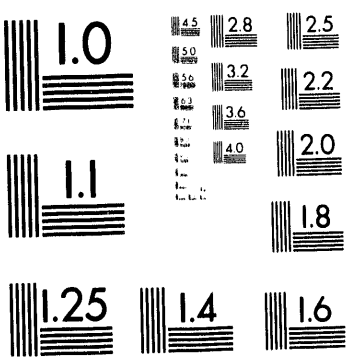
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IS-5080

Ames Laboratory

Site Environmental Report

Calendar Year 1991

Ames Laboratory

Iowa State University

Ames, Iowa 50011

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

DISCLAIMER

Table of Contents

1.0 EXECUTIVE SUMMARY

The summarized data and conclusions from the Ames Laboratory environmental monitoring program are presented in this Annual Site Environmental Report. This program is a working requirement of Department of Energy (DOE) Order 5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements" and Order 5400.1, "General Environmental Protection Program."

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

Ames Laboratory is responsible for a small chemical burial site, located on ISU property. The site was used for the disposal of chemical and metal slags from thorium and uranium production. Samples of water from existing test wells and upstream and downstream sites on the nearby Squaw Creek show no detectable migration of the contents of the burial site. A Site Assessment plan submitted to the State of Iowa Department of Natural Resources (DNR) was approved. A Remedial Investigation/Feasibility Study work plan has been completed for additional studies at the site. This has been reviewed and approved by the DOE Chicago Field Office and the DNR. A National Environmental Policy Act (NEPA) review of the site resulted in a categorical exclusion finding which has been approved by the DOE.

Ames Laboratory has an area contaminated by diesel fuel at the location of a storage tank which was removed in 1970. Soil corings and groundwater have been analyzed for contamination and an assessment written.

Pollution awareness and waste minimization programs and plans were implemented in 1990. Included in this effort was the implementation of a waste white paper and green computer paper recycling program.

2.0 INTRODUCTION

2.1 SITE DESCRIPTION

The Ames Laboratory of the U. S. DOE is located on the campus of Iowa State University at Ames, Iowa (Figures 1 and 3). The buildings owned by the DOE are:

Building	Gross Square Feet
Spedding Hall	106,885
Wilhelm Hall	61,929
Metals Development Building	97,594
Computer Services Building	1,672
Campus Warehouse Building	16,594
Mechanical Maintenance Building	8,540
Maintenance Shops Building	7,503
Paint and Air Conditioning Shops Building	4,998
Construction Storage Shed	4,320

In addition to the buildings owned by the DOE, Ames Laboratory rents a net total of 26,070 square feet of space from ISU. In 1987 the DOE transferred ownership of the buildings it owned at the Applied Science Center (ASC) site to ISU. This site is located 1 mile Northwest of the ISU campus (Figure 4). The buildings included were the Applied Science Center building, ASC Annex, Radioactive Waste Disposal, and Test Cell. Ames Laboratory retains beneficial use of the Radioactive Waste Disposal building. This building also houses the Alpha Containment Facility, a Laboratory facility which uses small amounts of radionuclides.

The ISU campus is surrounded by the City of Ames, Iowa (Figure 2). An estimated 50,000 people live within a 5-mile radius of the campus. The student population of ISU is about 25,000.

The primary missions of Ames Laboratory are to:

1. Conduct basic and intermediate-range applied research in physical, mathematical, and engineering sciences that underlie energy technologies and other areas of national importance.

2. Utilize the Laboratory's unique strengths in materials preparation and processing, chemical sciences and materials reliability to solve complex materials problems in energy production and utilization.

