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April 24, 2000

50-326

US Nuclear Regulatory Commission
Document Control Desk
Washington DC 20555

ATTENTION: Marvin Mendonca, Reactor Program Management Division.

Dear Marvin:

Please find enclosed two promised items:

(1) Environmental Report modeled on the report for NC State.
(2) Revised Operator Requalification Plan.

I hope that these may prove satisfactory.

Regards,

George

George E. Miller

A020

U. C. IRVINE NUCLEAR REACTOR FACILITY (UCINRF)

DOCKET 50-326

OPERATOR REQUALIFICATION PROGRAM

This program is designed to meet the requirements of 10 CFR 55.59 of the US Nuclear Regulatory Commission, and to assure the continued safe operation of UCINRF.

SCOPE

UCINRF has operated successfully as a small facility with limited licensed operator staff. This plan assumes a low level of staffing consisting entirely of Senior Operators. However it also anticipates an increased staffing level, including Operators, should that eventuality occur. The program is of two years duration, with automatic restart every two years. One Senior Operator will be designated as the Training Coordinator for each two year cycle. The Training Coordinator prepares and scores all examination materials, schedules reviews and documents operator performance and will only be required to meet items (3), (4) and (5) below.

REQUIREMENTS

Experienced Senior Operators are expected to meet the following requirements:

1. Pass an annual (at intervals not to exceed 15 months) operating test based on 10 CFR 55.45 (a), (1-12).
2. Pass a biennual (once during each 24 month period) written examination based on 10 CFR 55.41 (b) (1-13) and 55.43 (b) (1-7).
3. Carry out reactor operations for a minimum of 4 hours in each calendar quarter. These operations may include facility maintenance activities when the reactor is shut-down, but should include at least one start-up, one operation above 1 kilowatt power, and one shutdown (except when the reactor is not operational for any period exceeding three months).
4. Participate in ongoing discussions of reactor instrumentation operating characteristics based on checks, surveillance and calibration results.
5. Participate in immediate discussions whenever mechanical or procedural changes are implemented at the facility, whether or not they directly affect reactor characteristics.
6. Participate in review regarding any test ((1) or (2) above) item that is unsatisfactory prior to resuming any reactor critical or supercritical operation.

Operators at UCINRF will be required to meet all the above except that examinations and tests will be limited to those issues required of Operators by 10 CFR 55.41. Operators may not assume the role of Training Coordinator. In addition, operators may be expected to attend regularly scheduled seminars or tutorial sessions to review reactor theory, utilization, and practice relevant to both routine and emergency operations.

DOCUMENTATION

Documentation will be retained at the facility covering all items (1) through (6) above for the period of each Operator or Senior Operator License.

Proposed April 2000

ENVIRONMENTAL REPORT
U. C. IRVINE NUCLEAR REACTOR FACILITY
Docket 50-326
University of California, Irvine, CA 92697-2025

1. INTRODUCTION

The TRIGA® Mark I pulsing reactor was installed in 1969 in the basement of Rowland Hall on the main UCI campus and is known as the UCI Nuclear Reactor Facility (UCINRF). The reactor is owned by the Regents of the University of California and operated by the Department of Chemistry at UCI. The reactor was designed and built by Gulf General Atomic, Inc.

The reactor was designed to be safely operated in steady-state mode at power levels up to at least 1 megawatt and to be pulsed repetitively to yield a burst having a prompt energy release of about 16 Mw-sec, a peak power of about 1,200,000 kW and a pulse width at half maximum of about 11 milliseconds. The power levels attainable depend on fuel load, control rod configurations, and operational parameter limitations. The present license renewal request is for continuation of 250 kilowatt operation. The reactor configuration, selected for safe installation in a multi-purpose building on an urban campus, has a fixed core installed in a below ground pool tank with no beam ports.

The safety of the TRIGA® reactor lies in the large prompt negative temperature coefficient that is an inherent characteristic of the uranium-zirconium hydride fuel-moderator material. Thus, even when large, sudden, reactivity insertions are made and the reactor power rises on short period, the excess reactivity is compensated automatically because the fuel temperature rises simultaneously so that the system returns quickly to a normal power level before any heat is transferred to the cooling water.

The reactor facility includes a separate stand-alone facility for gamma irradiation, radioassay equipment, and laboratories for preparing samples and handling irradiated samples. UCINRF is used primarily by the Department of Chemistry in its programs of research and teaching in the field of radioanalytical chemistry. Other users from both on and off campus departments and organizations mostly carry out analytical determinations using variations on the sensitive neutron activation analysis technique.

