi: picocurie, 10^{-12} Curies

PIDS: performance indicator database system

QA: quality assurance

QAP: Quality Assessment Program, DOE

RCRA: Resource Conservation and Recovery Act

rem: Roentgen equivalent man, radiation dose

RESRAD: residual radiation model for sites

RI: remedial investigation

RPP: Radiological Protection Plan, for Ames Laboratory

SARA: Superfund Amendments and Reauthorization Act

SDWA: Safe Drinking Water Act

SEG: Scientific Ecology Group

SER: annual Site Environmental Report, for Ames Laboratory

SQG: small quantity generator

STP: Site Treatment Plan, for Ames Laboratory

Sv: Sievert, 100 rem

TASF: Technical and Administrative Support Facility, the Ames Laboratory office building

TIP: Technology Integration Program of Ames Laboratory

TPQ: threshold planning quantity

TRU: transuranic waste

TSCA: Toxic Substances Control Act

uCi: microcurie, 10^{-6} Curies

ug/L: micrograms per liter

UHL: University (of Iowa) Hygienic Laboratory, provides analytical services for DNR

USGS: United States Geological Survey

UST: underground storage tank

WAS: work authorization system of Ames Laboratory

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APPENDIX A

FIGURES AND TABLES

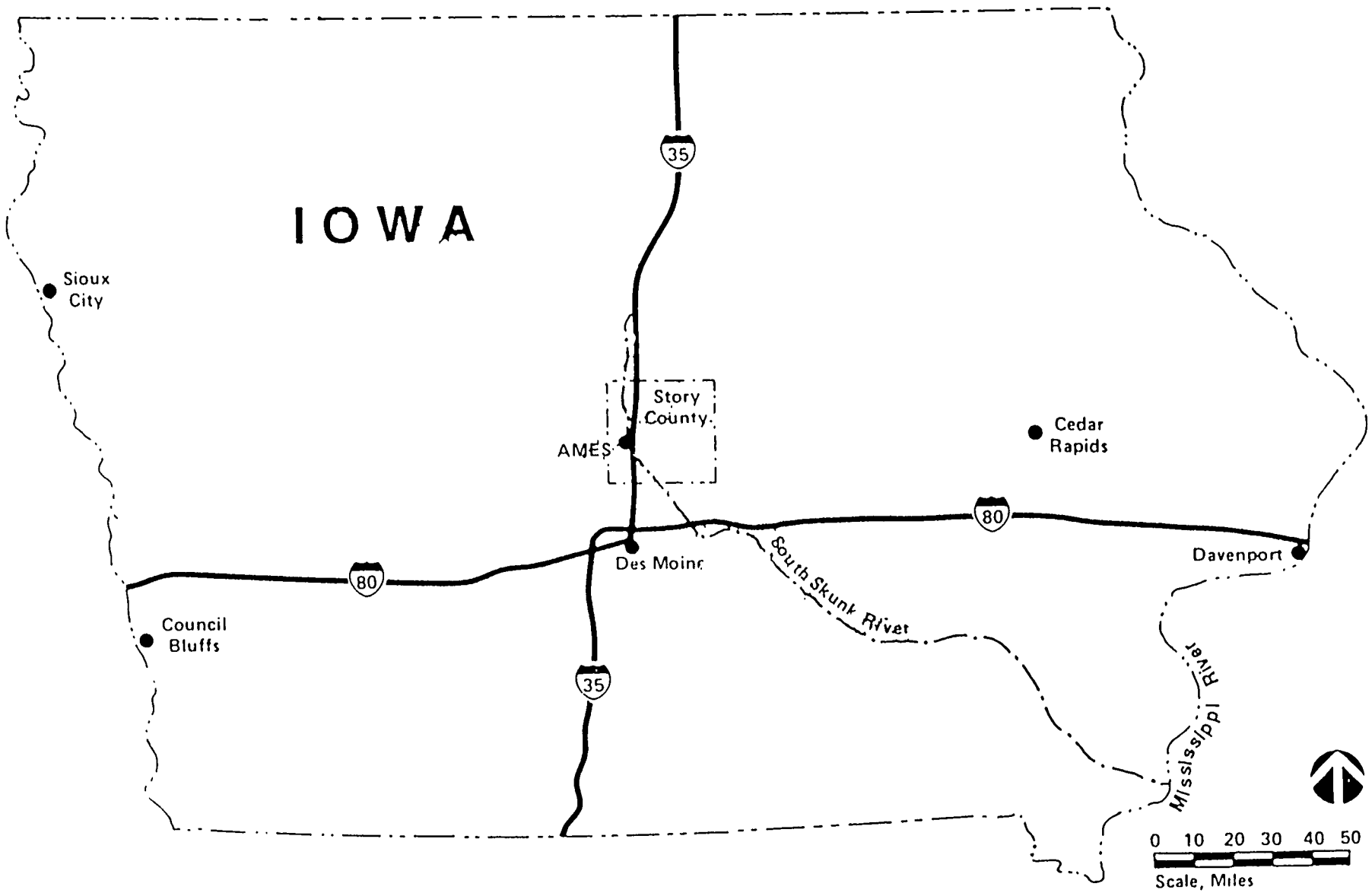


Figure 2-1, Location of the City of Ames in the State of Iowa

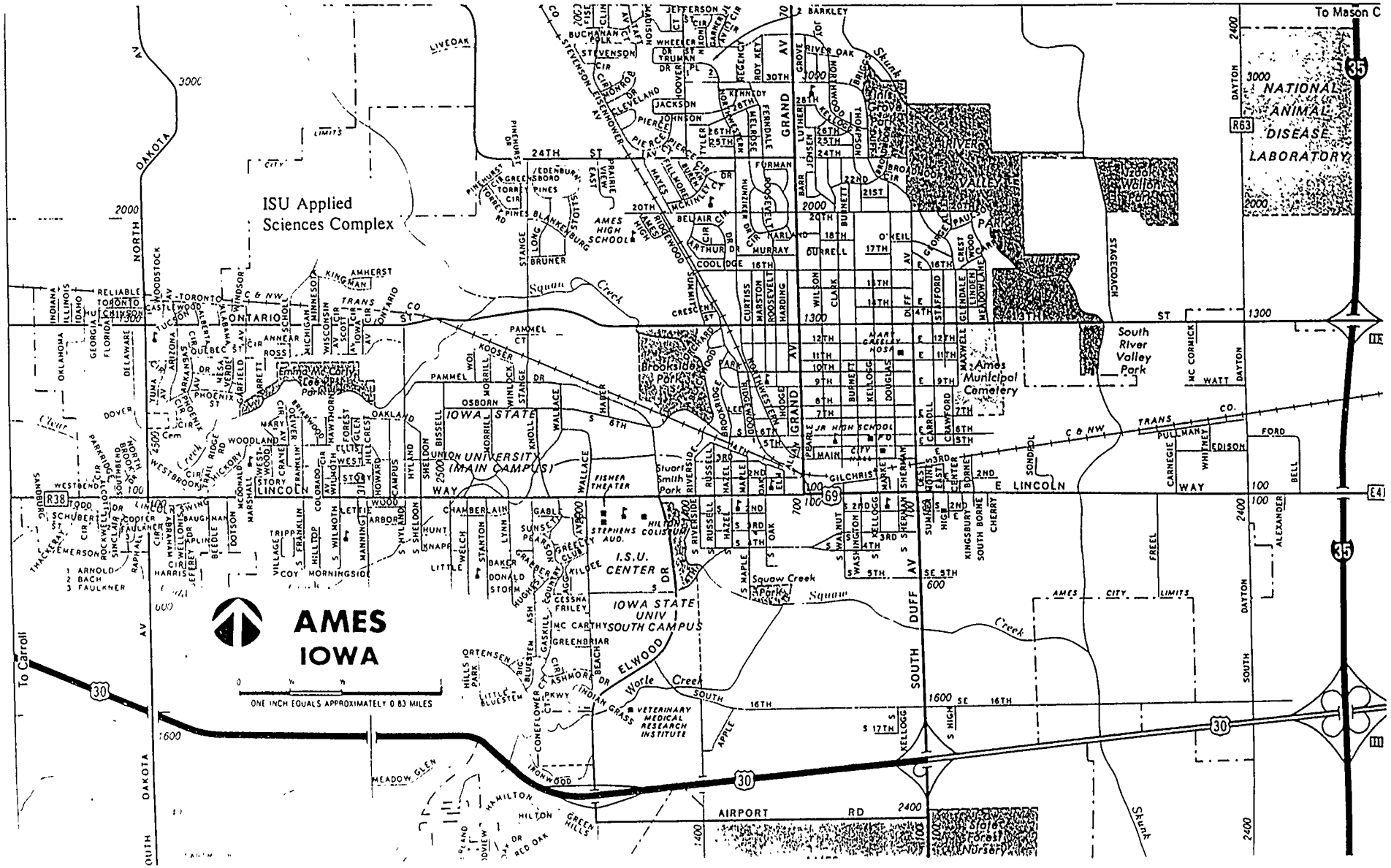


Figure 2-2, ISU Campus in the City of Ames

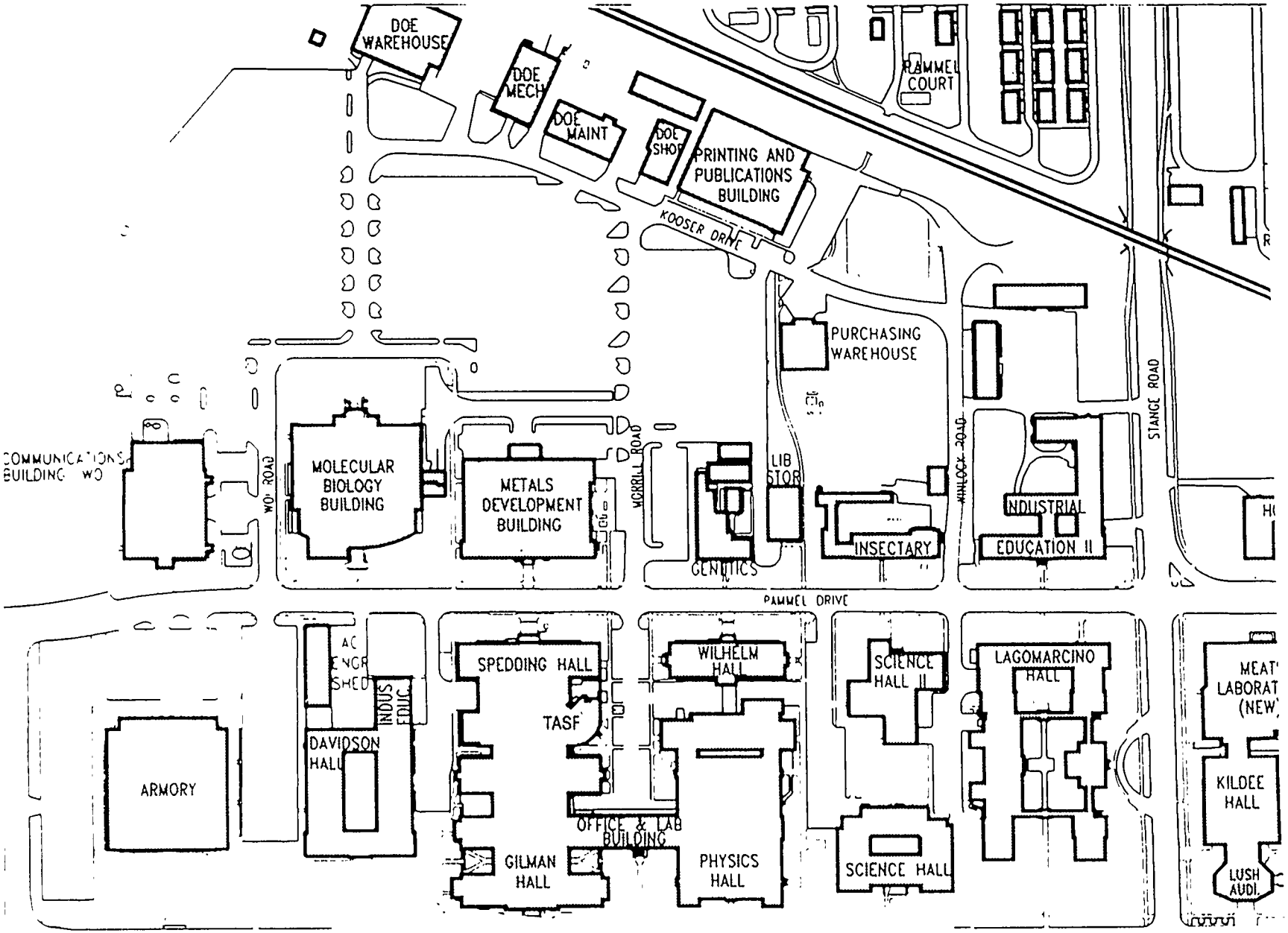


Figure 2-3, Ames Laboratory Facilities on ISU Campus

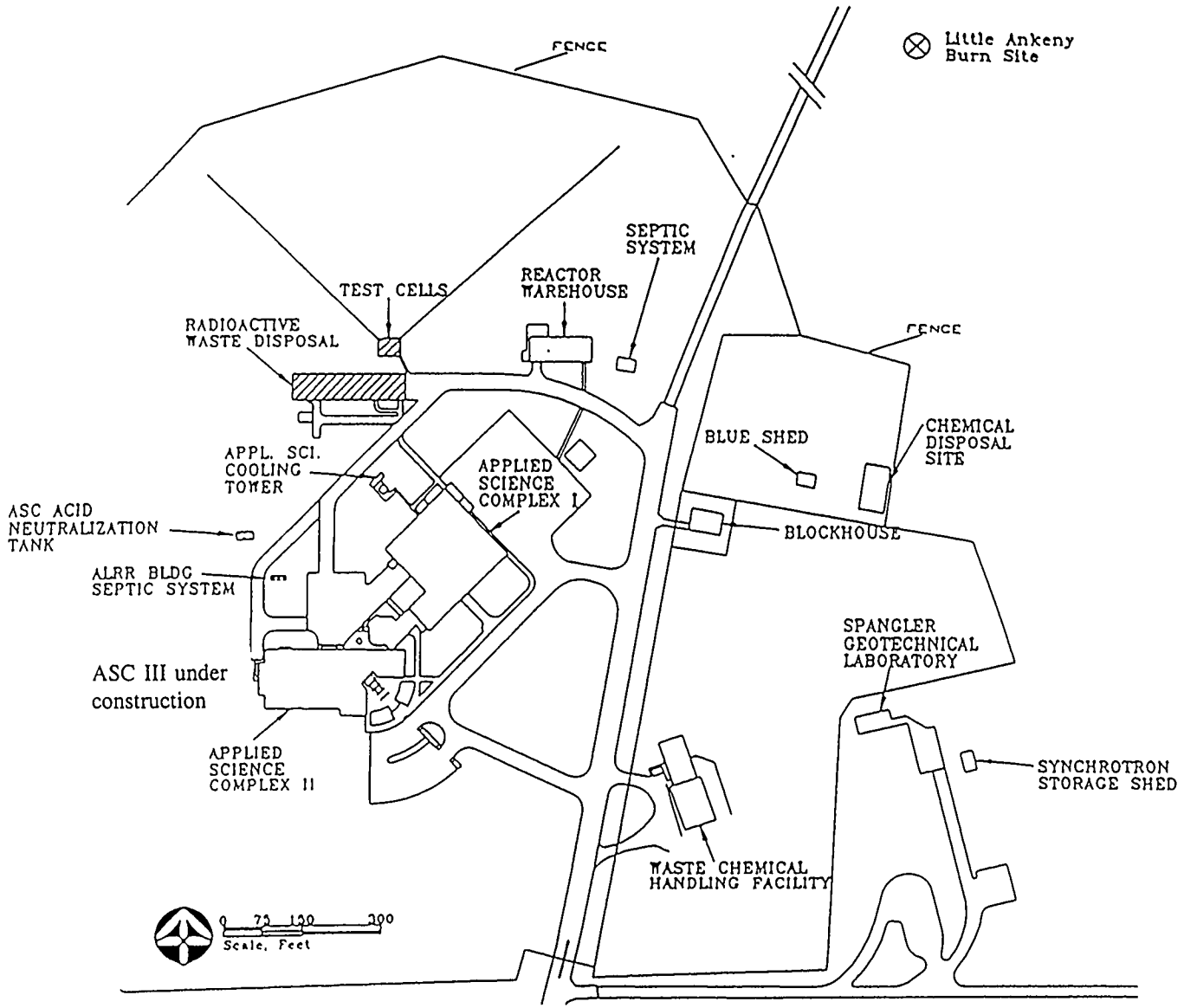


Figure 2-4, ISU Applied Sciences Complex Buildings

Ames Laboratory
Organization

AMES LABORATORY

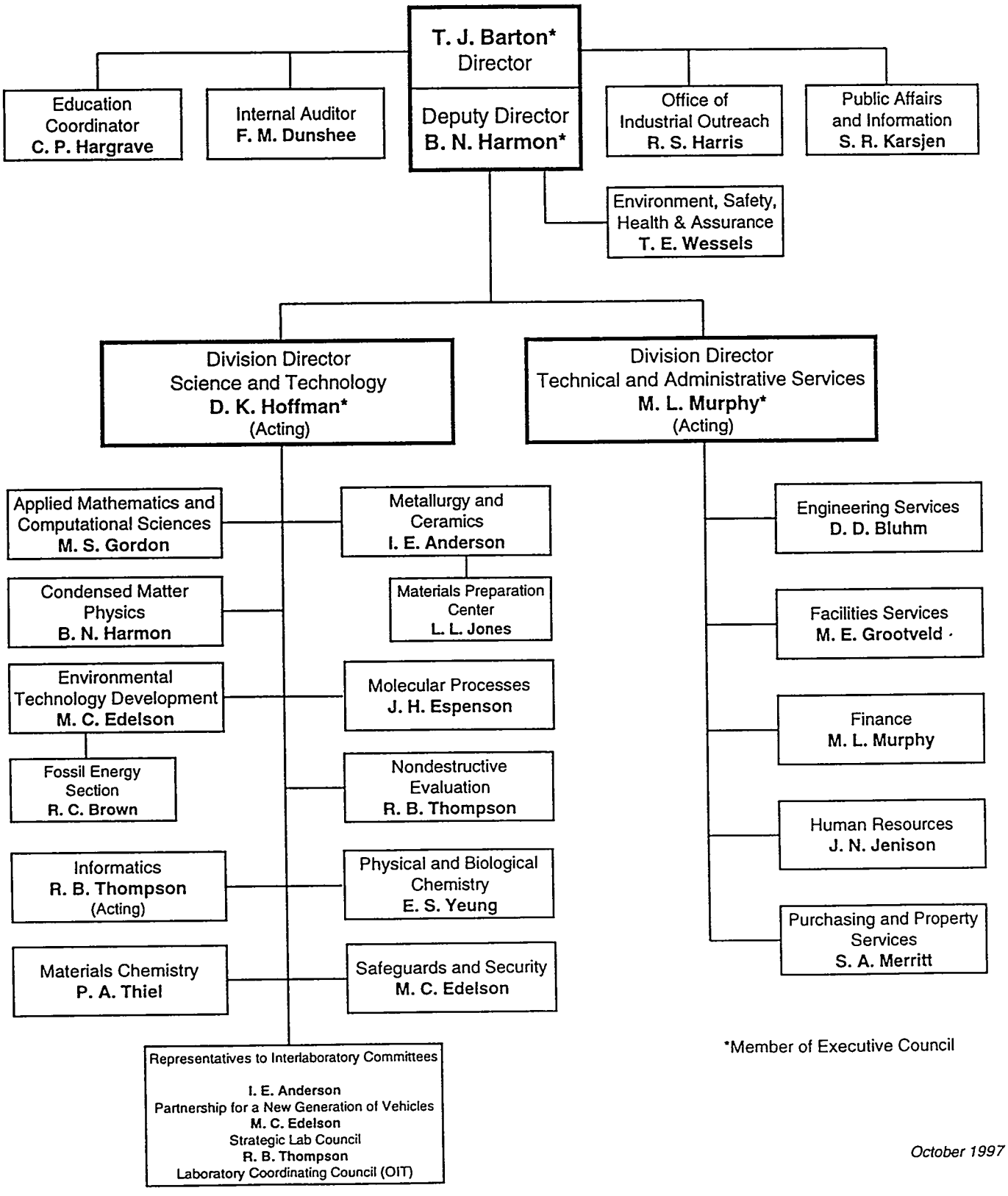
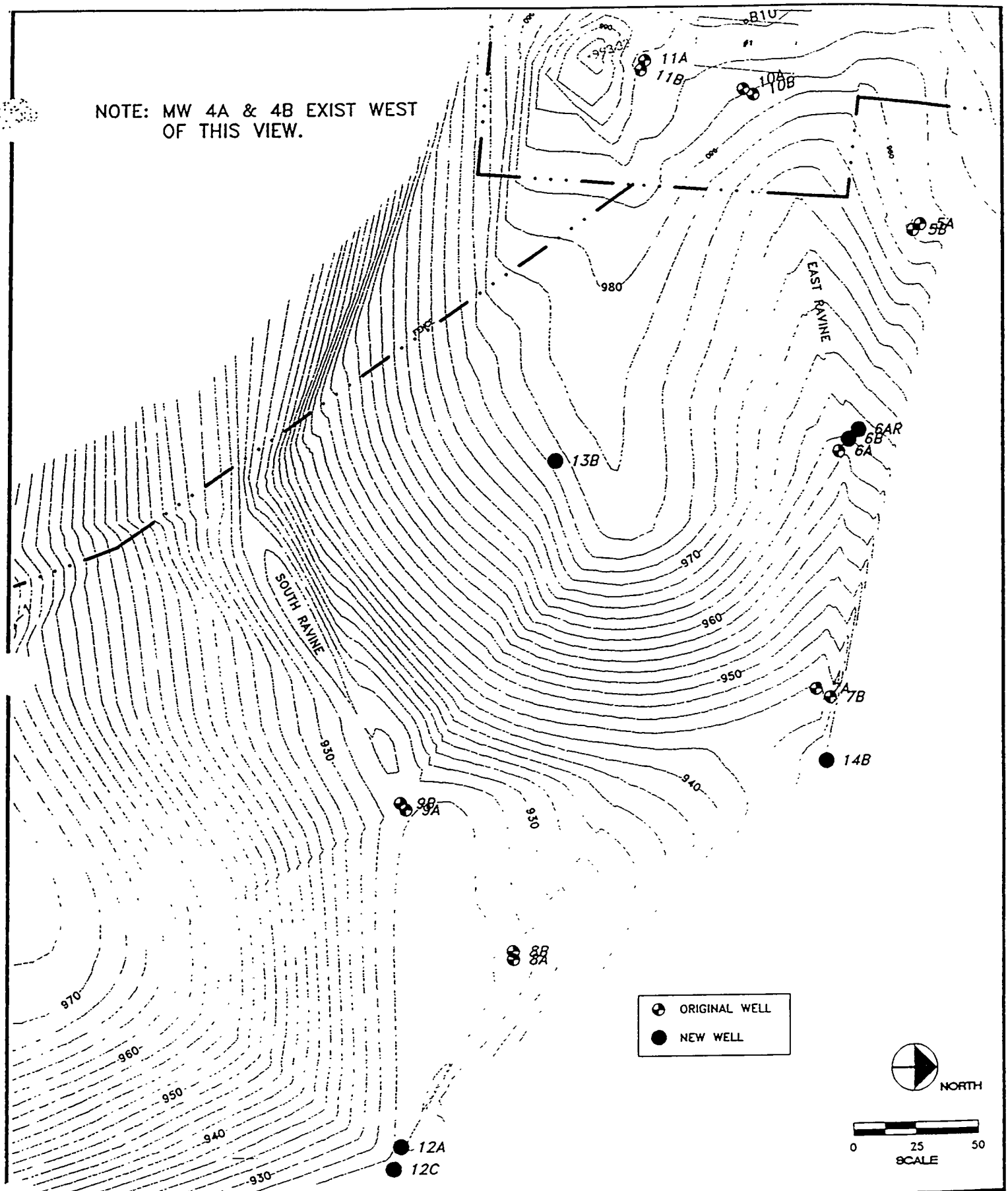