3. Contribute to the training of new scientific and engineering professionals.

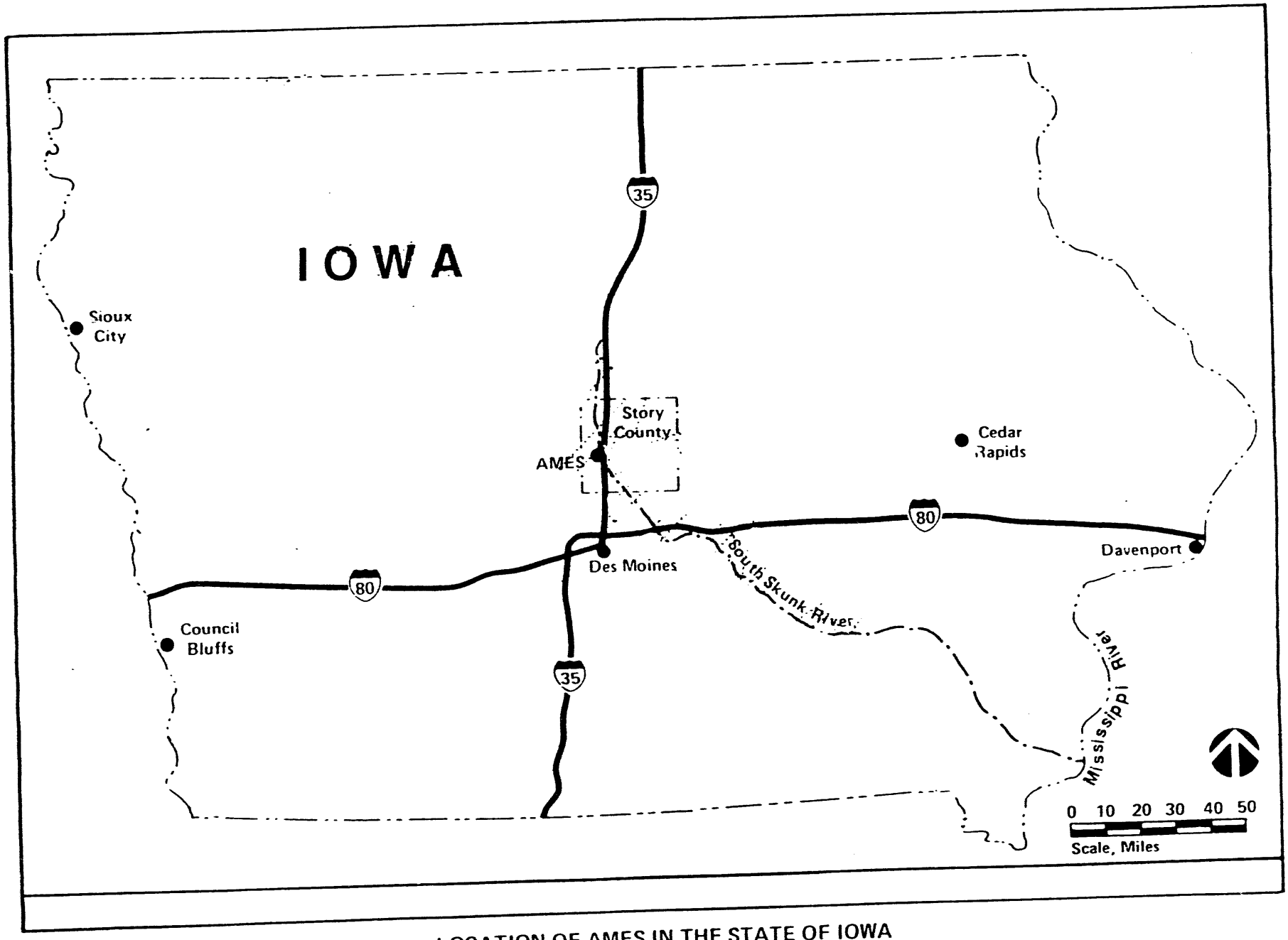
4. Transfer the information and technologies resulting from the Laboratory's research efforts to the private sector and other governmental units to stimulate economic development on the local, regional, and national levels.

The climate is temperate, continental, and subject to wide temperature and precipitation ranges throughout the year. Mean monthly temperature varies from a low of 19 degrees Fahrenheit in January to a high of 75 degrees Fahrenheit in July. Rainfall varies from less than 1 inch in the winter to over 5.5 inches in June.

The region is gently rolling with a slight pitch to the southeast. Surface material is glacial drift with a depth of about 65 feet. This material is underlaid by one thousand feet of limestone. In the campus area, depth to ground water is about 10 feet. At the ASC site this depth is about 15 feet. Surface run-off from both areas goes to Squaw Creek and Skunk River which together have an average daily flow of 170 million gallons.

2.2 Organization and Administration

Ames Laboratory is operated by Iowa State University under Contract No. W-7405-eng-82 with the U. S. Department of Energy. The Department of Energy's Chicago Field Office oversees operation of the Ames Laboratory.



LOCATION OF AMES IN THE STATE OF IOWA

FIGURE 1.