2. FACILITY AND SITE CHARACTERISTICS (Figs. M1, M2, and M3)

The Irvine Campus of the University of California is located in Orange County, some 40 miles south-east of the center of Los Angeles and is about 4 miles from the Pacific Coast. Situated on slopes at the northern extremity of the San Joaquin Hills, the campus overlooks the Santa Ana basin to the north and the inland end of Newport Bay to the west; higher land of the Hills extends south and east to just over 1000 feet above sea level. The average land elevation is 100 feet.

The 1500 acres of land owned by the Regents of the University is within the boundaries of the extensive Irvine Ranch, controlled by the Irvine Company. By agreement between the Irvine Company and the Regents, a joint Master Development Plan has provided for the development of the surrounding area in close conjunction with the University. A Research Park is the latest co-development, under construction in 1999. Since its incorporation, in 1971, the city of Irvine encompasses most of the immediately surrounding community.

Much of the anticipated development of UCI and the surrounding community from rural into urban/suburban, projected in 1968, has been accomplished. A new growth cycle for the campus and the surrounding business community is underway and will continue for the next 15-20 years.

Orange County is a densely populated urban area with 2.6 million residents in 32 cities and a further 0.2 million in unincorporated areas (1999 California Dept of Finance). UCI is situated about in the middle (N, S, and E directions) and the borders in those directions are about 30 km (19 miles). Thus 2.8 million residents live within a 30 km zone.

The UCINRF TRIGA® Mark I reactor design makes safe and adequate provisions for normal operating considerations such as heat disposal during full power operation and radiation dose rates, including nitrogen-16 and argon-41 generation. It does this by providing adequate depth of pool water, appropriate room ventilation rates, pool stirring, and minimal areas of air exposed to high neutron flux. Laboratory facilities, and a fume hood, together with fixed radiation monitoring stations are provided for irradiated sample handling from several in-core experimental facilities. The reactor room and the laboratories form a confinement volume, with normal reduced pressure operation to assist in control of airborne radioactivity. 24-hour surveillance of this area is provided by both area and particulate radiation monitors in order to alert staff to any mishap in the facility. An automatic ventilation system shutoff operates if airborne activity levels above normal background are detected. During shutoff, air is exhausted at a very slow rate through a HEPA filter.

Small amounts of solid and liquid radioactive waste generated are disposed of through the Campus Office of Environmental Health and Safety. Other non-radioactive wastes are similar in nature and hazard to those from chemical, biological, physics, engineering, and medical laboratories at UCI, and are disposed under standard campus procedures. Quantities are entirely negligible compared to campus totals.

3. ENVIRONMENTAL EFFECTS OF SITE PREPARATION AND FACILITY CONSTRUCTION

Construction of Rowland Hall in 1968-69 was accomplished as part of an overall UCI Campus expansion group of buildings. The entire UCI Long Range Development Plan (LRDP) assesses the impact of conversion of an area of coastal scrub to an urban society and modern Research University. The reactor construction in about 1/6th of the basement of a six-story laboratory facility being constructed made a negligible contribution to large overall construction impact.

4. ENVIRONMENTAL EFFECTS OF FACILITY OPERATION

This facility operates only on a demand basis, so hours of operation have fluctuated over the years. In terms of potential impact, the best measure is energy generation (Figure H1). The only effect to be considered is that of gaseous effluent argon-41 released at building height which is estimated over the same time period (Figure H2). The radioactivity is generated by irradiation of air dissolved in the pool water and from air contained within experimental facilities, especially the pneumatic transfer (PT) system. Thus the estimated releases displayed in H2 include these amounts, which are computed based on minutes of PT operation. These estimates are highly conservative because they assume that all operation is at full licensed power (250 kilowatts), whereas a significant amount of operation at this facility is done at lower power levels for experimental reasons, where the argon-41 produced is at a lower level. The information is provided as annual summations expressed in millicuries. The average concentrations at the point of release may be obtained by dividing these numbers by the (constant) annual exhaust rate from the facility, which is 6.3×10^{13} mL. Thus the peak year shown (1978 - 150 mCi) represented an average concentration of 2.4×10^{-9} microcuries/mL. If correct (it is a highly conservative estimate), this would have meant an annual exposure for someone standing immersed at the stack of 10 mrem. In a more typical recent year, the concentration and consequent exposure estimate is $1/10^{th}$ of this value. These releases, when added dilution is taken into account, are below established federal guidelines, even assuming constant immersion in the plume.

Further confirmation of the negligible exposure added by the releases from the facility is provided by data from environmental radiation measurement packets (calcium sulfate/dysprosium activated dosimeters) that have been in use at the facility since 1974. Annual summaries of this information for four locations are provided in figure H3. One pack is suspended in the facility exhaust stack at the roof. Others are distributed in various locations around the campus. Two issues may be noted:

(1) there is no apparent correlation with facility energy generation (H1), or Argon-41 release estimates (H2), and

(2) a range of "normal" exposure rate is observed varying from a low in the upper level of a two story wood frame house, to a high in the 5th floor main library associate director's office. The measured stack effluent levels fall well within these other limits.

