UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

AUG 28 2002

MEMORANDUM

SUBJECT: Request for a Removal Action and $2 Million Exemption at the Webster-Gulf Nuclear Site, Webster, Harris County, Texas

FROM: for Gregory E. Fife, Senior On-Scene Coordinator Chris Petersen
Site Response Section (6SF-R2)

TO: Myron O. Knudson, P.E., Director
Superfund Division (6SF)

THRU: Charles A. Gazda, Chief Robert R. Brayle
Response and Prevention Branch (6SF-R)

I. PURPOSE

This memorandum documents the verbal approval for a Removal Action pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, 42 U.S.C. §§ 9601 et seq., at the Webster-Gulf Nuclear Site ("Site") located in Webster, Harris County, Texas. The memorandum also documents an exemption to the $2 million statutory limit for a Removal Action. The proposed action involves the removal and proper disposal of the radioactive sources and contaminated wastes at the Site, and disassembly and disposal of the contaminated buildings and foundations.

This memorandum also documents the use of the On-Scene Coordinator's delegated authority to initiate a Classic Emergency Response.

This action meets the criteria for initiating a removal action under the National Contingency Plan (NCP), 40 CFR §300.415. This action is expected to require less than twelve months.

II. SITE CONDITIONS AND BACKGROUND

CERCLIS # TX0000605420
Category of removal: Classic Emergency
Site ID # 06MD

A. Site Description

1. Removal site evaluation

The Webster-Gulf Nuclear Site ("Site") is located in Harris County. At the Webster Site are numerous radioactive sources and radioactive-contaminated wastes, materials, and structures. Machining of radioactive sources, spills, and other releases during operations at the Site contaminated the structures and equipment. The radiation level in the structures has resulted in their being defined as a High Radiation Area, and therefore time and shielding precautions must be observed. Several radioactive isotopes have been identified throughout the facility.

The meters and monitors have detected elevated radiation beyond the perimeter of the Webster Site. This is from the "shine" from the gamma radioactive sources within the building. The level of radiation at the perimeter is high enough to be of concern to the Texas Department of Health, Bureau of Radiation Control (TDH-BRC).

Gulf Nuclear prepared radioactive sources for use in the oil field, for medical services, for chemical plant processes, and research purposes in the space program. Sources used in the oil field were bundled inside a downhole tool that would "light up" the formations or grout in a well in order to evaluate the formation or determine the effectiveness of the grout job. Other sources were used in a variety of diagnostic and therapeutic forms in the medical services. The chemical industry uses radioactive sources to determine the quality of welds in pipe, density of fluids, and other operations. These sources are normally stored in "pigs" or shielding devices usually made of thick walls of lead, polyethylene, or paraffin.

Gulf Nuclear also prepared tracers. In the oil patch, tracers are typically radioactive sand that is pumped along with proppant and settle in place within the formation during a fracturing operation. Medical tracers are short half-life isotopes made to be injected into a body. Radioactive Iodine-131 was also prepared at the Site for thyroid treatments.

The investigation has found radioactive contamination on the building walls and floors at the Webster Site. The construction of the building and type of contamination do not allow for effective and efficient decontamination of the structure. Experience at the Gulf Nuclear site in Odessa, Texas, has shown that building decontamination is not realistic. However, portions of the structures are not contaminated, or contaminated below level of concern.

The Webster facility is also associated with a site located on Tavenor Road in Houston. The Tavenor-Gulf Nuclear Site (06ME) is located about 10 miles away. The TDH-BRC has indicated that the two facilities operated as one for most of the time.

2. Physical location

The Site is located at 202 Medical Center Boulevard in Webster. The immediate area is a medical center with clinics, offices, and a hospital. To the east is a breast cancer diagnostic clinic separated by only a sidewalk. To the west is a medical office building and then the Clear

Lake Regional Hospital. The front door opens onto Medical Center Boulevard to the south. Parking lots for the clinic and doctors' offices surround three sides. A dog kennel is located to the north, separated by a parking lot of two rows of parking and the driveway. Retail stores, other commercial buildings, and ball fields are nearby in the busy urban area of the immediate vicinity. New housing construction has started in the empty field across Medical Center Boulevard.

3. Site characteristics

The Webster Site has a series of structures that are connected or abutted on a plat of approximately 300 feet by 85 feet. Materials of construction include brick, prefab metal, and wood siding. There are ten distinct areas consisting of laboratories, machine shops, storage areas, and offices. The entire Site is fenced as a result of the EPA emergency response initiated on October 18, 2001.

The building has central air conditioning units on the roof. The roof has decayed and the units are sinking into the roof and are a threat to fall through. That could leave a large hole in the roof, exposing the contaminated structure to the weather.

An investigation conducted by U.S. Ecology in September 2001 found significant radioactive contamination on walls and floors in several rooms. The contamination was not limited to the radiation containment areas, as the investigation found Alpha contamination 120 times greater than background at the opening of the front door. Dust and dirt in the office area had readings of 650 times that of background.

Radioactivity in frequented pathways, such as office entryways, was as high as 400,000 counts per minute (cpm) as measured by Geiger Mueller detectors. A count per minute represents a degradation of the radioactive material atom, measuring the alpha, beta, or neutron particle released by the atom. The naturally occurring background is 40 to 60 cpm. A paper towel dispenser at the Site was measured at 300,000 cpm, a refrigerator at 10,000 cpm.

Subsequent investigation by the EPA has revealed that the contamination at the Site is much more extensive than indicated in the U.S. Ecology report. The EPA has found numerous additional radioactive sources at the Site.

While Gulf Nuclear was operating, a significant release occurred involving a metal lathe. Americium-241 was spewed throughout the room. Fabric, which was designed and used to prevent the contamination of structures, was placed on floor, walls and ceiling of the room. When the fabric was pulled back, the detectors measured the degradation at approximately 2,000,000 cpm on the floor.

A dead rat found in the front office had a gamma radiation level reading of 2,000 micro-Roentgen/hour (mR/h); natural background for the area is only 40 mR/h. Cockroaches registered 60,000 cpm.

Every room located at the Webster facility exceeded the acceptable surface limits for radioactivity, as defined by Title 25 of the Texas Administrative Code, Chapter 289.

4. Releases or threatened release into the environment of a hazardous substance, pollutant or contaminant

An inventory of the radionuclides at the Webster Site includes predominately Cesium-137, Americium-241, Cobalt-60, and Radium-226. A detailed inventory of the material found in the building is included in Attachment 3. The radionuclides Cesium, Americium, Cobalt, Radium, and the others are designated hazardous substances as defined in Section 101(14) of CERCLA, 42 U.S.C.§ 9601(14), and 40 CFR § 302.4.