FIGURE 3

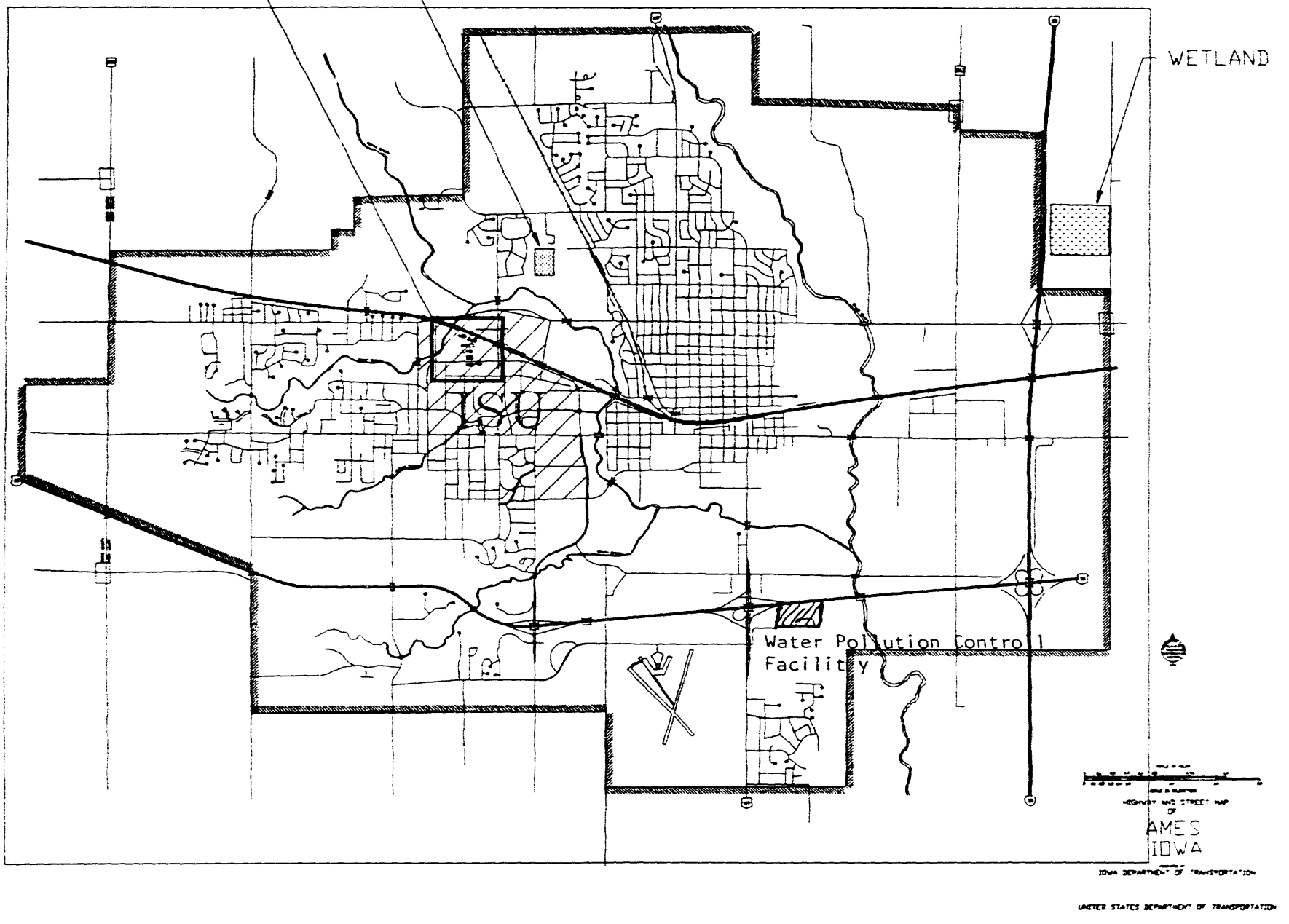


FIGURE 2 CITY OF AMES, IOWA

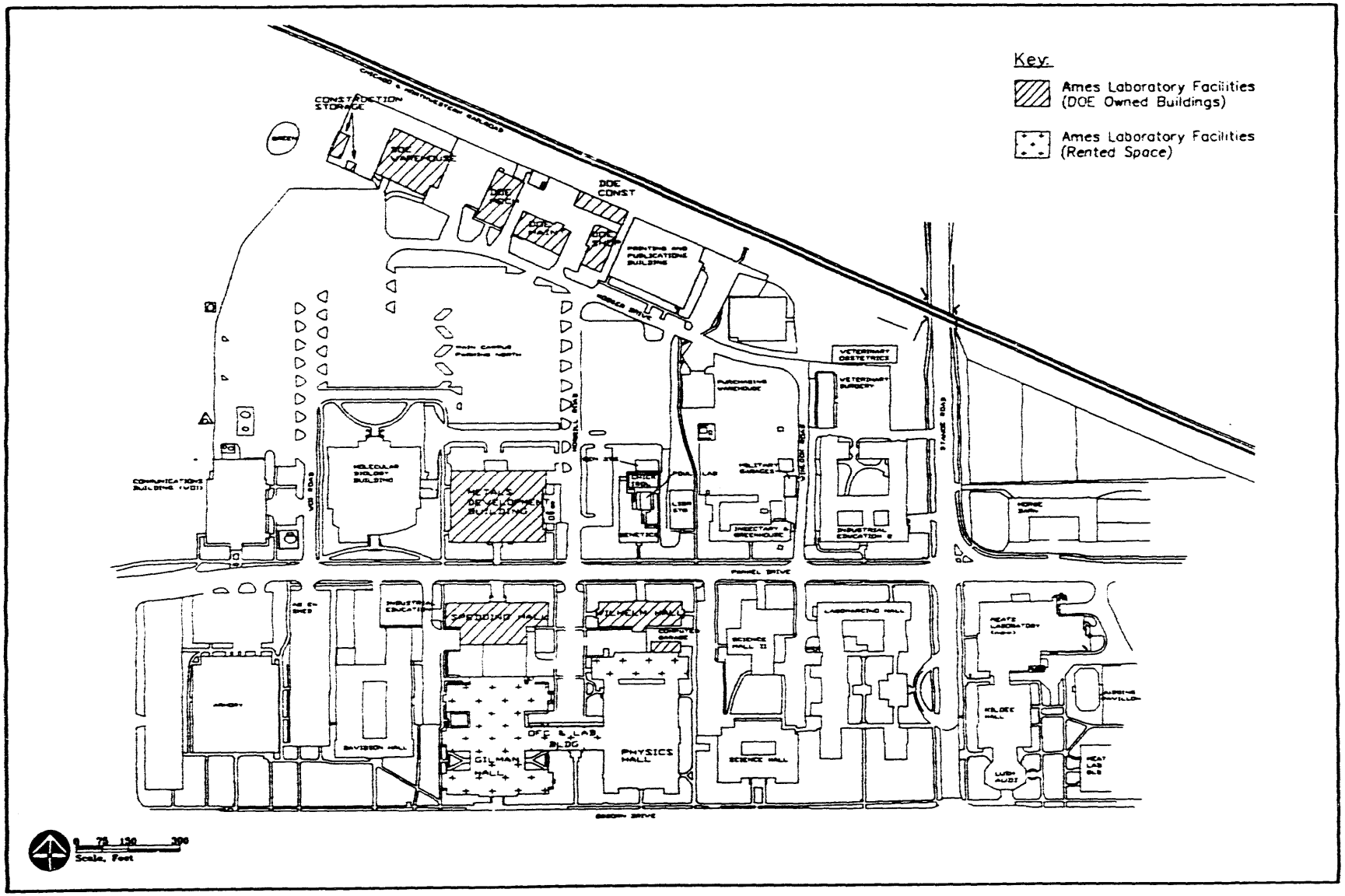


FIGURE 3 AMES LABORATORY FACILITIES ON THE IOWA STATE UNIVERSITY MAIN CAMPUS

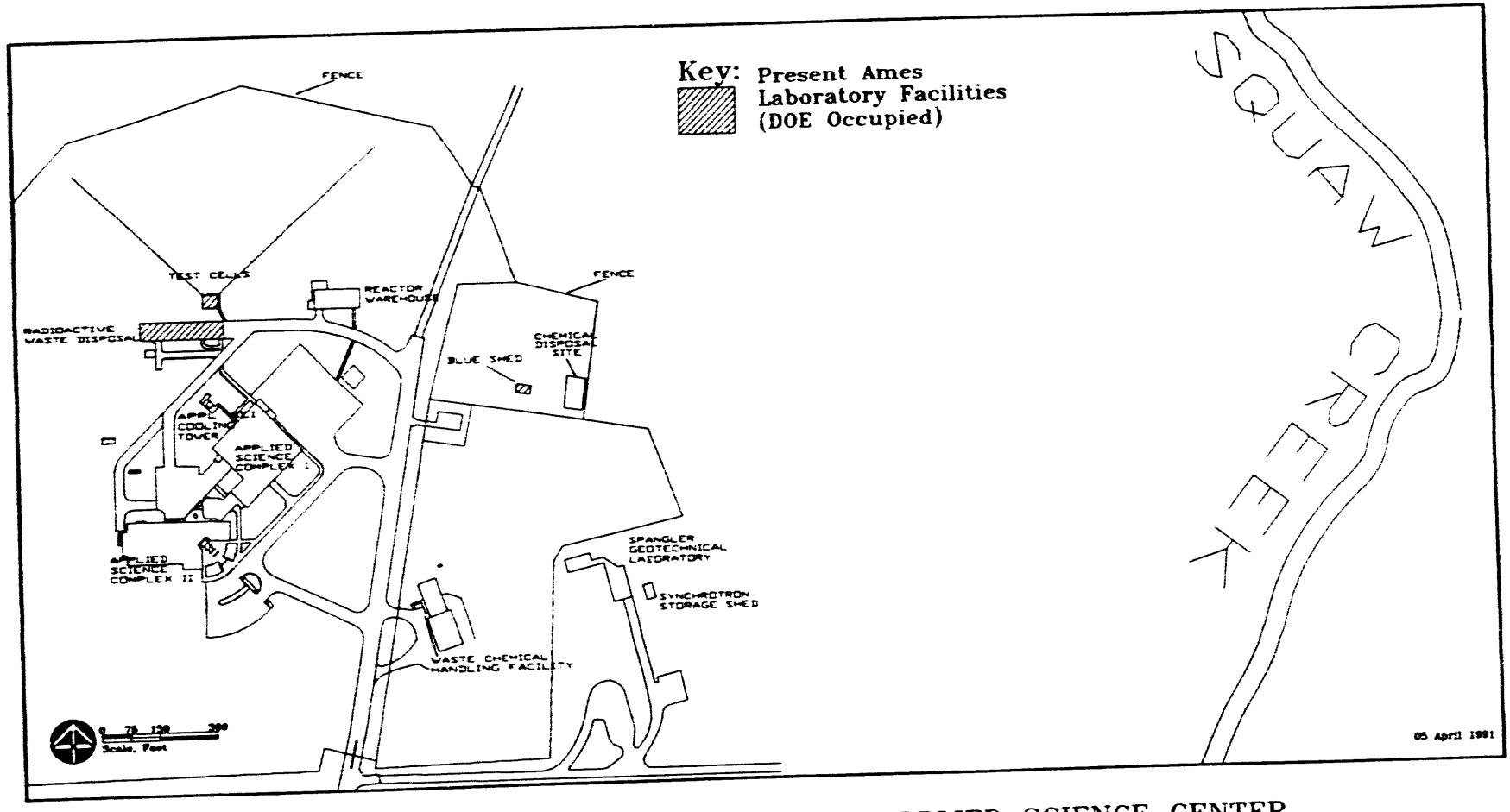


FIGURE 4 IOWA STATE UNIVERSITY APPLIED SCIENCE CENTER

Ames Laboratory Chemical Disposal Site
Test Well Locations

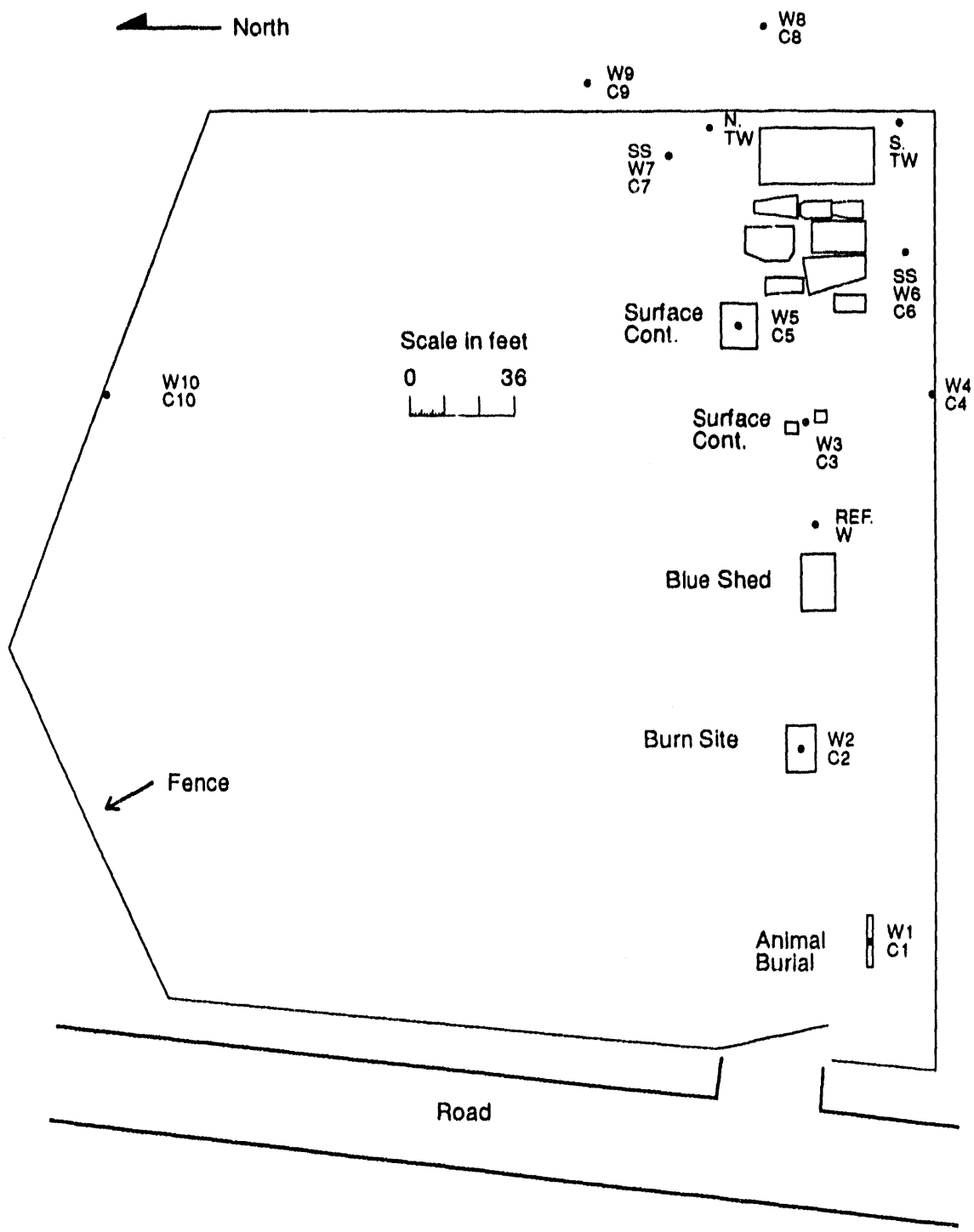


Figure 5

Ames Laboratory
Safety Health and Plant Protection
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3.0 COMPLIANCE SUMMARY

3.1 CALENDAR YEAR 1991

Ames Laboratory was not in compliance with all environmental regulations during 1991.

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

A chemical disposal site used by Ames Laboratory from 1958 through 1966 was classified by the Iowa Department of Natural Resources according to Iowa Code Section 455B.426-Registry of Abandoned or Uncontrolled