Within the accuracy of the measurement devices, these entirely confirm the lack of potential added person exposure as a result of historical facility operation. Since operations are not projected to change significantly, this should provide satisfactory extrapolation for the future.

It should be noted that the release described is essentially within a controlled area, since it is onto the roof of Rowland Hall, which is a locked area under control of UCI Facilities management personnel. Considerable dilution will take place before these effluents could reach a member of the general public. The dilution is enhanced by the fact that all the effluents from all laboratories in the building which operate on a 24 hour duty cycle are also discharged above the roof area. In contrast, all air intakes to the building are at ground level, approximately 100 feet below the roof, to prevent mixing.

The use of all hazardous material, in research or otherwise, at UCI is controlled through the Office of Environmental Health and Safety (EH&S). From 1969 through 1992, radioactive waste (including the small amounts delivered to EH&S from operations at the reactor facility, was delivered to the commercial LLRW disposal site at Beatty, Nevada for burial. Subsequent to 1992, all materials have been stored in appropriately constructed storage facilities at UCI under the close and continual supervision of EH&S staff. During this time, all the short-lived materials will have decayed to below levels of concern, leaving only very small amounts of longer lived activities within the material.

Small amounts of non-radioactive chemical and general waste are also delivered for disposal. Their additional impact is negligible when considered in the context of the entire operation of the School of Physical Sciences, which has over 100 experimental research faculty conducting research and teaching laboratory activities in three main buildings, including Rowland Hall.

Waste heat from reactor operation is occasionally transferred to UCI Central Plant operations through a heat exchanger fed by a chilled water line. This is usually only done during full power operations of greater than 30 minutes. The entire UCI Campus air conditioning system is operated from this chilled water system. The reactor contributes a negligible amount of energy to this large system. In addition, the facility uses heating when needed for room comfort provided from the Central Plant hot water lines. UCI has installed buffer water tanks to increase the efficiency of the cooling and heating systems to minimize costs and environmental impact.

The additional impact of the reactor facility on the surrounding environment compared to the impact of normal operations of a 20,000 student campus (research, teaching, parking, etc) is so slight that its removal would certainly be un-noticed.

5. ENVIRONMENTAL EFFECTS OF ACCIDENTS

Potential accidents range from the failure of an experiment to hypothetical core damage with associated fission product release. These have been assessed relative to 10CFR Part 20 guidelines and found to be negligible in terms of likely personnel exposure. The facility has an automated ventilation system shutdown, HEPA filters, and emergency procedures and equipment to mitigate the consequences of accidents.

6. UNAVOIDABLE EFFECTS OF FACILITY CONSTRUCTION AND OPERATION

The unavoidable effects of construction and use involve the materials of construction and core fissionable materials that cannot be recovered. Assuming that Rowland Hall remains in place, there is permanent loss of natural terrain and habitat.

7. ALTERNATIVES TO CONSTRUCTION AND OPERATION OF THE FACILITY

The facility provides unique scientific capabilities that are unavailable elsewhere in Southern California. Students and researchers are provided with unique and immediate opportunities that would not be readily undertaken via travel to more remote locations.

8. LONG TERM EFFECTS OF CONSTRUCTION AND OPERATION

The long-term consequences of the continued operation of the UCINRF are anticipated to be beneficial in terms of contributions to education and the creation of new scientific knowledge.

The capital investment, operational costs, and environmental effects have been extremely small in relation to the building and operation of the University of California, Irvine. There is no doubt that the urbanization of Orange County and the continued growth in "high tech." industry has had, and will continue to have, a major impact on the formerly rural environment. Construction and operation of the campus has been planned as a part of the driving initiative for this process. This has been a necessary part of the economic and political growth of the region that is irreversible.

9. COSTS AND BENEFITS OF FACILITY AND ALTERNATIVES

As noted above, the costs have been minor in relation to the creation of the UCI campus. The reactor facility cost represented less than $1/12^{th}$ of the costs of building Rowland Hall. The benefits continue to be provision of educational and research experiences in the utilization of neutrons for experimental purposes, and of training for students in the handling of radioisotopes. No other facility currently exists in this large and highly populated region (Southern California) that can provide these services and experiences.

10. CONCLUSION

There will be no significant environmental impact associated with the continued operation of the UCI Nuclear Reactor Facility subsequent to re-licensing. Hence no additional environmental impact statement over and above this document is required.