Figure 2-5, Ames Laboratory 1997 Organizational Chart



FOX ENGINEERING
AMES, IOWA

CHEMICAL DISPOSAL SITE
Monitoring Well Locations

Ames Laboratory
Ames, Iowa

FIGURE: 4

REVISION	NO.	DATE
DRAWN JAK	PROJECT NO. 2609-94A	DATE 10/97

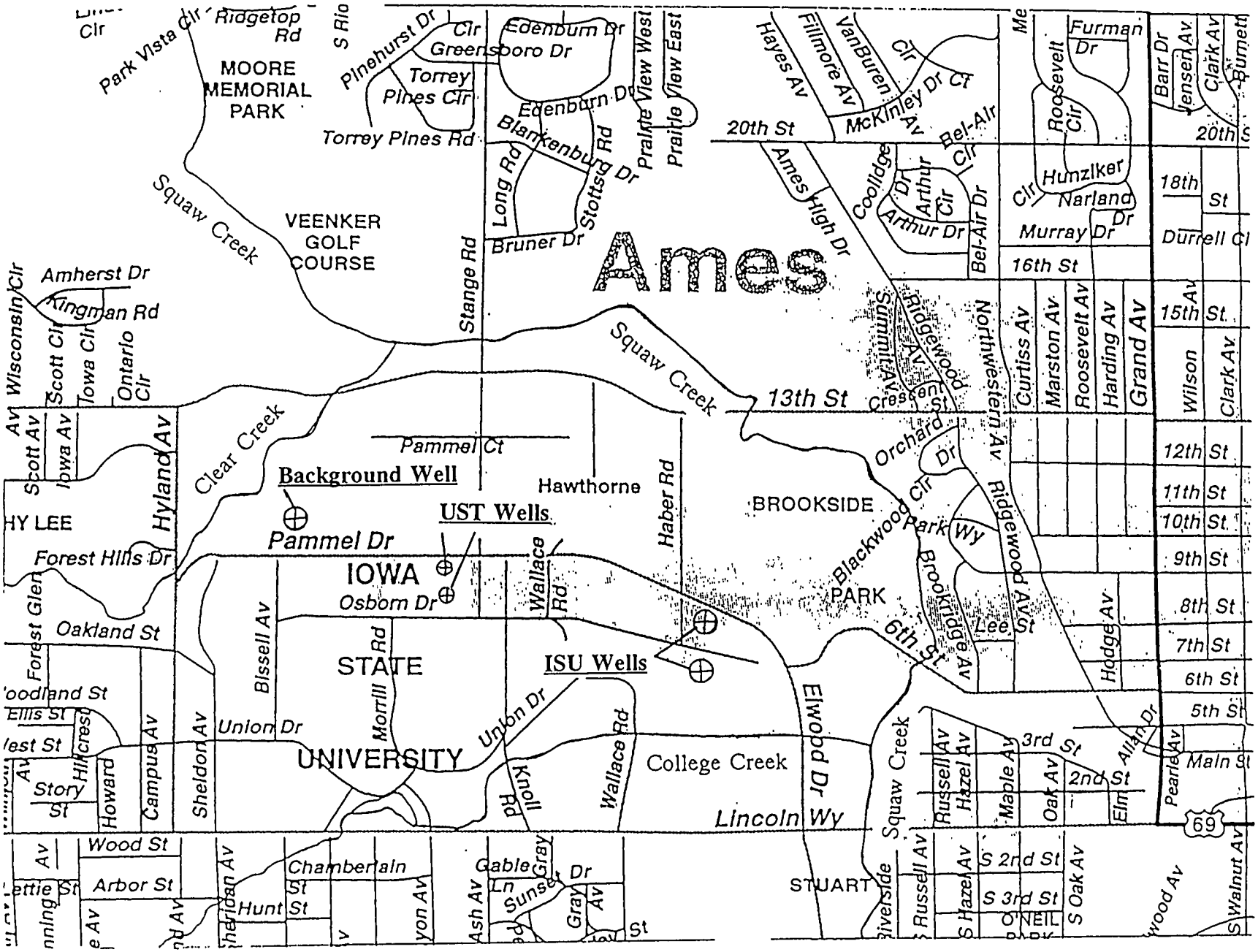


Figure 7-1, Main Campus Monitoring Well Network

Table 3-1, Ames Laboratory Drinking Fountain Analysis

Building Location	1994 Lead / Copper (mg/l)	1995 Lead / Copper (mg/l)	1997 Lead / Copper (mg/l)
Warehouse, shipping & receiving office	<0.002 / 0.03		
Mechanical Maintenance Shop, main area	<0.002 / 0.03		
Metal Development, 2nd floor hallway	<0.002 / 0.13		
Computer Building (now records storage)	,0.002 / 0.01		
Spedding Hall, 1st floor west hallway	<0.002 / <0.01	<0.002 / 0.03	
Spedding Hall, ground floor east hallway			<0.002 / 0.03
Wilhelm Hall, 3rd floor west hallway	<0.002 / 0.02		
Wilhelm Hall 3rd floor east hallway	<0.002 / <0.01	0.003 / 0.02	<0.002 / 0.03
Metals Development, room 158	<0.002 / <0.03	<0.002 / 0.06	<0.002 / 0.05

The regulatory limits are 0.015 mg/l for lead and 1.3 mg/l for copper.

Table 5-1
Ames Laboratory Air Dose Compliance
Calendar Year 1997

Summary of Input Parameters

Isotope	Ci(Bq)/yr	Adjustment Factors (Appendix D to Part 61)	Adjusted Source Term, Ci(Bq)/yr
		Iowa State University Campus Site	
Thorium-232	0.0E0 (0)	1.0E-6 (solid)	0.0E0 (0)

In 1997, activities involving very small quantities of thorium, <10 grams, did not result in airborne particulates.

Compliance Assessment

Ames Laboratory-Iowa State University Site.

Effective Dose Equivalent:

For dep. Uranium,	0.00
For U-234,	0.00
For Th-232,	0.00

Doses are calculated in accordance with DOE 5400.5 and 5400.1. The standard for air emissions found in 40 CFR 61.92 states that emissions of radionuclides to ambient air from a DOE facility "shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr" (0.1 mSv/yr). The Laboratory is in compliance with the stated standard.

APPENDIX B

The following tables were tabulated from the "site characterization" for the CDS. The characterization was conducted by ISU, as advised by the IDPH and IDNR. The final "Site Characterization Report" will be available fall of 1998.

* Fourth quarter samples will be taken Spring of 1998 and will be included in the final report.