Disposal Sites as "not a significant threat to the public health or environment-action may be deferred." This action was taken to satisfy the requirements of this code. A Remedial Investigation/Feasibility Study(RI/FS) work plan and a National Environmental Policy Act (NEPA) review were completed for additional activities to be performed at the site.

The Laboratory is subject to the emergency reporting requirements of the Superfund Amendments and Reauthorization Act (SARA) in Title III, Section 303. A facility representative and a listing of all hazardous chemicals on site have been reported to the local emergency planning committee, in this case the City of Ames Fire Department.

3.1.2 Resource Conservation and Recovery Act (RCRA)

Ames Laboratory has a RCRA waste generator identification number issued by the Region VII office of the Environmental Protection Agency (EPA). The Laboratory disposes its waste at an out-of-state EPA-permitted facility under this number. It is the Laboratory's practice to have these RCRA-regulated wastes incinerated rather than put in a landfill. Incineration ensures the complete destruction of the hazardous constituents and eliminates any potential for members of the public being exposed in the future. Preparations for a February, 1992 Tiger Team inspection resulted in monthly waste generations in excess of 1000 kg hazardous waste and 1 kg acutely hazardous waste. By definition, this designated the Laboratory as a "large quantity generator" which means it is no longer exempt from many of the administrative requirements of RCRA. This has caused the Laboratory additional requirements regarding handling and disposal practices for its hazardous waste. Ames Laboratory has adopted a 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 were RCRA-regulated wastes.