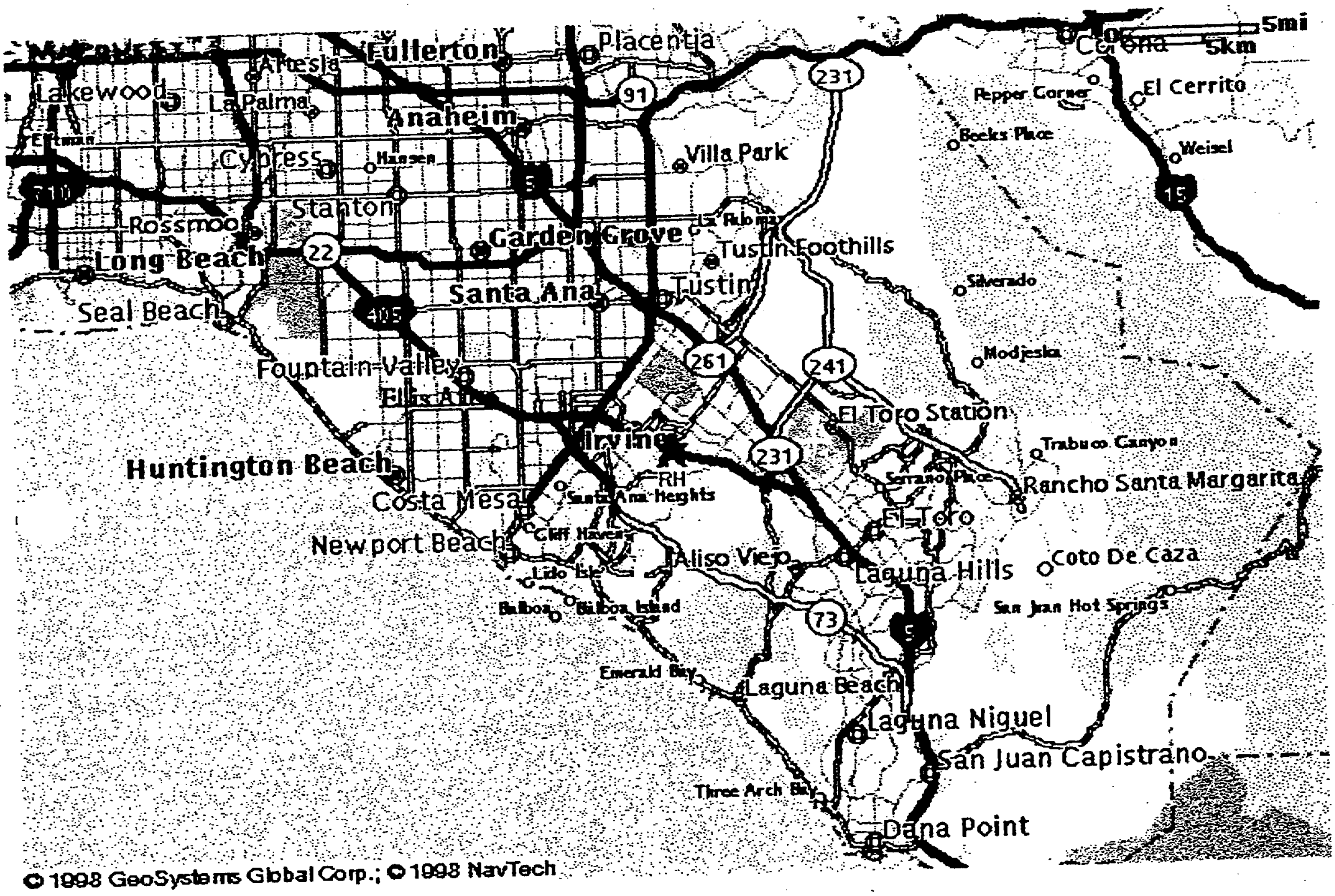


Fig M.1 Location of Orange County