The TDH-BRC maintains the perimeter thermo-luminescent dosimeters (TLDs) to monitor the radiation being emitted from the Site. In the report provided by TDH-BRC to EPA on November 8, 2001, the highest annual dose rate recorded at a station at the Webster site was 1966.5 milli-Rem (mRem), and an adjacent TLD recorded 1585.7 mRem. On the opposite side of the building, a TLD recorded an annual dose rate of 1148.7 mRem. The background TLD recorded 71.7 mRem. The permissible annual dose rate for the public is 0.1 Rem, and for occupational exposure is 5 Rem (10 CFR §§ 20.1302 and 20.1201).

Employees of the neighboring clinic wear personal dosimeters as part of their occupational requirements. Exposures to radiation have been recorded on TLDs worn by employees working in the clinic closest to the Site. Patterns of exposure indicate a significant contribution from the Site, although the exposures recorded are within the permissible limits.

5. NPL status

The Site is not on the NPL. The Site has not been ranked for possible inclusion on the National Priorities List.

6. Maps, Pictures and other graphic representations

Attachment 1 Enforcement Addendum
Attachment 2 Site Map
Attachment 3 Site Specific Decommissioning Cost Estimate, Prepared for the U.S. Bankruptcy Court, 10/18/2001
Attachment 4 U.S. EPA Fact Sheet on Ionizing Radiation, No. 1 (EPA 402-F-98-009)
Attachment 5 U.S. EPA A Fact Sheet on the Health Effects from Ionizing Radiation, No. 2 (EPA 402-F-98-010)

B. Other Actions to Date

1. Previous actions

Following the October 17, 2001 conversion of the owner's Chapter 11 bankruptcy proceedings to a Chapter 7 bankruptcy, the State of Texas requested assistance from EPA. Under the OSC's authority, a new fence was constructed to completely enclose the Webster facility. Other repairs and actions were taken to bolster the security of the Webster and Tavenor sites. EPA also took control of the alarm systems at both sites.

2. Current actions

Following verbal approval by the Region 6 Superfund Division Director on October 26, 2001, crews have mobilized to the Site and begun the cleanup actions. The sources have been accumulated from the various rooms in the buildings and staged for proper disposal. Debris has been cleared from the building. The air conditioning units have been removed from the building roof and other actions have been taken to stabilize the facility and reduce radiation exposure. The investigation to determine potentially responsible parties continues.

C. State and Local Authorities' Roles

1. State and local actions to date

Since the closing of the facility in 1992, the TDH-BRC has worked with Gulf Nuclear and its bankruptcy trustee to identify, remove and dispose or reuse some of the sources left in the Webster facility.

2. Potential for continued State/local response

The TDH-BRC has indicated its continued interest and its commitment to participate in the proposed removal action. The TDH-BRC is expected to assist in the identification of radioactive contamination and the isotopes, and confirmation of decontamination. The TDH-BRC assistance will facilitate the disposal and transportation procedures.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

A. Threats to Public Health or Welfare

The current conditions at the Site meet the following factors which indicate that the Site is a threat to the public health, welfare and the environment and a removal action is appropriate under Section 300.415(b)(2) of the National Contingency Plan. Any or all of these factors may be present at a site yet any one of these factors may determine the appropriateness of a removal action.

1. Exposure to Human Populations, Animals or the Food Chain, NCP Section 300.415 (b)(2)(i)

People can be exposed to the radiation from the perimeters of the Site. The perimeter monitoring instruments have detected radiation levels that require limited exposure to people in that area. Within the facility, a member of the general public would exceed the hourly allowable dose of radiation within a few minutes. The allowable dose for individual members of the public is found in 10 CFR § 20.1301, and allows no more than 100 mRem per year and no more than 2 mRem in any one hour. The perimeter dosimetry registered an annual dose of 1966.5 mRem.

In addition to the gamma radiation found at the Site, alpha and beta sources and contamination were also found in the building. The particulates were found as surface contaminants on walls, floors, equipment, and tools. People coming into contact with those contaminated surfaces could have picked up the radioactive particles or ingested or inhaled the contaminated dust particles.

The clinics and medical offices share patients, and as a result there is a high volume of pedestrian traffic in front of the Webster facility. The neighboring breast diagnostic clinic makes uses of every parking space in its lot. Eighteen of the spaces are along the exterior wall of the facility, where the dosimeter registered 1148.7mRem.

2. Hazardous Substances or Pollutants or Contaminants in Drums, Barrels, Tanks, or Other Bulk Storage Containers, That May Pose a Threat of Release; NCP Section 300.415 (b)(2)(iii)

At the Webster Site, radioactive-contaminated waste is stored in pigs, bags, and boxes. The waste includes a combination of suits and gloves, laboratory supplies, and miscellaneous material. It is contaminated with alpha, beta, and gamma radiation. Oil, water, and sand in ground vaults are contaminated with several radioactive isotopes.

Over 300 radioactive sources have been found at the Site. The sources are the capsules, disks, bottles, or vials prepared for use in the various industries. The count of sources includes a single 18 Curie Cesium source and bundles of Radium needles. A bundle of Radium needles ranges from 3 to 150 per bundle. Americium-241, Cesium-13, Radium-226, and Cobalt-60 are the primary radioactive isotopes found. Radioactive isotopes of Strontium, Plutonium, Europium, Thorium, Uranium, Polonium, Iodine, Silver, Iridium, and Gadolinium have also been found on the Site in significant quantities.

At least 25 vaults have been found at the Site. These vaults are constructed of metal or plastic pipe and placed in the ground, thus using the ground as shielding. The vaults typically are used to store sources. Contaminated oil and sand have been found in some of the vaults. Investigation of the other vaults will be conducted as protective shielding and equipment are erected to safely explore the contents.

3. Weather Conditions That May Cause Hazardous Substances or Pollutants or Contaminants to Migrate or be Released. NCP Section 300.415 (b)(2)(v)

The area is subject to hurricanes and other severe weather. Since the building itself is contaminated, any structural damage would cause the radioactive contaminants to be released. The building does provide protection for the containers and other contaminated items. However, the building is highly contaminated, and if the building is significantly damaged, the contaminants could easily migrate off-site. Gulf Nuclear installed shielding which was comprised of pouring lead shot or oil between wall panels or window panes. Damage to these building components could release the shot or oil.