3.1.3 National Environmental Policy Act (NEPA)

The Ames Laboratory produced two NEPA documents in 1991. A Finding of No Significant Impact (FONSI) was prepared for the chemical disposal site. Approval for this finding has been received. An Environmental Assessment (EA) was prepared for the Technical and

Administrative Services Building to be constructed on the ISU campus. Several environmental evaluations were completed during 1991 for minor site construction, modification, and demolition projects having no significant environmental impact. Proposed projects are continuously evaluated for environmental impact, and NEPA reviews will be performed as necessary.

3.1.4 Clean Air Act (CAA)

The Laboratory uses only small quantities of chemicals on a laboratory scale for its research and development activities. Any air emissions generated by Ames Laboratory activities would be sporadic and in very small quantities. The Ames Laboratory does not have a power plant, but obtains its utilities from ISU. Ames Laboratory is in compliance with all CAA requirements including the National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations for radionuclide emissions from DOE facilities.

3.1.5 Clean Water Act (CWA)

The Ames Laboratory does not have any point source discharges on its site. Neither Ames Laboratory nor ISU has any NPDES permits. The Laboratory discharges approximately 59,000 gallons of water per day to the ISU sanitary sewer system. This is 4% of the total discharged from the University. The University discharges its water to the City of Ames sewer system. Ames Laboratory discharges are approximately 0.8% of the total waste water processed per day by the City of Ames waste water treatment facility. The City of Ames has a National Pollutant Discharge Elimination System (NPDES) permit for the discharge of treated sanitary wastes from its Water Pollution Control Plant. The City of Ames has an agreement for waste water treatment with ISU which includes the Ames Laboratory. The University and the City of Ames sample ISU waste water effluent as part of this agreement.

3.1.6 Safe Drinking Water Act (SDWA)

Drinking water for the Laboratory is supplied by the University which obtains its water from the City of Ames public water system. The Ames water system is tested to meet the standards of the SDWA.

3.1.7 National Historic Preservation Act

No historic resources have been identified on the Ames Laboratory site.

3.1.8 Current Actions

There are no non-compliance issues at the Ames Laboratory.

3.1.9 Permit Summary

Ames Laboratory currently has no environmental discharge or disposal permits.

3.2 FIRST QUARTER 1992

3.2.1 Compliance Status and Permit Summary

The compliance status of the Laboratory with regard to environmental statutes and permits are undergoing review as a result of the Tiger Team inspection of February 1992. The Ames Laboratory Corrective Action Plan will address needed corrections and additions.

3.2.2 Current Activities

A diesel fuel contaminated area located at the site of a former leaking Emergency Generator underground fuel tank has been reported to the State of Iowa Department of Natural Resources. Test corings have been taken to determine the extent of the contamination. A consultant has been selected to prepare a final Site Assessment Plan. Remediation of the site is expected to occur in FY 1994.

Ames Laboratory is responsible for a small chemical burial site, located on ISU property, which was used from 1958-1966 for disposal of hazardous wastes and wastes from thorium and uranium production. With completion of a site assessment plan, RI/FS work plan, and approval of the NEPA review, a contractor has been obtained. Work at the site is expected to be carried out in calendar 1992. Sampling of existing test wells and the nearby Squaw Creek are ongoing. Results of these analyses are included elsewhere in this Site Environmental Report.

4.0 ENVIRONMENTAL PROGRAM INFORMATION

4.1 Environmental Monitoring

Liquid aqueous wastes, when generated at the Laboratory's Radioactive Waste Disposal Facility (Figure 4), are analyzed for radioactivity before release to the sanitary sewer as required by DOE Order 5480.1 (1). Samples are collected before release. They are analyzed for radioactive content using gamma ray spectroscopy, gas proportional counting for gross beta and alpha activity, and liquid scintillation technique. No release of liquid aqueous waste was made during 1991. When generated, results of sample analysis and quantities released are reported to the City of Ames, Iowa, the DOE Chicago Operations Office and Idaho Operations Office.

4.2 Environmental Permits

Ames Laboratory discharges all liquid wastes to the ISU sanitary sewer system, which discharges into the City of Ames sewer system. The Laboratory is included in the University's discharge contract with Ames. The contract between ISU and Ames was renewed in 1989 for five years. The contract requires the University to analyze its waste discharges periodically. This discharge includes the contribution by Ames Laboratory. Ames Laboratory contributes an estimated 4% of the total ISU sanitary waste which comprises 10-20% of the sanitary wastes received by the Ames Water Pollution Control Facility.

Ames Laboratory does not have any NPDES permits for direct discharge or surface runoff to the environment.

Asbestos wastes, from renovation projects, were buried at the Ames Story Environmental Landfill (a private company). No landfill permits are required. The Laboratory complies with the State of Iowa Solid Waste Disposal Rule #102.14 and 40 CFR 61, Subpart M (asbestos NESHAP).