and City of Irvine

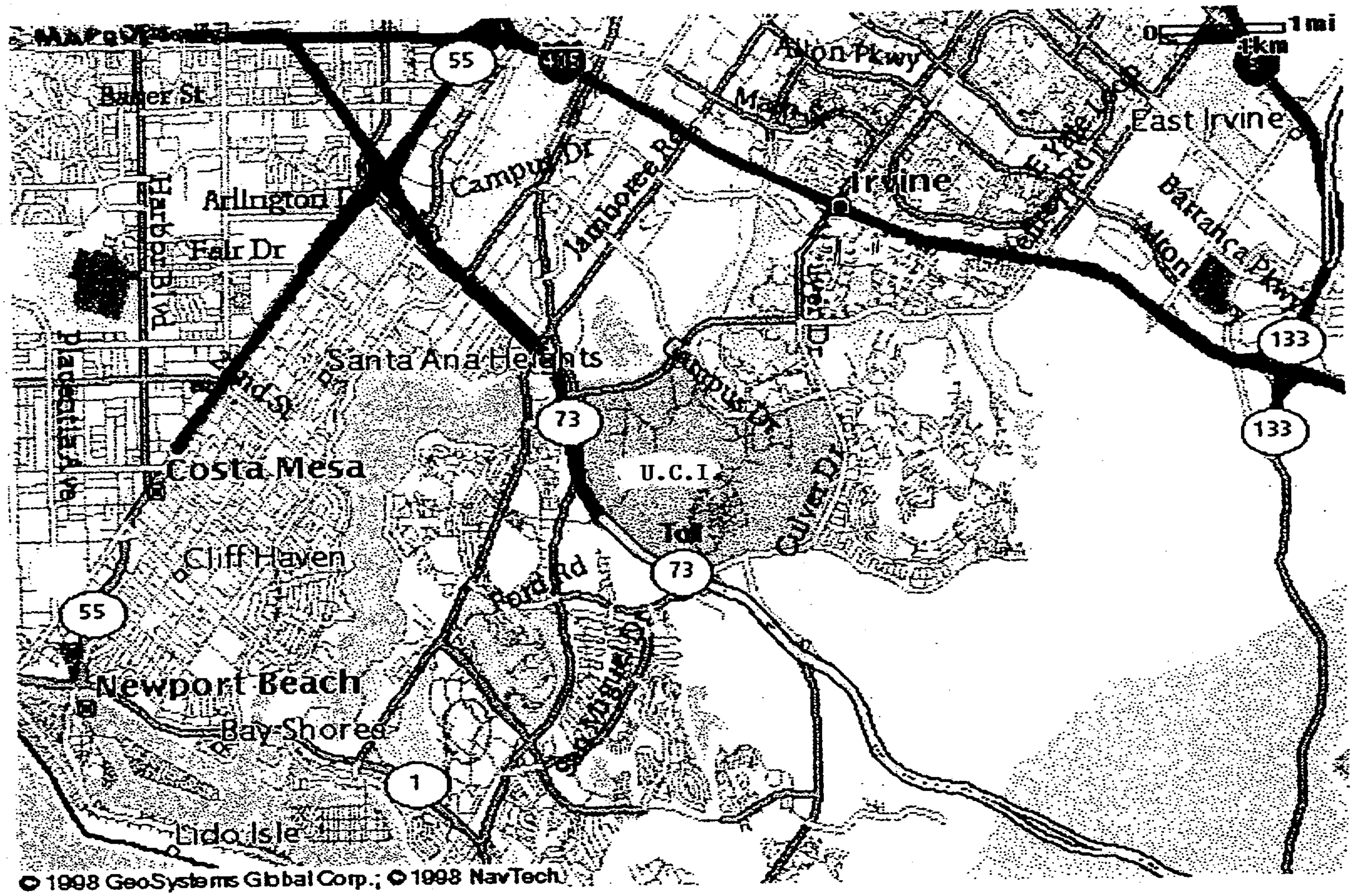