4. Threat of Fire or Explosion, NCP Section 300.415 (b)(2)(vi)

The volume of volatile chemicals is minimal and does not present a high risk of fire or explosion resulting from those chemicals. However, the fire department is on record as saying that should a fire occur, it will take no action to fight the fire or enter the building. A fire could carry radiation in the plume which could be disperse throughout the city.

5. Availability of Other Mechanisms, NCP Section 300.415 (b)(2)(vii)

The TDH-BRC is expected to participate in the removal action, and its involvement will be instrumental in facilitating the proper disposal of the radioactive. The TDH-BRC has indicated that it has exhausted its capability to dispose of the remaining material. The TDH-BRC does not have the mechanisms to conduct the required removal action.

No activity is expected from the potentially responsible parties (PRPs). The bankruptcy trustee does not have the capability to perform the removal action. Sources and wastes that could easily be linked by the TDH-BRC to a PRP have been previously disposed of off-site.

6. Other Situations or Factors That May Pose Threats to Public Health or Welfare of the United States or the Environment, NCP Section 300.415 (b)(2)(viii)

If the Site was intentionally set on fire, the contamination could spread over a very wide area. Homes, businesses, hospitals, malls, schools, and parks would be severely impacted. Soil contamination above the action levels could exist in an area greater than the size of the City of Webster. The nearly 300 known radioactive sources could be involved in the fire, as well as the severely contaminated building features. Walls, floors, and air handling equipment are so contaminated that they could significantly contribute to the widespread contamination of the surrounding community.

B. Threats to the Environment

Runoff from the sites has the potential of contaminating the bayous and other drainage pathways. The water would enter Clear Lake and subsequently Galveston Bay.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances, pollutants or contaminants from this Site, if not addressed by implementing the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to the public health, welfare, or the environment.

V. EXEMPTION FROM STATUTORY LIMITS

1. Immediate Risk to Public Health or Welfare or the Environment

The amount of radiation recorded at the perimeter of the Site poses an immediate risk to the public who may work or live in close proximity. The exposure standards require limited exposure to the radiation levels detected at the perimeter. Continued exposure to the radiation has been linked to respiratory effects, anemia, and other adverse health effects. The radionuclides are considered carcinogens, and cancer is the major effect of concern. The permissible exposure level for members of the public entering the building or even remaining at the perimeter would be exceeded quickly.

Gamma (γ), Beta (β), and Alpha (α) radiation have been found in sources and in the form of contamination in the building. Each of these forms of radiation poses a different threat to human health based on the characteristics of each. Gamma radiation is wave-like and can penetrate skin or other such barriers. Beta and Alpha radiation are particles, and barriers are more effective but the particles can enter a body by ingestion or inhalation. The particles could then have an effect on the cells of the body, causing cancer or mutations. See Attachments 4 & 5 for Health Effects of ionizing radiation.

Several radioactive sources on the Site pose an immediate danger. Exposure to the 18-Curie Cesium-137 source and other sources would result in immediate tissue damage. Several of the Americium-Beryllium (AmBe) sources are breeched and leaking. The fine powders are respirable and easily suspended in the air.

2. Continued Response Actions are Immediately Required to Prevent, Limit, or Mitigate an Emergency

The proposed response action will remove the immediate threat from the radioactive sources and contamination. The dose rate from the radiation in the structures is high and requires limits on the exposure to humans. However, should something disrupt the integrity of the building or one or more of the several containers, the migration of the radioactive material could be widespread. The State has expressed concern that material from the Site may lead to the wide spread contamination.

Several Americium-241 and Cesium-137 sources are stored in the building. Direct exposure or even proximity exposure to the unshielded sources would have an effect on humans. Cell damage could occur immediately and the potential for long-term effects is great. One of the

Cesium-137 sources has an activity of 18 Curies; the cleanup level established by EPA is 40 pico-Curies (ρCi) or 40 x 10^{-12} Ci.

3. Assistance Will Not Otherwise be Provided on a Timely Basis

The State has exhausted its response capabilities. Through the BRC, many sources and contaminated materials were properly disposed of at off-site facilities. However, no other PRPs can easily be identified to dispose of the remainder of the material. The owner of the Site, The GNI Group, Inc., is no longer an entity that can respond. There are no other state or local agencies capable of conducting the response on a timely basis.

The State of Texas Natural Resource Conservation Commission (TNRCC) has committed to contribute ten percent of the cleanup cost to expedite the response. The TDH-BRC has committed to assist with the EPA-lead response by providing personnel and equipment on-site.

VI. PROPOSED ACTIONS AND ESTIMATED COSTS

A. <u>Proposed Actions</u>

1. Proposed Action Description

The radioactive sources and wastes will be packaged and transported off-site for disposal at a proper facility that is in compliance with the EPA Off-site Rule. The buildings and foundations will be disassembled and disposed of off-site at an appropriate facility. The contaminated material will be screened and segregated to minimize the volume of radioactive material. If any of the sources are viable for reuse, the TDH-BRC may assist with the proper transfer of licensing for future use. The foundation will be backfilled to appropriate grade. Cleanup levels for each different radioactive isotope are based upon Title 25 of the Texas Administrative Code, Chapter 289.202.

2. Contribution to remedial performance

No remedial action is expected to take place at this Site. However, should conditions change or more information is found that indicates a remedial action is appropriate, the proposed action is consistent with any potential remedial action.

3. Description of alternative technologies

There are no alternative technologies that could feasibly be applied.

4. Applicable or relevant and appropriate requirements

This removal action will be conducted to eliminate the actual or potential release of a hazardous substance, pollutant, or contaminant to the environment, pursuant to CERCLA, 42 U.S.C. § 9601 <u>et seq</u>., and in a manner consistent with the National Contingency Plan, 40 CFR.

Part 300, as required at 33 U.S.C. § 1321(c)(2) and 42 U.S.C. § 9605. Pursuant to 40 CFR Part 300.415(j), fund-financed removal actions under CERCLA § 104 and removal actions pursuant to CERCLA § 106 shall, to the extent practicable considering the exigencies of the situation, attain the applicable or relevant and appropriate requirements under Federal environmental law.