Employee fire extinguisher training sessions involving open burning of flammable liquids and solids are permitted by State of Iowa open burning statutes (7). Notification of the local Fire Department is required. Two notifications were made in 1991.

4.3 Draft and Final Impact Statements

Not Applicable.

4.4 Summary of Significant Environmental Activities

A review of analytical results from soil analyses, taken following a final radiological survey

in 1990 at the Ames Water Pollution Control (sewage) Plant (Figure 2), have identified small areas with thorium contamination levels of 5 to 6 pCi/gm (1.8 to 2.2 x 10^{-1} Bq/g) soil which need additional restoration to meet requirements of 40 CFR 192 (5). The additional restoration will be completed in 1992. The site also has depressions, where the removed soil was not adequately restored, which will require filling. This site resulted from the release of thorium to the City of Ames sanitary sewer system in 1952. Contaminated soil was removed in 1988 for burial at a radioactive waste site.

An underground storage tank used to contain emergency generator diesel fuel was removed in 1991 and the site sampled. No contamination was found. The tank was located at the Metals Development Building.

4.5 Pollution Awareness and Waste Minimization Programs

A waste minimization plan and program was implemented in 1990, as required by DOE Order 5400.1. Elements of the plan include:

- o A statement of management support and commitment.
- o A waste minimization policy for the Laboratory.
- o Objectives and numerical goals.
- o Methods of tracking waste production.
- o Employee awareness, training, and incentive programs.
- o Program performance, evaluation, and quality assurance.

The Laboratory has been engaged in many waste minimization activities and procedures. The procedures have reduced the quantities on non-hazardous and hazardous wastes generated by the Laboratory's research efforts. Examples include:

- o Collection of surplus chemicals for re-issue.
- o Review of Purchase Orders to prevent duplication or over-supply.
- o Collection of surplus mercury for resale.

All other non-hazardous waste generated by the Laboratory, e.g., paper, garbage, trash et cetera, is collected and transported to the City of Ames' Waste Recycling Plant where it is processed. Combustible waste is used as fuel in the city's electrical utility power plant. Scrap metal is sold for re-use.

5.0 ENVIRONMENTAL RADIOLOGICAL PROGRAM INFORMATION

5.1 Radioactive Effluent Data

The Ames Laboratory routinely monitors waste water containing radioactive contamination from the Waste Disposal Building, before release to the sanitary sewer. No release of contaminated waste water was made to the Ames sanitary sewer system during 1991. Average daily discharge of waste water at the Ames Water Pollution Control Plant is $>2 \times 10^{+7}$ liters. Of this, $2.5 \times 10^{+5}$ liters or less than 2% comes from the Ames Laboratory complex located on the campus of ISU. No liquid effluent releases are made directly to the environment.

5.2 Environmental Sampling for Radioactivity

Ames Laboratory is responsible for a small chemical burial site, located on ISU property, which was used from 1958-1966 for disposal of hazardous wastes and wastes from thorium and uranium production (Figure 5). Test wells and a reference well were installed at the site in 1989. Testing of the wells and water from upstream and downstream sites on the nearby Squaw Creek was begun in 1990.

Comparison of the reference well soil and water samples with those from the test wells shows that the levels of trace elements measured were essentially the same, i.e., background levels.

Surface soil samples from the site have shown that Ra-228 and Ra-226 levels are below guidelines found at 40 CFR 192, although two areas have uranium concentrations exceeding the 5 pCi/g soil limit.

The Iowa DNR requested that a Site Assessment Plan be prepared to determine the environmental impact of the site. The plan was approved and a Remedial Investigation/Feasibility Study(RI/FS) work plan was prepared and approved by the Chicago Field Office and the DNR. The Elements of the work plan are as follows:

1. Collection and review of historical data.
    a. Past site activities.
    b. Documents relating to site.
    c. Interviews.
    d. Inventory of wells in a one-mile radius.

2. Field investigation.
    a. Field screening/analysis.
    b. Geophysical investigations.
    c. Monitor well and borehole drilling.
    d. Geological and hydrogeological investigations.

3. Sample collection.
    a. Sampling objectives.
    b. Frequency and location.
    c. Sample quantities.
    d. Equipment decontamination.
    e. Duplicate samples and blanks.
    f. Analytical methods.

4. Laboratory analysis.

5. Data analysis.

6. Site characterization summary.
    a. Geologic characterization.
    b. Hydrogeologic characterization.
    c. Geophysical characterization.
    d. Preliminary conclusions on potential migration pathways.

7. Remedial investigation generated waste disposal.

8. Risk assessment.

9. Treatability study/pilot testing.

10. Remedial investigation report.

5.3 Reporting Potential Dose to the Public

As a policy, airborne releases from the Ames Laboratory complex on the ISU campus are minimized or eliminated by experiment design or source limitation. Radioactive materials handled at the Ames Laboratory include radiation instrument calibration sealed sources and standards, laboratory quantities of normal and depleted uranium, thorium metals, Plutonium, and Uranium-235.