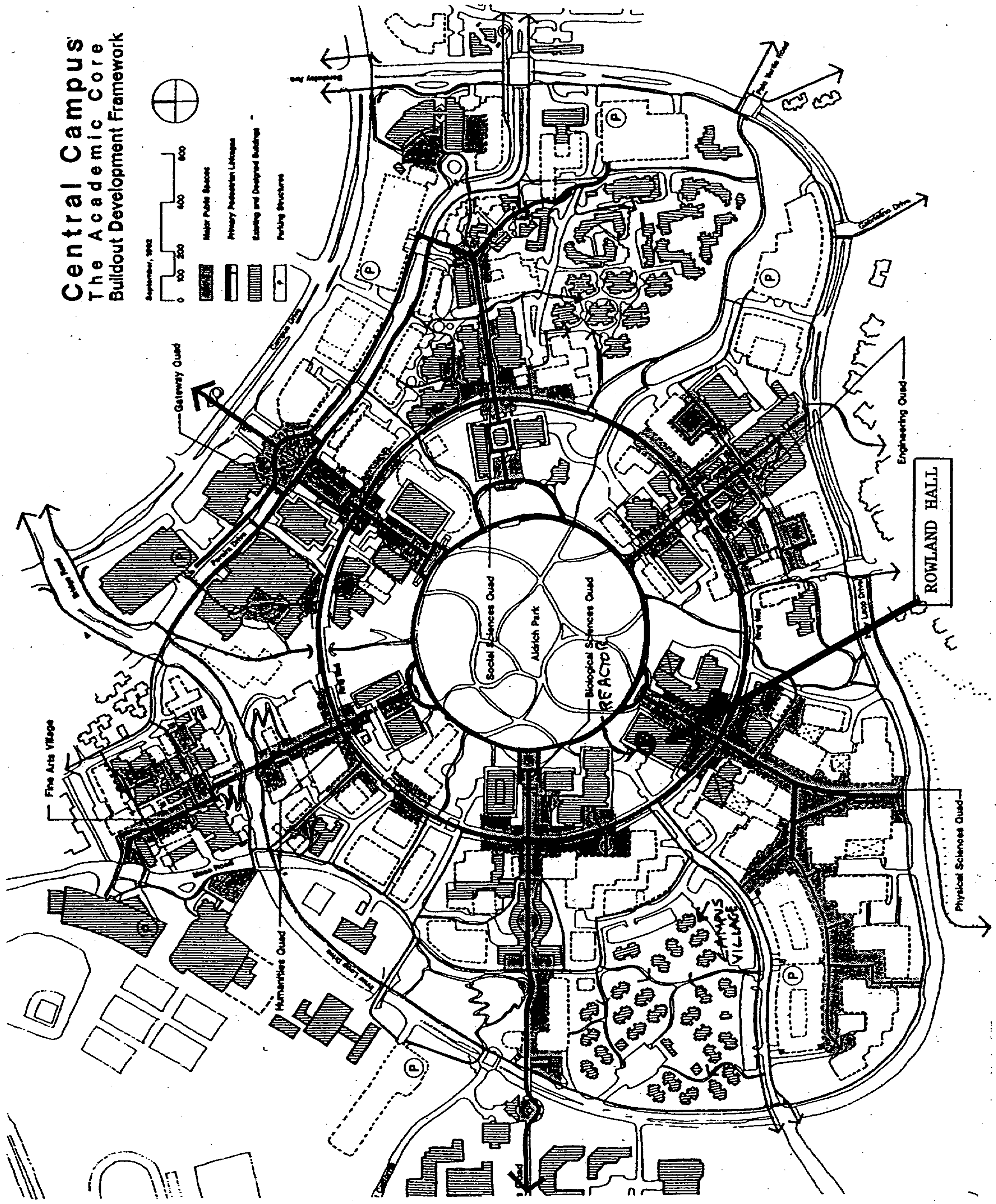
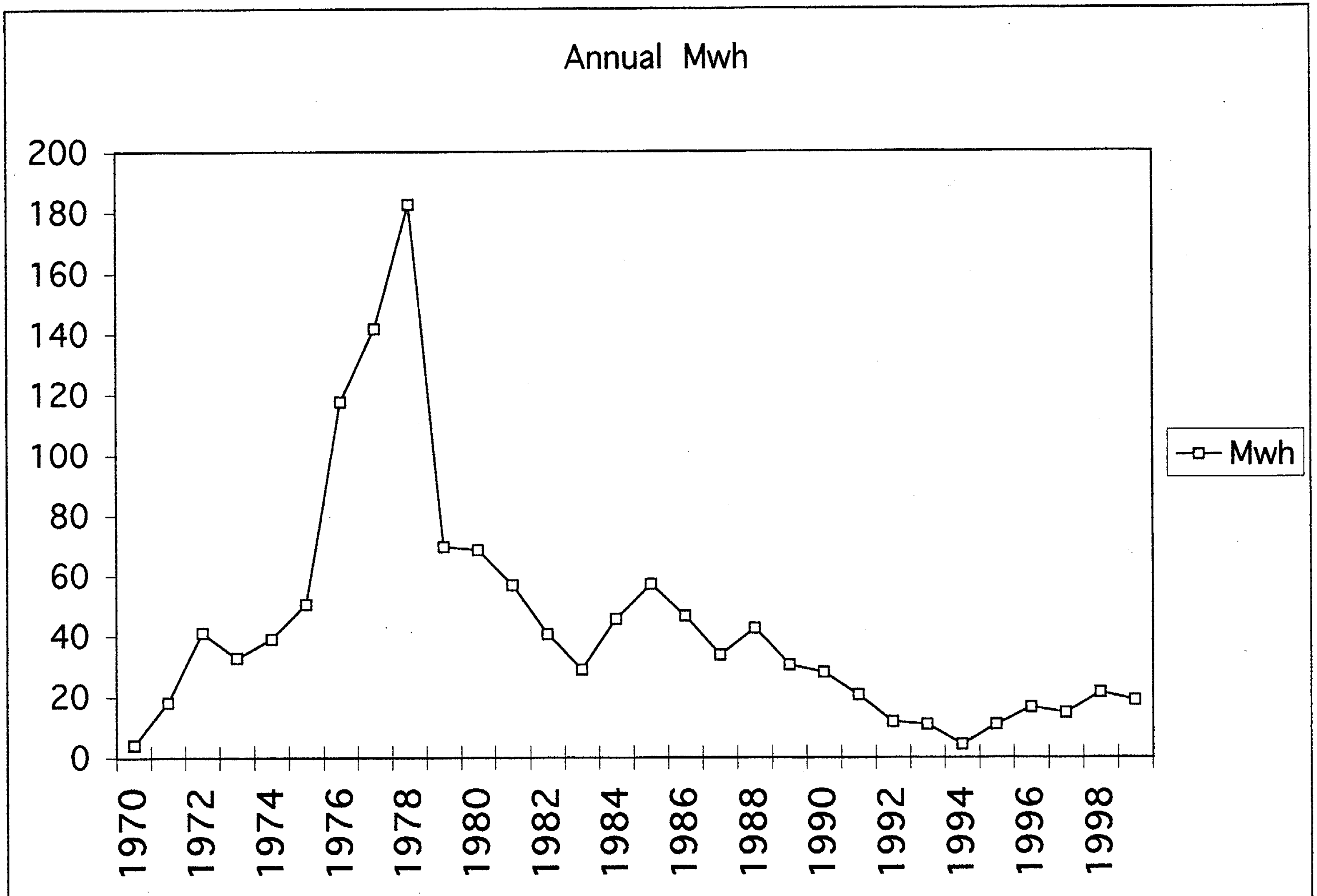