Table 4.3.1 Background Gross Alpha Concentrations (pCi/L)

Sample	Qtr 1	Qtr 2	Qtr 3	Ave.	S.D.	Required
MW-4A	1.18	0.33	0.70	0.74	0.43	71.34
MW-4B	5.31	4.32	1.38	3.67	2.04	66.12
Davidson Hall	1.98	2.10	2.03	2.04	0.06	0.19
Lynch Farm	1.33	2.03	1.77	1.71	0.35	9.13
Beef Nutrition	12.40	2.78	1.83	5.67	5.85	226.73
Squaw Creek	------	------	4.28			

Required = number of samples needed to meet a 95% confidence level based on existing data
S.D. = standard deviation

Table 4.3.2 Background Gross Beta Concentrations (pCi/L)

Sample	Qtr 1	Qtr 2	Qtr 3	Ave.	S.D.	Required
MW-4A	1.25	0.70	1.38	1.11	0.36	22.54
MW-4B	2.68	3.31	3.47	3.15	0.42	3.74
Davidson Hall	1.29	2.48	2.00	1.92	0.60	11.98
Lynch Farm	4.15	6.76	5.69	5.53	1.31	17.90
Beef Nutrition	8.41	6.05	4.75	6.40	1.86	20.65
Squaw Creek	------	------	4.68			

Required = number of samples needed to meet a 95% confidence level based on existing data
S.D. = standard deviation

Table 4.3.3 Gross Alpha and Beta Concentrations in Water Samples

Water Sample	Gross Alpha (pCi/L)			Gross Beta (pCi/L)		
Subsurface	1st qtr	2nd qtr	3rd qtr	1st qtr	2nd qtr	3rd qtr
MW-5A	4.08	6.73	Dry	4.30	3.84	Dry
MW-5B	4.19	1.11	0.78	4.47	5.13	<1.19
MW-6AR		3.45	Dry		5.34	Dry
MW-6B		3.62	11.5		3.34	8.39
MW-7A	17.2	23.9	2.12	11.5	12.9	2.04
MW-7B	10.4	8.65	2.96	17.7	10.1	3.52
MW-8A	0.33	2.57	0.93	2.92	6.19	2.81
MW-8B	3.26	6.07	0.81	3.45	4.02	2.11
MW-9A	2.25	4.33	1.01	7.68	3.24	2.01
MW-9B	2.17	2.01	1.09	2.30	3.72	2.30
MW-10A	2150	1540	2600	1850	2060	726
MW-10B	49.1	980	1320	174	1370	722
MW-11A	722	503	Dry	1060	858	Dry
MW-11B	5.41	3.83	2.86	5.49	<2.80	<2.82
MW-12A		2.72	1.33		5.88	2.9
MW-12C		11.3	0.76		7.29	3.52
MW-13A		Dry	Dry		Dry	Dry
MW-13B		3.83	0.56		3.82	1.39
MW-14B		Dry	11.9		Dry	<6.03
SW-1	29.3	12.4	Dry	8.69	18.4	Dry
SW-2	11.1	11.4	Dry	9.98	19.2	Dry
SW-3	<0.90	3.58	3.81	2.22	3.90	4.60

Table 4.3.4 Uranium-235 and Thorium-234 Concentrations in Water Samples

Water Sample	Uranium-235 (pCi/L)			Thorium-234 (pCi/L)		
	1st qtr	2nd qtr	3rd qtr	1st qtr	2nd qtr	3rd qtr
MW-10A		46.6	56.5	1710	1980	840
MW-10B		27.1	22.2	977	832	391
MW-11A	17.8			920	850	
FDMW10A	48.3	49.7	37.7	1390	1410	794

Table 5.3.1a Background Surface Soil Results (pCi/gm)

			Alpha Spectral Results					
Sample	Gross Alpha	Gross Beta	U-234	U-238	U-235/6	Th-228	Th-230	Th-232
1.1	4.57	2.86	0.36	0.48	0.076	0.58	0.76	0.59
2.1	6.02	2.64	0.41	0.32	<0.043	0.61	1.00	0.67
3.1	4.25	3.30	0.51	0.47	<0.054	0.58	1.22	0.56
4.1	5.57	3.98	0.76	0.56	<0.078	0.64	0.77	0.62
5.1	3.51	4.12	0.39	0.45	<0.010	0.55	0.67	0.54
6.1	4.33	4.52	0.71	0.44	0.052	0.67	0.87	0.68
7.1	5.04	3.79	0.79	0.58	<0.085	0.7	0.91	0.65
Mean	4.76	3.60	0.56	0.47	<0.0697	0.62	0.89	0.62
S.D.	0.85	0.69	0.19	0.09	0.0205	0.05	0.18	0.05
Required	**4.82**	**5.49**	**16.57***	**4.95**	**13.01***	**1.14**	**6.40**	**1.17**

* insufficient samples to meet a 95% confidence level.
Required = number of samples needed to meet a 95% confidence level based on existing data

Table 5.3.1b Background Subsurface Soil Results (pCi/gm)

Sample	Gross Alpha	Gross Beta
2.1	3.	4.0
5.1	2.0	1.3
7.1	3.4	2.4
Mean	3.0	2.6
S.D.	0.8	1.3
Required	**38.79***	**38.15***

* insufficient samples to meet a 95% confidence level.
Required = number of samples needed to meet a 95% confidence level based on existing data

Table 5.3.1c Background Surface Soil Gamma Spectral Results (pCi/gm)

Sample	Ra-226	Pb-212	Bi-212	Tl-208
1.1	2.43	0.94	0.98	0.26
2.1	1.95	1.34		.29
3.1		1.00	0.90	0.28
4.1	2.52	1.06	0.90	0.32
5.1		0.98	0.81	0.29
6.1	2.07	1.04	1.05	0.36
7.1			1.06	0.36
Mean	2.24	1.06	0.95	0.31
S.D.	0.28	0.14	0.10	0.04
Required	**3.82**	**2.73**	**1.74**	**2.43**

Required = number of samples needed to meet a 95% confidence level based on existing data

Table A

First Quarter Water Analysis Results - Radiological
Iowa State University
Ames Laboratory Chemical Disposal Site

Units - ρCi/L

CDS Groundwater Samples Collected 4/1/97 - 4/2/97					
Sample	**Gross Alpha**	**Gross Beta**	**Ra-226**	**U-235**	**Th-234**
MW8A	0.33	2.92			
SW-3	0.58	2.22			
RS MW10A	1.17	0.05			
MW4A	1.18	1.25			
JL Well	1.33	4.15			
DH Well	1.98	0.93			
MW9B	2.17	2.30			
FD SW-3	2.25	3.73			
MW9A	2.25	7.68			
MW8B	3.26	3.45			
MW5A	4.08	4.30			
MW5B	4.19	4.47			
MW4B	5.31	2.68			
MW11B	5.41	5.49			
FD MW7A	**8.01**	**7.05**			
MW7B	**10.40**	**17.70**			
SW-2	**11.10**	**9.98**			
BN Well	**12.40**	**8.41**			
MW7A	**17.20**	**11.50**			
SW-1	**29.30**	**8.69**			
MW10B	**49.10**	**174.00**			**977.00**
MW11A	**722.00**	**1060.00**		**17.80**	**920.00**
FD MW10A	**1370.00**	**1460.00**		**48.30**	**1390.00**
MW10A	**2150.00**	**1850.00**	**1020.00**		**1710.00**

JL Well = Well located on the Joe Lynch Property
BN Well = Well Located at the ISU Beef Nutrition Farm
DH Well = Well located in the Davidson Hall Parking Lot
RS = Rinse sample
FD = Field Duplicate
Numbers in bold print indicate values greater than twice background.

Table B

Second Quarter Water Analysis Results - Radiological
Iowa State University
Ames Laboratory Chemical Disposal Site
Units - ρCi/L

CDS Groundwater Samples Collected 6/5/97 - 6/6/97					
Sample	**Gross Alpha**	**Gross Beta**	**Ra-226**	**U-235**	**Th-234**
MW4A	0.08	0.05			
MW5B	1.11	5.13			
FD SW-3	1.52	2.60			
MW9B	2.01	3.72			
JL Well	2.03	6.76			
DH Well	2.10	2.48			
MW8A	2.57	6.19			
MW12A	2.72	5.88			
BN Well	2.78	6.05			
MW6AR	3.45	5.34			
SW-3	3.58	3.90			
MW6B	3.62	3.34			
MW11B	3.83	1.30			
MW13B	3.83	3.82			
MW4B	4.32	3.31			
MW9A	4.33	3.24			
RS MW10A	4.39	2.01			
MW8B	6.07	4.20			
MW5A	6.73	3.84			
MW7B	**8.65**	**10.10**			
MW12C	**11.30**	**7.29**			
SW-2	**11.40**	**19.20**			
SW-1	**12.40**	**18.40**			
MW7A	**23.90**	**12.90**			
MW11A	**503.00**	**858.00**			**850.00**
MW10B	**980.00**	**109.00**			**832.00**
MW10A	**1540.00**	**2060.00**		**46.60**	**1980.00**
FD MW10A	**1590.00**	**2100.00**		**49.70**	**1410.00**

JL Well = Well located on the Joe Lynch Property
BN Well = Well Located at the ISU Beef Nutrition Farm
DH Well = Well located in the Davidson Hall Parking Lot
RS = Rinse sample
FD = Field Duplicate
Numbers in bold print indicate values greater than twice background.