Due to the fact that consolidation and off-site disposal are the principal elements of this removal action, RCRA waste analysis requirements found at 40 CFR §§ 261.20 and 261.30, RCRA manifesting requirements found at 40 CFR § 262.20, and RCRA packaging and labeling requirements found at 40 CFR § 262.30 are deemed to be appropriate requirements for this removal action. Regulations covering the transportation of radioactive materials include 49 CFR § 173, Subpart I; 10 CFR § 71 and 10 CFR § 61. Ambient air quality standards at 40 CFR 50 will be used, as applicable, to protect the quality of air during the implementation of the action.

5. Project schedule

The duration of activities is expected to be four to six months, depending upon weather conditions and scheduling, and the availability of disposal contractors and other contractors.

B. Estimated Costs

The Region 6 Superfund Division Director gave verbal approval on October 26, 2001, to conduct the removal action and established a ceiling of $4,500,000 for the cleanup contractors and disposal. That ceiling was to cover both the Webster-Gulf Nuclear and the Tavenor-Gulf Nuclear actions. The conditions as understood by EPA on October 26, 2001, were consistent with a cost estimate of $4,500,000; however, the number of unanticipated sources, hidden rooms, and levels and quantities of contamination have raised the original estimate of costs. The Tavenor-Gulf Nuclear site will be addressed in a separate action memorandum. The original approval to initiate the Classic Emergency Response was provided by the OSC using his delegated authority, with the Classic Emergency Response ceiling initially established at $50,000.

Extramural Costs

Cleanup Contractor.. $5,750,000
(Includes the $50,000 ceiling for the Emergency Action)

START.. $100,000

TOTAL, EXTRAMURAL COSTS $5,850,000

VII. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

If this action is not taken at the Site, the potential for human exposure to contaminants at the Site will remain unabated. The drums, boxes, and bags will continue to deteriorate and the radioactive material will be released. The building is subject to vandalism, and people coming into contact with the contamination will be exposed to dangerous levels of radiation. Vandalism or damage from storms could result in the release and migration of the radiation.

VIII. OUTSTANDING POLICY ISSUES

It is anticipated that several glove-boxes or hot-cells will exceed the classification of Class C waste. There are no current disposal facilities for commercial greater-than-class-C waste (GTCC). The Department of Energy (DOE) has facilities that are capable of taking the GTCC waste.

IX. ENFORCEMENT

See Attachment 1.

X. RECOMMENDATION

This decision document represents the selected removal action for the Webster-Gulf Nuclear Site, in Webster, Harris County, Texas, developed in accordance with CERCLA as amended, and not inconsistent with the NCP. This decision is based on the administrative record for the Site.

Conditions at the Site meet the criteria as defined by 40 CFR Section 300.415(b)(2) of the NCP for a removal, and I recommend your approval of the proposed removal action and your approval of the $2 million dollar exemption. The total project ceiling will be $5,850,000.

APPROVED Pamela Phillips, Acting DATE 8/28/02

MEMORANDUM

SUBJECT: Request for a Removal Action and $2 Million Exemption at the Webster-Gulf Nuclear Site, Webster, Harris County, Texas

FROM: Gregory E. Fife, Senior On-Scene Coordinator
Site Response Section (6SF-R2)

TO: Myron O. Knudson, P.E., Director
Superfund Division (6SF)

THRU: Charles A. Gazda, Chief
Response and Prevention Branch (6SF-R)

I. PURPOSE

This memorandum documents the verbal approval for a Removal Action pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, 42 U.S.C. §§ 9601 et seq., at the Webster-Gulf Nuclear Site ("Site") located in Webster, Harris County, Texas. The memorandum also documents an exemption to the $2 million statutory limit for a Removal Action. The proposed action involves the removal and proper disposal of the radioactive sources and contaminated wastes at the Site, and disassembly and disposal of the contaminated buildings and foundations.

This memorandum also documents the use of the On-Scene Coordinator's delegated authority to initiate a Classic Emergency Response.

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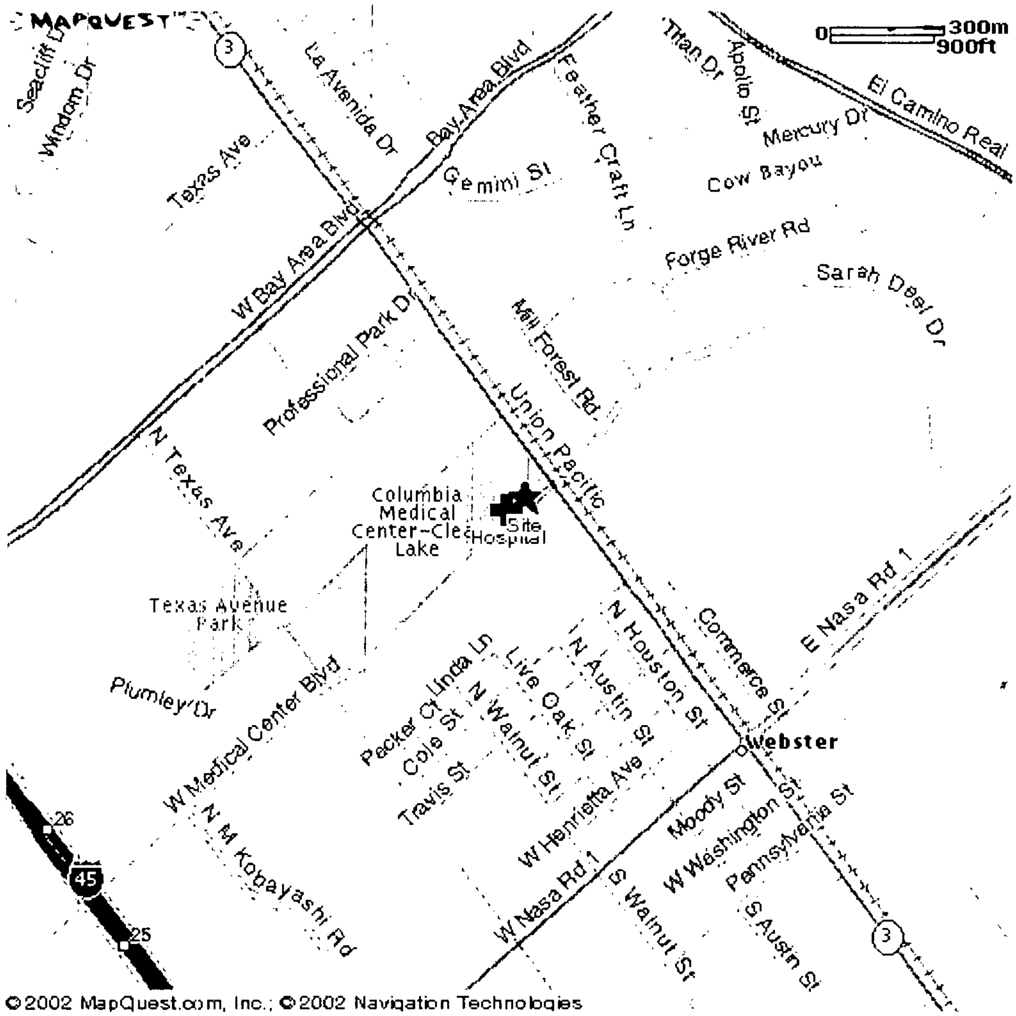
II. SITE CONDITIONS AND BACKGROUND