Research activities using less than 0.5 gm quantities of several isotopes of Plutonium and gram quantities of Uranium-235, are conducted in a single glovebox facility designed for inductive coupled plasma (ICP) spectroscopy research. This glove box is located at the Alpha Containment facility at the Applied Science Center site. During 1991 no work with these radionuclides was conducted due to the renovation of the building that houses this glove box facility.

Work with uranium and thorium has consisted of arc melting the solid metal into alloys or electro-transport purification of small batches of 75 grams or less. All this work is done

either under vacuum or in inert gas sealed atmospheres. No venting of the process is done until the chambers are opened on the solidified material. Approximately 870 grams of depleted Uranium was arc melted during 1991. No work with thorium metal was done during 1991.

The National Emission Standards for Hazardous Air Pollutants; Radionuclides, under Subpart H of 40 CFR Part 61 (8), require that an Air Emission Annual Report be submitted by each DOE facility emitting any radionuclides (other than radon) into the air. Using the guidance found in 40 CFR 61.94, an annual report for 1991 was prepared. According to the guidance and based on the isotope inventory in Curies per year used at the Laboratory, air emissions are not required to be monitored at the Laboratory. 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. This information, and other required parameters, were used to calculate an effective 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 input parameters and dose estimates are shown in Table 5-2.

Table 5-1

AMES LABORATORY CHEMICAL DISPOSAL SITE
Trace Elements and Cyanide in Water

Average concentrations for 1991

Concentrations in parts per million

ELEMENT	REFERENCE WELL	SOUTH TEST WELL	NORTH TEST WELL	SQUAW CREEK UP	SQUAW CREEK DOWN
BERYLLIUM	<0.0008	<0.0008	<0.0008	<0.008	<0.008
CHROMIUM	<0.004	<0.004	<0.004	<0.004	<0.004
COBALT	<0.009	<0.009	<0.009	<0.005	<0.005
LITHIUM	0.03	0.07	0.11	0.01	0.01
MERCURY	<0.1	<0.1	<0.1	<0.1	<0.1
THALLIUM	<0.07	<0.07	<0.07	<0.05	<0.05
THORIUM	<0.02	<0.02	<0.02	<0.01	<0.01
URANIUM	<0.06	<0.06	<0.06	<0.05	<0.05
YTTRIUM	<0.001	<0.001	<0.002	<0.001	<0.001
ZIRCONIUM	<0.002	<0.002	<0.002	<0.002	<0.002
CYANIDE	<1.	<1.	<1.	<1.	<1.

Table 5-2

Summary of Input Parameters

Isotope	Ci/yr	Adjustment Factors (Appendix D to Part 61)	Adjusted Source Term Ci/yr
		Iowa State University Campus Site	
Uranium (depleted)	3.8×10^{-4}	1.0×10^{-6} (solid)	3.8×10^{-10}
Uranium-234 in depleted Uranium	1.6×10^{-5}	1.0×10^{-6} (solid)	1.6×10^{-11}
		Alpha Containment Facility Site	
		No radionuclides used at this site during 1991.	

Compliance Assessment

Ames Laboratory-Iowa State University Site.

Effective Dose Equivalent: For dep. Uranium, **6.34×10^{-8} mrem/yr** (6.34×10^{-10} mSv/yr)

For U-234, **1.43×10^{-9} mrem/yr** (1.43×10^{-11} mSv/yr)

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.

6.0 ENVIRONMENTAL NON-RADIOLOGICAL PROGRAM

6.1 Chemical Waste Effluent Data

Sanitary sewage effluents are currently not being monitored for the presence of chemical wastes.

6.2 Environmental Sampling

Test well and creek samples from the chemical burial site were analyzed for elements known to be buried and for cyanide.

Comparison of results from the reference well, test wells and creek samples shows that migration of wastes is not evident.

7.0 GROUND WATER.

A program for monitoring emergency generator underground fuel tanks for fuel leakage is conducted by the Laboratory as required by the State of Iowa Code, Chapter 135 (6). The program consists of sampling ground water from two test wells at each tank site, once each month. Water samples are examined for the presence of diesel fuel using a vapor detection method (odor) and visually. Evidence of a leaking tank will be reported to the Iowa DNR. Corrective action, consisting of tank and content removal, would then be taken. No leaks have been observed to date.

8.0 QUALITY ASSURANCE PROGRAM

The Ames Laboratory has a Quality Assurance Program. Elements of the program which involve measurement of radioactivity are the responsibility of the Safety, Health and Plant Protection Group. 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. The Laboratory also participates in a DOE Quality Assessment Program designed to test the quality of the environmental measurements being reported to the DOE. The most recent series of samples (soil and water) showed that the Laboratory was within 15% of the expected values of the test samples.

9.0 REFERENCES

1. DOE Order #5480.1, "Effluent and Environmental Monitoring Program Requirements."

2. DOE Order #5484.1, "Environmental Protection, Safety, and Health Protection Information Reporting Requirements."

3. DOE Order #5400.1, "General Environmental Protection Program."

4. DOE Order #5480.14, "Comprehensive Environmental Response, Compensation, and Liability Act Program."

5. 40 CFR Part 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings."

6. State of Iowa Code, Chapter 135, "Underground Storage Tanks."

7. State of Iowa Code, Chapter 23, "Emission Standards for Contaminants."

8. 40 CFR Part 61, "Clean Air Act."

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