Table C

Second Quarter Water Analysis Results - VOCs
Iowa State University
Ames Laboratory Chemical Disposal Site
Units - µg/L

Sample	1,1,1-Trichloroethane	1,1-Dichloroethane	1,2-Dichloroethane	Acetone	Benzene	Chlorobenzene	Ethylbenzene	Toluene	Trichloroethylene	Xylenes, total
SW-3	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
FD SW-3	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
SW 2	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
SW 1	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
RS MW10A	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
MW4A	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
MW4B	< 1	< 1	< 0.04	< 10	< 1	< 1	5.3	< 1	< 1	4.5
MW5A	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
MW5B	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
MW7A	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
MW7B	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
MW9A	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
MW8A	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
MW8B	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
MW12A	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
MW12C	< 1	< 1	< 0.04	< 10	< 1	< 1	1.3	< 1	< 1	5.6
MW13B	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
MW6AR	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
MW6B	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
MW11A	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
MW11B	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1
MW10A	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	24.8	< 1
FD MW10A	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	24	< 1
MW10B	< 1	< 1	< 0.04	< 10	2.9	< 1	< 1	< 1	12.9	< 1
MW9B	< 1	< 1	< 0.04	< 10	< 1	< 1	< 1	< 1	< 1	< 1

Table D

Second Quarter Water Analysis Results - Metals
Iowa State University
Ames Laboratory Chemical Disposal Site

Units - µg/L

Metals Analysis for CDS Water Samples collected on 6/5/97 - 6/6/97							
Sample	**Barium**	**Chromium**	**Manganese**	**Nickel**	**Lithium**	**Uranium**	**Mercury**
SW-3	102		141				
FD SW-3	103		197				
SW 2	284	21.5	1980	19.9	16.9		
SW 1	774	37.4	4120	63.4	36.2		
RS MW10A			0.89				
MW4A	97.7		6.6				
MW4B	64.6		2.1				
MW5A	30.2		18.9		20.2		
MW5B	60.4	4.8	478		25.5		0.2
MW7A	43.8		403	9.3	59.4		
MW7B	12.6		952	9.4	130		
MW9A	59.3		474	21.1	22.9		
MW8A	93.7		72.5	40.9	18.3		
MW8B	61.7		6.4		27		
MW12A	137	8.7	160		6.1		
MW12C	94.7		373		70		
MW13B	144		250		19		
MW6AR	171		55		20.8		
MW6B	86.3		509		47.3		
MW11A	73.2	2.9	17.4		153	2380	
MW11B	168		551		32		
MW10A	213		1520	73.4	3490	7170	0.16
FD MW10A	176		1030		3350	7100	
MW10B	402		1760		1220	3190	
MW9B	64.6		319		37.4		

Table E

Third Quarter Water Analysis Results - Radiological
Iowa State University
Ames Laboratory Chemical Disposal Site
Units - ρCi/L

CDS Groundwater Samples Collected 10/28/97 – 10/29/97					
Sample	**Gross Alpha**	**Gross Beta**	**Ra-226**	**U-235**	**Th-234**
MW11A	**Dry**	**Dry**			
RS MW10A	0.52	0.63			
MW13B	0.56	1.39			
MW4A	0.70	1.12			
MW12C	0.76	3.52			
MW5B	0.78	1.09			
MW8B	0.81	2.11			
MW8A	0.93	2.81			
MW9A	1.01	2.01			
MW9B	1.09	2.30			
MW12A	1.33	2.9			
MW4B	1.38	3.47			
JL Well	1.77	5.69			
BN Well	1.83	4.75			
DH Well	2.03	2.00			
MW7A	2.12	2.04			
MW11B	2.86	<2.82			
MW7B	2.96	3.52			
SW-3	3.81	4.60			
Squaw Creek	4.28	4.68			
FD SW-3	4.88	2.17			
MW6B	**11.5**	**8.39**			
MW14B*	**11.9**	**<6.03**			
MW10B	**49.1**	**1320**		**22.2**	**391**
FD MW10A	**1530**	**701**		**37.7**	**794**
MW10A	**2600**	**726**		**56.5**	**840**

JL Well = Well located on the Joe Lynch Property
BN Well = Well Located at the ISU Beef Nutrition Farm
DH Well = Well located in the Davidson Hall Parking Lot
RS = Rinse sample
FD = Field Duplicate
* Laboratory reported small sample volume and high solids content
Numbers in bold print indicate values greater than twice background.

Table F

Soil Analysis Results – Radiological (ρCi/L)
Iowa State University
Ames Laboratory Chemical Disposal Site

Sample	Gross Alpha	Gross Beta	Cs-137	K-40	Ra-226	Ra-228	U-235	Th-234	Pb-210	Pb-212	Bi-212	Tl-208	Bi-214	Pb-214	Ac-228
BKG1	3.17	2.86	0.60	15.80	2.43				1.77	0.94	0.98	0.26	0.61	0.89	0.54
BKG2	3.85	2.64	0.53	16.20	1.95	0.74			10.60	1.32		0.29	0.63	0.87	
BKG3	3.88	3.30	0.61	15.30			0.13	1.06	0.90	1.00	0.90	0.32	0.67	0.87	0.64
BKG4	3.73	3.98	0.46	15.70	2.52	0.64			1.27	1.06	0.90		0.75	0.96	
BKG5	3.57	4.12	0.41	15.90					10.00	0.98	0.81	0.29	0.60	0.81	0.66
BKG6	3.26	4.52	0.48	15.70	2.07					1.04	1.05	0.36	0.87	1.05	0.80
BKG7	3.78	3.79	0.15	15.80							1.06	0.36	0.81	1.41	0.75
BKG8	6.62	3.89	0.28	15.50		0.78	0.10	1.04	0.58	1.25	1.08	0.35	0.82	1.07	
Mean	3.98	3.64	0.44	15.74	2.24	0.72	0.12	1.05	4.19	1.08	0.97	0.32	0.72	0.99	0.68
A9	5.46	2.87	0.16	16.00	3.39	0.71						0.27	0.71	1.22	
A10	7.37	2.94	0.51	15.20	2.02			1.07	1.05	0.96	0.79	0.31	0.60	0.82	0.63
B4*	***12.80***	***27.50***	0.41	14.80		0.69	0.51			0.97	1.27	0.26	0.59	0.82	
B5	3.91	2.74	0.48	15.00	1.92	0.55					0.81	0.25		1.04	
B6	4.60	3.32	0.18	13.00						0.96	1.00	0.28	0.65	0.83	0.75
B7*	***10.10***	***7.49***	0.34	14.10		0.73	0.29			1.08		0.34	0.62	0.81	
B8	4.16	2.55	0.03	14.50		0.64	0.13		0.64	0.99	0.88	0.28	0.71	0.86	
B9	1.90	2.49		15.00	1.79			0.95	0.45	1.00	0.81	0.31	0.72	0.88	0.61
B10	7.40	5.48	0.24	15.60	2.84					1.03		0.28	0.72	0.95	0.74
C3	3.79	3.23	0.25	9.68						0.58	0.65	0.22	0.68	0.86	
C4	3.34	2.79	0.39	11.40	1.86			1.04	0.78	1.25		0.35		0.96	
C5	3.46	3.63	0.43	14.70	2.32							0.32	0.59	1.00	0.71
C6	7.14	4.92	0.45	16.20	3.16					1.64			0.85	1.08	0.88
C7	5.41	4.09	0.29	16.00	3.13	0.73						0.34	0.70	1.12	
C8	7.88	3.77	0.19	14.60						1.57		0.30	0.62	0.91	
C9	1.48	2.13	0.06	14.20	3.35	0.87					1.68	0.46	0.71	1.21	
C10	4.89	3.47	0.10	14.10	2.10			1.80		1.16	0.74	0.33	0.77	1.02	
D2	2.12	2.42	0.18	12.80	1.55	0.57	0.05	0.90	0.52	0.86	0.75	0.25	0.60	0.78	
D4	3.91	2.48	0.31	16.70	2.31	0.76	0.06	1.28	0.58	1.18	0.95	0.35	0.87	1.10	
D8	3.06	1.88	0.23	16.80	2.03	0.71			1.28	1.04	0.93	0.34	0.83	0.97	
E6	0.00	0.00	0.04	4.82	0.90	0.28		0.42	0.23	0.38		0.11	0.34	0.45	
G4	4.30	3.79	0.16	17.80	2.10			1.07	0.49	1.22	1.13	0.34	0.77	1.01	0.77
G6	2.74	2.56	0.10	13.90	1.41					1.28		0.29	0.71	0.90	0.62
G9	4.63	3.24	0.24	14.10	2.10				1.52	0.91	0.98	0.28	0.57	0.76	0.67
G10	3.58	2.94	0.17	16.60	2.69					0.99	0.86	0.33	0.60	0.87	0.61