CERCLIS # TX0000605420
Category of removal: Classic Emergency
Site ID # 06MD

CONCURRENCE:

Broyles	Suttice	Parr	Foster	Peycke	Buzzell
6SF-AP	6SF-AC	6SF-AC	6RC-S	6RC-S	6SF
		07/12/2002	8/14/02	08/15/02	8/28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Union Pacific
N Texas Ave
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Site
Hospital
Texas Avenue Park
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N Austin St
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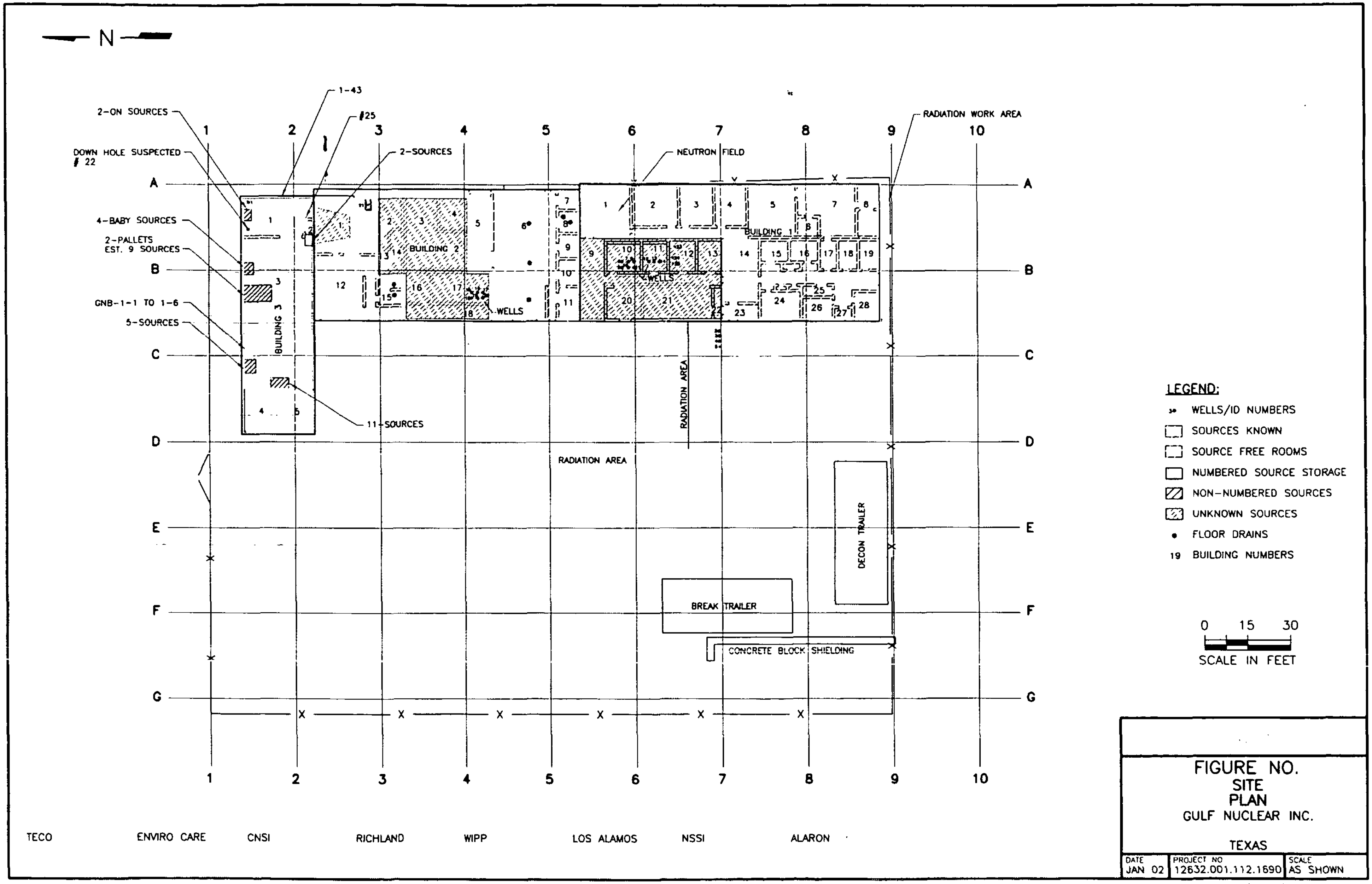
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GULF NUCLEAR INC.
TEXAS
DATE JAN 02
PROJECT NO 12632.001.112.1690
SCALE AS SHOWN

SITE SPECIFIC DECOMMISSIONING COST ESTIMATE REPORT

of the facilities located at

202 Medical Center Boulevard, Webster, TX
&
9320 Tavenor Street, Houston, TX

Formally Operated by
Gulf Nuclear of Louisiana

October 18, 2001

Prepared For:

The Honorable Wesley W. Steen
U.S. Bankruptcy Judge
United States Bankruptcy Court
Southern District of Texas
515 Rusk Avenue
Houston, Texas 77002

Attachment

Prepared By:

USEcology

109 Flint Road
Oak Ridge, TN 37830

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1.0 INTRODUCTION

This site specific Decommissioning Cost Estimate Report (DCER) provides the information needed to identify site hazards and to select worker protection methods during subsequent clean-up activities. The more accurate, detailed, and comprehensive the information available about the site, the more the protective measures can be tailored to the actual hazards that workers may encounter.

US Ecology was issued an "Engagement Letter" by the U.S. Bankruptcy Judge, United States Bankruptcy Court, Southern District of Texas dated August 20, 2001 containing authorization to proceed with the work referred to in the letter.