Fig M.2 Location of UCI Campus


Central Campus
The Academic Core
Buildout Development Framework
Major Public Spaces
Primary Pedestrian Linkages
Existing and Designed Buildings
Parking Structures
Gateway Quad
Engineering Quad
ROWLAND HALL
Physical Sciences Quad
Social Sciences Quad
Aldrich Park
Biological Sciences Quad
REACTOR
Fine Arts Village
Humanities Quad
CAMPUS VILLAGE

UCIU Nuclear Reactor Facility
LIFETIME SUMMARY



ER FIGURE H-1

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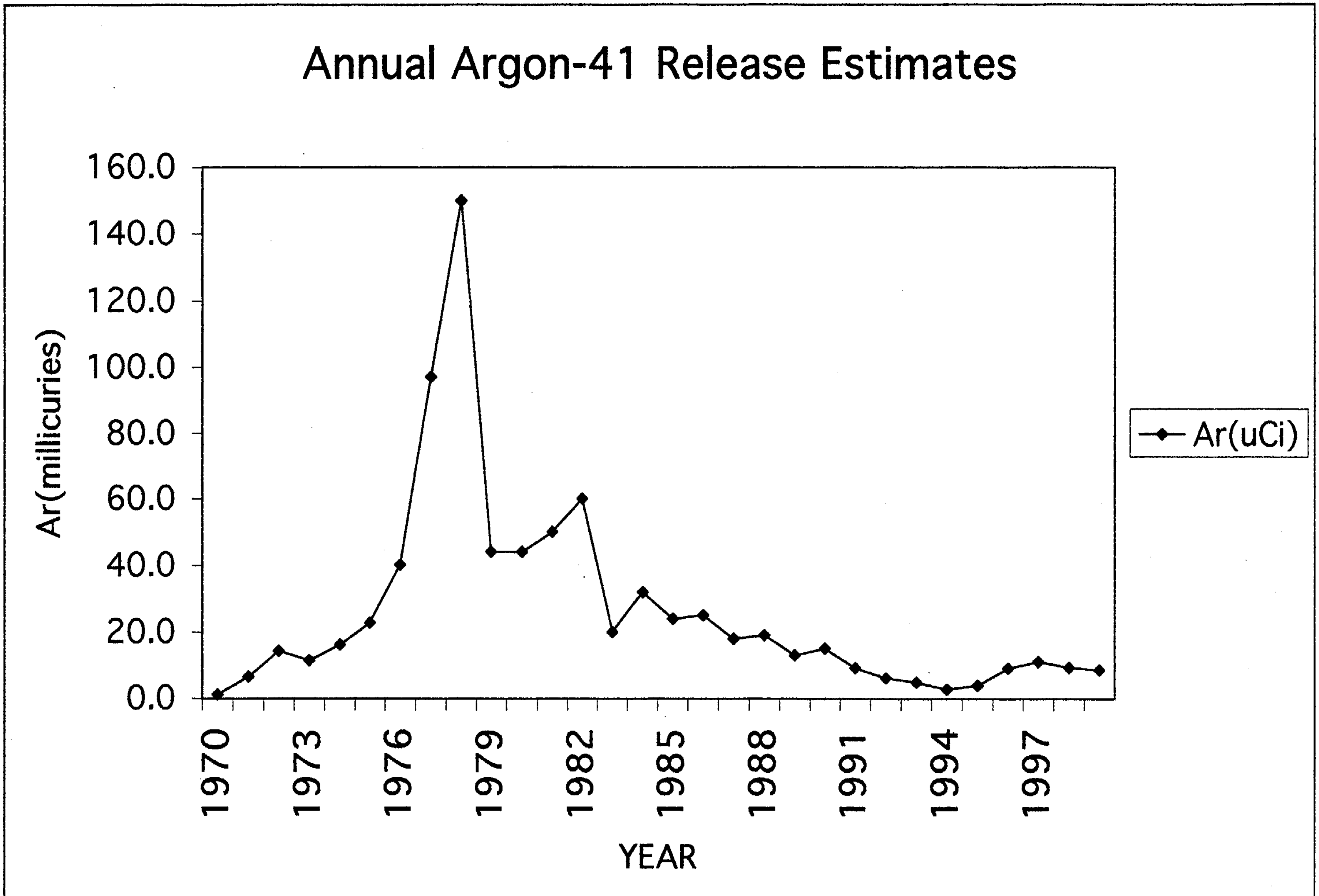