Table F (continued)
Soil Analysis Results - Radiological
Iowa State University
Ames Laboratory Chemical Disposal Site

Sample	Gross Alpha	Gross Beta	Cs-137	K-40	Ra-226	Ra-228	U-235	Th-234	Pb-210	Pb-212	Bi-212	Tl-208	Bi-214	Pb-214	Ac-228
South 1	4.16	2.66	0.29	16.30	1.73	0.60		0.79	0.54	0.95	0.94	0.26	0.61	0.80	
South 2	1.99	1.79	0.35	15.60	1.83	0.54		0.81	0.67	1.05	1.12	0.29	0.71	0.90	
South 3	4.14	3.27	0.56	15.30	1.39			1.08	1.11	1.01	0.93	0.35	0.70	0.97	0.78
South 4	6.16	3.93	0.46	16.00	2.15			1.01	0.85	1.18		0.31	0.77	1.02	0.82
South 5	1.90	1.17	0.05	12.10	2.98					1.14	1.16	0.32	0.90	1.01	
South 6	5.83	3.70	0.27	14.60	2.13		0.04	1.16	1.20	1.18	1.09	0.35	0.86	1.11	0.74
South 7	5.25	1.41		13.50	1.82	0.55		0.61	0.31	0.85	0.86	0.23	0.86	1.13	
South 8	2.35	1.19	0.03	13.60	2.13			0.92	0.46	0.93	0.91	0.27	0.95	1.18	0.62
South 9	3.31	2.87	0.15	16.20			0.17	1.35	0.33	1.31		0.34	0.98	1.28	0.78
South 10	5.01	2.53	0.53	17.80	1.95				0.87	1.09		0.29	0.78	0.98	0.78
North 1	6.40	3.15	0.50	16.20	2.09						0.78	0.31	0.62	1.15	0.69
North 2	5.02	3.06	0.53	15.80	2.85	0.65			1.21	1.02	0.94	0.26	0.70	0.85	
North 3	5.51	2.87	0.27	15.70						1.04	1.21	0.26	0.72	1.16	0.66
North 4	4.41	4.30	0.63	16.10	1.86				0.86	1.00		0.30	0.75	0.95	0.62
North 5*	***8.40***	***3.67***	0.57	15.30	2.43			1.05	0.88	1.16	0.95	0.31	0.84	1.08	0.82
North 6	2.59	1.11	0.62	14.20	2.75	0.68					0.87	0.32	0.76	1.22	
North 7	4.25	3.03	0.43	15.80	2.42	0.66			1.28	1.02	0.96	0.29	0.71	0.88	
North 8	4.87	2.89	0.44	16.70	2.23	0.67			8.63	1.12	0.72	0.31	0.73	0.97	
North 9	6.70	3.91	0.43	17.80	2.02			1.11	0.78	1.23	1.08	0.36	0.80	1.05	0.76
East 1	4.76	3.14	0.52	16.70		0.68	0.05	0.97	0.68	1.02	0.80	0.29	0.71	0.93	
East 2	5.78	4.43	0.25	16.80	2.68	0.90				1.52		0.42	0.94	1.15	
East 3	5.01	3.68	0.32	12.30	1.93				0.59	1.08		0.32		0.88	
East 4	5.21	3.41	0.34	16.00	1.97			1.19	1.18	1.09		0.33	0.69	0.87	0.71
East 5	3.69	3.34	0.42	18.10	2.60				1.23	1.27		0.29	0.88	0.91	0.67
East 6	5.13	3.43	0.38	16.70	2.11					1.20		0.29	0.81	0.89	
East 7	3.27	5.06	0.17	15.20	2.71	0.75	0.11	1.85	0.53	1.11	1.10	0.31	0.79	1.03	
East 8	5.59	3.59	0.27	15.60	2.66	0.78			2.45	1.09	1.47	0.32	0.85	1.06	
East 9	2.63	3.25	0.08	14.40	2.05				18.4	0.79		0.21	0.59	0.71	

Table F (continued)
Soil Analysis Results - Radiological
Iowa State University
Ames Laboratory Chemical Disposal Site

Sample	Gross Alpha	Gross Beta	Cs-137	K-40	Ra-226	Ra-228	U-235	Th-234	Pb-210	Pb-212	Bi-212	Tl-208	Bi-214	Pb-214	Ac-228
East 10	6.62	5.11	0.10	15.50	2.56	0.65		1.08	0.58	1.32		0.36	0.84	1.04	
East 11	2.92	3.63	0.18	15.00	2.14				1.47	0.99	1.04	0.26	0.64	0.80	0.63
*East 12**	*46.10*	*4.82*	0.07	13.40	1.58					0.91		0.23	0.49	0.74	0.46
*East 14**	*60.30*	*1.94*	0.78	13.80	1.76					0.92	0.94	0.31	0.79	0.87	0.65
East 15	2.97	3.46	0.35	15.70	1.50				18.20	0.98	0.80	0.31	0.58	0.73	0.62
East 16	2.64	2.97	0.38	16.40	2.14	0.58					0.86	0.30	0.62	1.04	
*15***	*9.22*	*2.58*	0.07	14.20	1.77			0.91	0.54	1.01	0.84	0.27	0.90	1.21	0.63
*24**	*12.70*	*4.19*	0.21	16.40	2.26	3.77		3.95	0.39	6.33	5.29	1.72	0.67	0.95	
*29**	*3.94*	*1.78*	0.20	14.80	2.78	3.43				5.53	4.42	1.45	0.59	0.71	
*30**	*18.80*	*7.32*	0.39	16.70	8.02			6.48	0.73	12.20	10.10	3.51	0.75	0.79	
Subsurface Soil	**Gross Alpha**	**Gross Beta**	**Cs-137**	**K-40**	**Ra-226**	**Ra-228**	**U-235**	**Th-234**	**Pb-210**	**Pb-212**	**Bi-212**	**Tl-208**	**Bi-214**	**Pb-214**	**Ac-228**
BKG2 sub	3.60	4.08		13.60			0.11	0.89	0.40	0.93	1.15	0.28	0.70	0.88	0.59
BKG5 sub	2.02	1.00		14.80	1.36	0.48		0.69	0.30	0.78	0.69	0.22	0.56	0.69	
BKG7 sub	3.47	2.43		15.90	3.85	1.08	0.14		0.96	1.59	1.39	0.44	1.30	1.63	
Mean	**3.03**	**2.50**		**14.77**	**2.61**	**0.78**	**0.13**	**0.79**	**0.55**	**1.10**	**1.08**	**0.31**	**0.85**	**1.07**	**0.59**
B6 sub	2.06	2.81		14.00	2.59						0.77	0.28	0.67	1.17	0.57
B9 sub	6.08	4.47	0.04	14.40	2.55						0.55	0.31	0.78	1.27	0.64
B10 sub	3.61	2.61		12.90		0.54	0.09		0.60	0.80	0.87	0.22	0.55	0.71	
C6 sub	5.24	2.38					0.13	1.02	0.47	1.12	0.97	0.31		1.08	
*C8 sub**	*11.00*	*11.60*		15.03	2.56						0.92	0.31	0.69	1.18	0.63
C9 sub	0.67	0.60	0.01	14.70			0.11		0.49	1.04	0.85	0.29	0.73	0.95	0.73
C10 sub	2.60	2.22	0.01	13.10	2.31		0.08	1.91	0.37	0.95	0.80	0.27	0.69	0.90	0.61
G6 sub	1.84	0.94		12.70	1.23	0.30						0.15	0.39	0.62	
G9 sub	0.60	0.78		13.30	1.52	0.53		0.79		0.94	0.54	0.26	0.69	0.86	
24 sub	1.73	1.59		13.40	0.58		0.09		0.66	0.90	0.87	0.27	0.73	0.92	
29 sub	0.00	0.43		15.00			0.10	1.13	0.43	1.15	0.82	0.32	0.73	0.99	0.74
30 sub	1.34	0.89		13.60	2.20	0.58					0.76	0.29	0.70	1.21	