This report contains a summary of the characterization performed at Gulf Nuclear of Louisiana's Webster and Tavenor, Texas Facilities by US Ecology of Oak Ridge, Tennessee between September 4, 2001 and September 10, 2001. This report has been provided to the below listed court on the date of October 18, 2001.

The Honorable Wesley W. Steen
U.S. Bankruptcy Judge
United States Bankruptcy Court
Southern District of Texas

The Webster Facility began operations in 1971, primarily supplying radioactive tracers to the oil field industry. Over the next few years, operations expanded to include Am-241 neutron sources, Cs-137 sources and Ir-192 radiography sources. Many radioisotopes, such as Co-60 and Ra-226, were used in manufacturing products used primarily in the oil field industry.

Operations began as Nuclear Environmental Engineering Incorporated and operated as NEEI for several years. The name was changed to Gulf Nuclear and eventually to the GNI Group, Inc. ("GNI"). The facility and its radioactive business was sold and the facility was then operated by a third-party as Gulf Nuclear, Inc. Several years later, the facilities were returned by the third-party owner to the GNI organization under the name of Gulf Nuclear of Louisiana, Inc.

At the time of this survey, the facilities were not in operation and had been shut down for several years. The general condition of the site is that of disarray and untidiness. No security personnel are located at either facility.

1.1 Purpose

The following text is an excerpt from the State of Texas "Guidelines for Preparing a Decommissioning Cost Estimate Report (DCER). US Ecology prepared this DCER using guidance from this document.

The purpose of the DCER is to determine the proper amount of financial assurance for decommissioning the licensed facilities. In preparing the DCER, one should assume that the Texas Department of Health will engage a party other than the licensee to decommission the facility. The party must be specifically licensed by either the Texas Department of Health or the United States Nuclear Regulatory Commission or an Agreement State to possess and/or use the radioactive material encountered at the facility to be decommissioned and is authorized to perform decontamination of equipment and facilities at temporary job sites. If the party is not already licensed by the TDH to engage in such work, then the cost of either obtaining such a license or the cost of obtaining reciprocal recognition of their out of state license should be included in the cost estimate.

If the person engaged to perform the decommissioning of the facility is not a licensee within the Houston area, then the cost estimate should include the cost for travel to and from the Houston area, lodging and meals in the Houston area for the duration of the decommissioning effort, and the cost for local transportation.

The DCER should identify the classifications of personnel who will be needed to decommission the facility and their rate of compensation. For example:

Position	Compensation
Supervising Health Physicists	$XX/hr
Health Physicist Technician	$XX/hr
Laborer	$XX/hr
Clerical	$XX/hr

The DCER should estimate the amount of time and the staff needed to review both the Texas Department of Health license file on the licensee's operations and history and the licensee's own records to determine the radioactive material which the licensee may have possessed, where it was used and where loss of control of the material occurred.

In estimating the amount of time, staff and equipment needed to begin radiological characterization of the licensee's facility, the following should be done:

1. Identify each building, room or area in a building (including closets), and areas outside buildings that comprise the facility.

2. Provide the dimensions of each building, room or area in a building, and areas outside buildings at the facility.

3. Describe the nature of the construction of the floor, walls, and ceiling of each room or area in a building.

4. Identify the contents of each room or area in a building and areas outside buildings at the facility.

5. Identify the location of each plumbing feature (e.g., floor drains, sinks, commodes,

shower stalls, washing machine drains, etc.) in each room or area in a building or area outside buildings at the facility with a connection to either a sanitary sewerage or septic tank or holding tank.

6. Identify the location of each ventilation intake register and duct work in each room or area in a building.

7. Identify the location of each air handling system in each room or area in a building. This includes blower units, filter units and discharge ducting and outlets.

8. Identify the radiological monitoring/detection equipment needed to characterize the facility.

The DCER should systematically assess the cost for decommissioning the facility by tabulating for each room or area in a building, and for each area outside a building the type of surveys performed, the personnel to be used, the amount of time estimated to perform the surveys and the cost for such, the type of analytical services needed (if required, such as wipe sample analysis, soil sample analysis, or chemical analysis), an estimate of the radionuclides and activity expected, and an estimate of the volume of waste and the waste form.

The DCER should identify the type of decontamination methodology that will be needed for specific areas (e.g., rooms) or features (e.g., glove boxes) at the facility, or if demolition will be the prefered management methodology, and the equipment needed for each and the type of personnel to be engaged to conduct. The cost for these should be estimated for each area.

The DCER should identify the type and number of containers needed for the waste generated in decommissioning and the total cost and cost per container, and vendor for the containers.

The DCER should identify the disposal facility to which specific waste can be sent for disposal and provide the estimated cost for such. The cost estimate should include the details of the disposal cost estimate, packaging of the waste, surveying and labeling of the waste containers, loading of the waste on to transport vehicles, survey and placarding of the vehicles, preparation of the required shipping papers and manifest, and the cost for transport to the disposal site.

If waste cannot be disposed of at a current disposal facility, the DCER should identify the waste waste as to radionuclide(s) and volume and a plan stated for management of the waste. The plan for management of the waste should describe how the waste is stored, where it is stored, how it is secured, how it is monitored to preclude unauthorized entry to the storage area and/or removal of the material, how it is to be protected against flood, fire and wind, and an estimate of the cost for each of the aforementioned and ultimate disposal.

The DCER should identify the type of program (i.e., computer code) that will be utilized to demonstrate that the facility will meet the 25 mrem/year limit, the equipment and its cost for running the program, the personnel who will be used to run the program and their cost. The personnel and cost for preparing a report to the state documenting the decommissioning of the facility.

a. Title 49, Code of Federal Regulations, Parts 171 to 174, "Transportation", Revised as of April 1, 1996.
b. U.S. Nuclear Regulatory Commission, DRAFT NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination", February, 1993.
c. Title 25 of the Texas Administrative Code (25 TAC) Section (§) 289.252(gg)(1) and (2).
d. Title 25 TAC §289.254(h)(1) and (2).
e. Title 25 TAC §289.252(gg)(5).
f. NUREG –1575, Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)
g. Title 25 TAC §289.254(h)(5).
h. NUREG/CR-5849 Manual for Conducting Radiological Surveys in Support of License Termination

1.3 Site Description

The following text provides a brief physical description of the Webster and Tavenor facilities. Characterization data for the two facilities is located in Section 2.0.

1.3.1 Webster Facility Description

The east side of the Webster facility shares a parking lot with a Breast Cancer Medical Facility. The west side of the facility is enclosed with a cyclone fence. This fence is posted as a Radioactive Materials Storage Area. The south, north and east sides of the buildings are not posted.