ER FIGURE H-2

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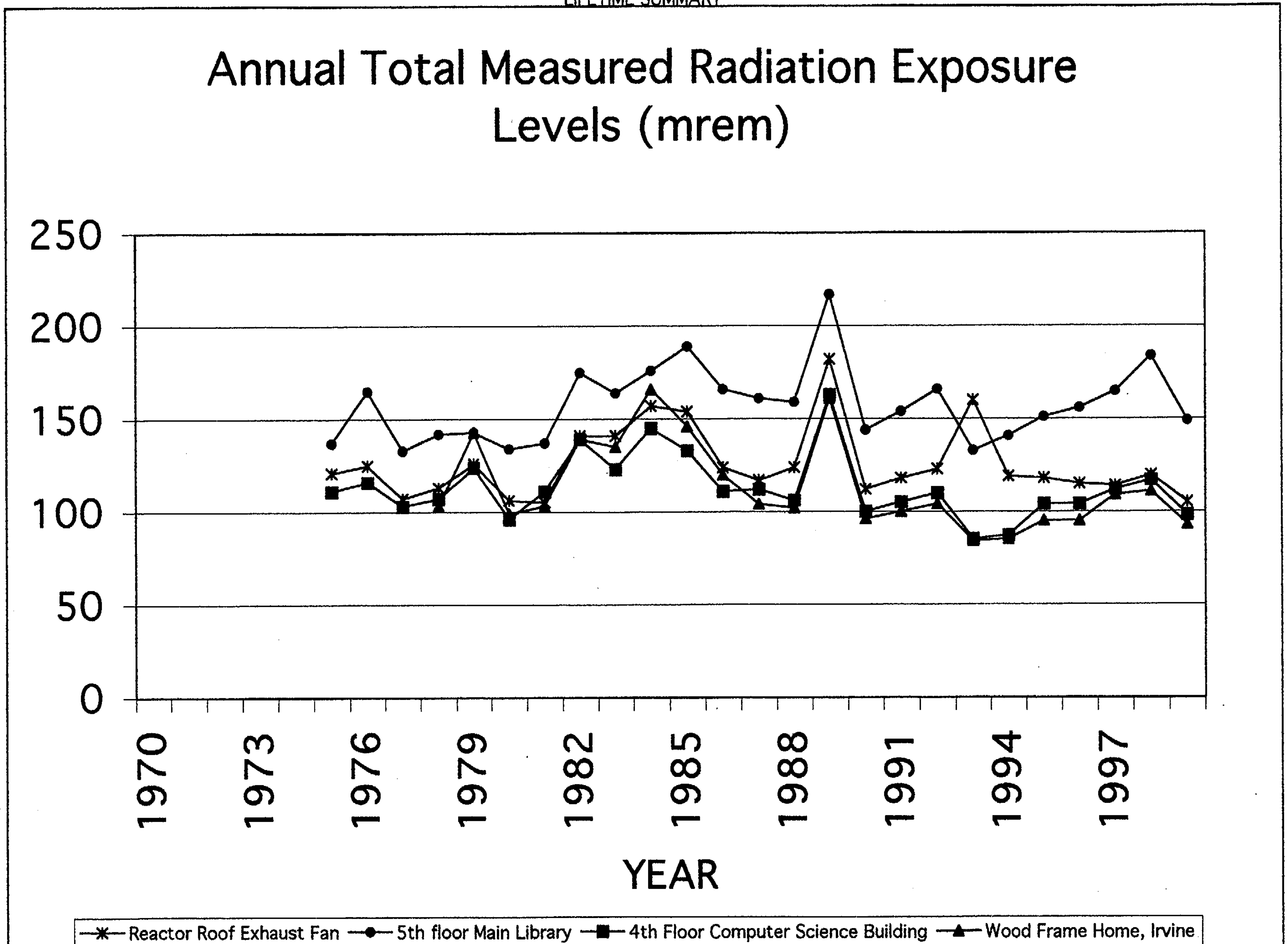
UCI Nuclear Reactor Facility
LIFETIME SUMMARY



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