Table F (continued)
Soil Analysis Results - Radiological
Iowa State University
Ames Laboratory Chemical Disposal Site

SUB-Surface Soil Samples	Gross Alpha	Gross Beta	Cs-137	K-40	Ra-226	Ra-228	U-235	Th-234	Pb-210	Pb-212	Bi-212	Tl-208	Bi-214	Pb-214	Ac-228
East 1 sub	2.70	1.20		14.90			0.06		0.68	1.04	0.95	0.29	0.74	0.96	0.69
East 2 sub	3.43	1.84		15.10			0.11	0.97	0.40	1.08	0.88	0.31	0.75	1.01	0.67
East 3 sub	4.84	2.68		16.00	2.33	0.64					0.91	0.33	0.68	1.19	
East 4 sub	3.25	2.17		14.20		0.58	0.09	0.86	0.32	0.95	0.64	0.26	0.61	0.79	
East 5 sub	4.74	3.75		14.60	2.40	0.87	0.04	1.29	0.63	1.33	1.20	0.40	1.00	1.32	
East 6 sub	6.92	4.56	0.02	16.20	3.62		0.10	1.62	0.87	1.50	1.32	0.43	1.62	2.08	1.05
East 14 sub	1.87	2.42		14.80	1.74		0.05	0.98	0.34	1.12	1.05	0.30	0.72	0.93	0.69
East 15 sub	2.05	2.40	0.05	14.70	2.12	0.63	0.08		0.78	0.99	1.00	0.28	0.67	0.86	
East 16 sub	2.90	2.69		14.00			0.12		0.61	0.95	1.02	0.27	0.65	0.89	0.67

* These samples required additional analyses and were sent to Quanterra July 24,1997, for as Isotopic Uranium and Alpha Spectroscopy analysis.

Table 5.3.1.4 Isotopic Uranium and Thorium Results (pCi/gm)

Sample	U-234	U-235/6	U-238	Th-228	Th-230	Th-232
A10	0.54	0.081	0.52			
B4	**6.00**	**0.33**	**5.91**			
B7	**3.44**	**0.31**	**3.53**			
B10	1.04	0.10	**1.20**			
C8	0.56	<0.063	0.82			
24	0.48	<0.038	0.60	**2.75**	0.86	**2.69**
29	0.71	<0.054	0.83	**3.03**	1.29	**3.19**
30.1	0.75	<0.036	0.76	**6.81**	1.28	**6.33**
15.1	0.52	<0.012	0.44			
North 5.1	0.47	<0.010	0.46			
East 12.1	0.34	<0.010	0.31			
East 14.1	0.56	<0.045	0.43			
C8.1 Sub	0.42	<0.084	0.41			
Background (avg.)	0.56	<0.0697	0.47	0.62	0.89	0.62

Numbers in bold print indicate values greater than twice background.

5.3.2 Metals Analysis

Five soil samples were analyzed for metals as requested by the Iowa Department of Natural Resources. The analytical results indicate that the metal levels found in the soil samples collected at the CDS are comparable to the background samples.

Table 5.3.2 Soil Metals Analysis Results (mg/kg)

Sample	Barium	Chromium	Manganese	Nickel	Lithium	Uranium	Mercury
BKGD 2.3	53.9	4.5	493	4.8	1.8	ND	ND
BKGD 5.3	43.2	5.1	358	5.3	2.1	ND	0.05
1.3	55.0	5.8	465	6.8	3.0	ND	ND
B10.3	45.6	7.6	287	9.8	3.7	ND	ND
26.3	514.0	7.8	335	9.5	3.5	ND	0.1

ND – not detected

APPENDIX C

LETTERS & CORRESPONDENCES

STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF PUBLIC HEALTH
CHRISTOPHER G. ATCHISON, DIRECTOR

January 11, 1996

Warren R. Madden
Vice President for Business and Finance
Iowa State University
125 Beardshear Hall
Ames, Iowa 50011-2038

Dear Mr. Madden:

Reference is made to your letter of January 5, 1996 in which you request our concurrence on the status of nine inactive waste sites which we possibly contaminated with radioactive materials as a result of the operation of Ames Laboratory as a DOE contractor in the past. Listed below are the sites by name and our conclusions as to the status of the site regarding closure.

1. Ames Old Waste Water Treatment Facility (WWTF): Met criteria for unrestricted use per Department letters to the city of Ames dated June 16, 1994 and February 17, 1995.

2. Grand Avenue Under Pass: Based on the data provided by DOE, ISU and data collected by this Department this area meets the criteria for unrestricted use. In fact, there is information which indicates that this area never was subjected to the spreading of contaminated sludge from the WWTF.

3. Ames Municipal Cemetery: Based on the date provided by DOE, ISU and data collected by this Department this area meets the criteria for unrestricted use. In fact, there is information which indicates that this area never was subjected to the spreading of contaminated sludge from the WWTF.

4. Applied Science Center: Based on the data provided by DOE, ISU and data collected by this Department, this area meets the criteria for unrestricted use.

5. Block House Area : Based on the data provided by DOE, ISU and data collected by this Department, this area meets the criteria for unrestricted use.

6. Little Ankeny Debris Site: Based on the data provided by DOE, ISU and data collected by this Department, this area meets the criteria for unrestricted use.

7. Annex I: Based on the data provided by DOE, ISU and data collected by this Department, this area can be used as it is now, in perpetuity, without public health concerns. However, if the site is developed for any other purpose additional surveys or sampling will be necessary to confirm that if residual radioactive material exists it is not in amounts which could be of public health concern during the developmental process.

8. Annex II: : Based on the data provided by DOE, ISU and data collected by this Department, this area can be used as it is now, in perpetuity, without public health concerns. However, if the site is developed for any other purpose additional surveys or sampling will be necessary to confirm that if residual radioactive material exists it is not in amounts which could be of public health concern during the developmental process.

LUCAS STATE OFFICE BUILDING / DES MOINES, IOWA 50319-0075 / 515-281-5787
FAX # (515) 281-4958 / TDD-DEAF SERVICES #(515) 242-6156

9. Ames Municipal Airport: Based on the data provided by DOE, ISU and data collected by this Department, this area can be used as it is now, in perpetuity, without public health concerns. However, if the site is developed for any other purpose additional surveys or sampling will be necessary to confirm that if residual radioactive material exists it is not in amounts which could be of public health concern during the developmental process.

Based on the above, it is my opinion that we concur with the University's decision to bring the nine sites to closure with the special provisions placed on Annex I, II and the Airport. I would like to take this opportunity to thank you, the ISU Staff and the Ames Laboratory Staff who have assisted in working through the long laborious process of reading the conclusions. We certainly look forward to working with all of you in the future. If you have question regarding the above, please do not hesitate to contact me.

Sincerely,

Donald A. Flater

Donald A. Flater, Chief
Bureau of Radiological Health
(515) 281-3478

cc: E. Sobottka, ISU
Tom Newman, City of Ames
Dr. Tom Barton, Ames Laboratory

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