It is evident that the facility has experienced at least one recent break-in or burglary. This is evident by a large broken window in the front office area that has since been secured with plywood.

The Webster facility basically consists of ten areas; 1) office section, 2) laboratory section, 3) radiography area, 4) machine shop, 5) old Cs-137 & Am-Be labs, 6) leak test lab, 7) new Cs-137 & Am-Be labs) 8) tracer lab, 9) storage area and 10) operational support areas.

The following is a brief description of these ten areas:

1) Office Section

The front office section is common residential construction with wood paneling inside and frame and brick construction on the outside. The building sits on a concrete pad foundation. The floor in this section is covered with asphalt tile and carpet. There are two air conditioning systems, one overhead system (top of the roof) and one closet type.

2) Laboratory Section

The Laboratory Section of the front building contains four labs and one storage area. These labs are 2 x 4 frame construction with sheet rock walls. The floors are covered with poured in place urethane material.

3) Radiography Room

The Radiography room contains a lead shot hot cell. The double walls are 6" apart and the mild steel in 1/8" thick.

4) Machine Shop

The Building Two area is the mechanical shop and at one time contained lathes and metal working machines. This area has a concrete floor that has been painted. The walls and ceiling are sheet rock. All of the partitions are 2 x 4 framing with sheet rock covering.

5) Old Cs-137 & Am-Be Labs

The (Old) Cs-137 room contains two hot cells that have not been used for several years. One hot cell is 2' x 2' x 2' and the other is 4' x 4' x 4'. The cells are constructed of mild steel. These two cells have contact readings of 5000 mR/hr.

The (Old) Am-Be Lab contains two Am-241 glove boxes. This room was not used for several years. The glove boxes are 2' x 3' x 4'. They are unshielded and constructed of mild steel. These hot cells have an estimated Curie content, based on MicroShield calculations, of 1-Curie. A copy of the MicroShield calculation is attached.

6) Leak Test Lab

The Leak Test Lab contains a wooden hood and two glove boxes. These units are small and were used for Tritium and I-125 operations. The cabinets are wooden and can be easily removed if necessary.

7) New Cs-137 & Am-Be Lab

The Cesium area is a lab that contains Cs-137 hot cells. The floor is covered with tile and the walls are covered with sheet rock. The walls are stacked 8" x 8" x 16" solid concrete blocks. Care must be taken to keep these blocks from being contaminated.

The Am-Be Lab is a double contained Am-241 hot lab. The walls are concrete blocks covered with sheet rock. The floor is concrete covered with tile. Caution must be exercised to keep the blocks free of contamination.

8) Tracer Lab

The Tracer Lab contains an area which was used for packaging and shipping of radioactive material. This building is a metal building with exposed surfaces. The inside surfaces are coated with blown on insulation. There is an inside area that contains hoods and glove boxes that were used for tracer materials. The devices are constructed of wood.

This Tracer Lab contains two hot cells. One cell was used for work with Gd-153 and Sc-46. This cell is a double walled cell filled with lead shot. The second cell is constructed of concrete blocks covered with hard board. This cell contained Ir-192.

9) Storage Area

The back building was used for storage. The building is metal with a concrete floor. There is a radioactive waste bunker that is constructed of concrete blocks. There is an enclosed area behind the Gd-153 cell to prevent the spread of contamination from the hot cell. There is a down hole high pressure unit in the floor. This unit is approximately 6' deep. The open area inside the security fence is covered with asphalt that is approximately 2" thick.

10) Operational Support Areas
The room labeled "Pipeliner" was used for shipping and contains only wooden cabinets.

The room that is not labeled was used as a lunchroom and as a storage room. This room does not contain any radioactive equipment.

1.3.2 Tavenor Facility Description

The Tavenor facility is located on a 5.01-acre site. The site has five buildings and surrounding grounds. Four of the five buildings are the remains of the process area that was occupied by Gamma Industries. The property was sold to GNI in 1985. GNI has performed partial decommissioning in the four remaining process buildings. The fifth building was constructed five years ago to store radioactive waste generated during the decommissioning performed by GNI. The site basically consists of 1) New Waste Storage Building, 2) One Story Brick Office Building, 3) Fabrication/Machine Shop, 4) Am-Be Lab, 5) Radiography Lab, and 6) Surrounding Grounds.

The following is a brief description of these six areas:

1) New Waste Storage Building
The new waste storage building is constructed from sheet metal with a concrete slab floor. The building is elevated ~ 2-feet above grade. The ceiling is 20-feet high with a double-pitch. The interior space is ~2,800 square feet.

There are 52 B-25 boxes of waste currently stored inside. These boxes are single stacked and comprise approximately 80% of the available floor space. Fifty B-25 boxes contain soil and gravel from remediation of Tavenor's radioactive contaminated leach fields. Two boxes contain Am-Be hot cells. These boxes are easily identified as they are 1.5-feet taller than the rest of the boxes. They were staged in the middle of the storage building with the soil boxes placed around them for shielding.

There are two equipment roll-up doors and one personnel door. The building does not have a ventilation system. This building does have electrical and is equipped with an alarm system.

2) Brick Office Building
The one story brick office building comprises ~4,500 square feet of floor space. This building has been partially remediated. This building is in a deteriorated condition and is unsafe for personnel entry. Many of the interior structural supports and roof beams have collapsed. Sections of the roof have collapsed. The floor in some areas has been removed. Carpet from this building was removed during remediation and placed outside for storage. The carpet is

radiologically contaminated. Readings were collected with a G-M Detector that ranged between 20,000 counts per minute (cpm) to 50,000 cpm.

3) Fabrication/Machine Shop

The fabrication/machine shop is a 785 square foot metal building with a small storage loft. The floor area is littered with old fabrication equipment and an assortment of discarded junk. Several items, such as drill bits, had elevated readings of radioactivity up to ten times background.

4) Am-Be Lab

The Am-Be Lab has been 90% demolished. One sheet metal wall, several steel wall support beams and approximately 20% of the sheet metal roof still exist. The concrete floor has undergone scabbling to remove contamination. The scabbling was performed by GNI personnel. The building sits on concrete slab footprint of 795 square feet. GNI believes that Cs-137 sources may have been historically manufactured in this building as well.

5) Radiography Lab

The radiography lab is a concrete building with 624 square feet of floor space. It has two rooms of about equal size. Each room has had partial remediation performed in the interior areas, i.e., concrete floor scabbling, sub-floor soil removal, and equipment removal. This building still has extensive radioactive contamination. Readings of 1mR/hr were found on the floor and walls.

6) Surrounding Grounds

The surrounding grounds around the before mentioned buildings is ~75% overgrown with dense trees and underbrush. Much of the ground was under six to twelve inches of water at the time of the characterization survey. Thick swarms of mosquitoes are present. Approximately 4,000 square feet of broken asphalt and concrete covers the grounds between the buildings.

Radioactive contaminated leach fields are located throughout the surrounding grounds. There is a total of one thousand feet of leach field line at Tavenor. Section 2.0, Historical Review, describes the leach fields in more detail.

2.0 HISTORICAL REVIEW

Texas radioactive materials license L02995 and L03378 were reviewed for the period 1983 to the present. Both licenses are issued in the name of GNI of Louisiana, Incorporated. License L02995, formerly L01654 extends back to the early 1970's when the predecessor of GNI of Louisiana, Gulf Nuclear was named Nuclear Environmental Engineering, Incorporated. License L03378 was originally issued to Gamma Industries, which was acquired by Gulf Nuclear in the 1980's. The files document the existence of contamination at both sites, both within and outside the restricted areas. The review of license L02995 did not yield any comprehensive inventory of the radioactive sources and materials stored in that facility. Nor are there any comprehensive surveys of the facility within that file. Periodic contamination surveys were performed during routine inspections, however, these ceased more that eight years ago. Those surveys reviewed did document contamination in excess of allowable levels in restricted and unrestricted areas on a frequent basis.

Although the file for license L05378 does indicate that contaminated soil and equipment is contained in 50 some odd B-25 boxes stored in a Butler building within the fenced area at the Tavenor Street site, an inventory of the contents of those boxes could not be located there. Again routine inspections of the facility ceased some eight or more years ago. Both facilities have been monitored by the Texas Department of Health, Bureau of Radiation Control for the period from 1983 to the present. Monitoring consisted of placing and exchanging on a quarterly basis numerous TLD's along the fences surrounding the facilities. Also soil samples and sewage samples were collected. Fence line monitors depict widely fluctuating radiation levels at certain locations along the fence at the Webster facility (L02995). Samples of sewerage taken at the waste water treatment plant serving the Webster facility have contained measurable concentrations of Am-241 and some soil samples taken near that facility have in the past contained Cs-137.

The only documented contamination incident located in the file occurred at the Webster facility in 1983. The incident consisted of the inadvertent breach of a three curie americium-beryllium source. The incident prompted and extensive investigation and facility survey. The survey revealed wide-spread contamination within the facility, especially within the plenum formed by the false ceiling and in air conditioning duct work. Also several technicians were determined to have had sufficient intakes of americium to warrant chelation therapy. The investigation revealed the transfer of soils contaminated with Cs-137 off-site to the property of one of the employees. The contaminated soil was removed from this property and the property ultimately surveyed and released by the Bureau of Radiation Control. The investigation report is rather lengthy and will be made available as an addendum to this report.

In respects to Tavenor, it is important to note that it was Gamma Industries licensed practice to release radioactive material into the site's septic system which subsequently flowed into extensive leach fields located within the property boundary. The soil in this region has a layer of dense clay approximately two feet below grade. When the contamination was released in the leach field it percolated through the top soil until it reached this layer of clay. At the clay layer, the contamination spread laterally to some extent. GNI performed extensive remediation of the leach field areas. Approximately 4,800 cubic feet of soil and gravel were removed and placed into the 50 B-25 boxes currently stored in the New Waste Storage Building described in Section 1.2.2, Tavenor Facility Description.

During the years that the Gulf Nuclear facility located on Tavenor Street in Houston was operated by Gamma Industries, radioactive materials, predominantly cesium-137 found thier way into a septic tank. One tank and drainfield are located within the fenced area to the west of the Butler building. Some contaminated soil from this area has been excavated and stored in the Butler building. There are several areas where soil remains contaminated from another septic tank, located directly behind the main office building. The tank is exposed and elevated readings can be obtained from the root ball of a rather large tree which grew out of it. From its location relative to the nearest fence, it appears the drain field for this tank is also within the fenced area.

The Webster facility still has an abundance of radiological sources, i.e., Am-Be sealed sources used in the oil industry, check sources, and radium needles used in the medical industry. An inventory of sources is provided in Section 4.0, Facility Characterization.

GNI reported that all radioactive sources from Tavenor were collected and properly disposed.

3.0 RADIOLOGICAL OVERVIEW FOR WEBSTER AND TAVENOR FACILITIES

US Ecology personnel performed a radioactive characterization survey which consisted of the collection of soil samples, swipe samples of interior surfaces, direct surface radiation measurements, and general area radiation readings. In addition, an inventory of radiation sources was performed.

During the initial phases of the characterization survey, it quickly became evident that radioactive contamination was not contained within the confines of the radiological engineered controlled areas. Alpha contamination 120 times greater than natural background levels was measured at the opening of the front door exit. A small pile of dirt and dust that had been swept into a corner near the front door had readings 650 times greater than background. There were two vacuum cleaners in the front office area that had high levels of internal contamination.

The interior of each facility was littered with dead cockroaches, dead rodents and rodent feces that had high levels of radioactivity. One dead rat located in the front office had radiation levels reading 2000 microR/hour. Natural background in the Houston area was measured at 40 microR/hour. Dead cockroaches had radiation levels of up to 60,000 counts per minute (cpm) using a Geiger Mueller (GM) Detector. Natural background for the GM detector was 40 to 60 cpm.

The bathroom facilities in the office areas also contained measurable levels of contamination. The sink drain lines had readings of 3,000 cpm. A paper towel dispenser was measured at 300,000 cpm on the external surface. The air intake vent on a refrigerator had 10,000 cpm. Elevated contamination was found on several door knobs and light switches.

Each of the 21 rooms located in the front office area had contamination levels exceeding acceptable surface limits for radioactivity as defined in Texas Administrative Code 289.202. Contamination was found on frequented pathways, such as office entryways, with levels as high as 400,000 cpm.

Each office contained an air vent located in the ceiling. Each vent had elevated levels of radioactivity. The office area ventilation exhaust system vents directly to the atmosphere. This air duct system is not filtered.

4.0 FACILITY CHARACTERIZATION

Site characterization proceeded in three phases:

1. Prior to site entry, offsite characterization was conducted. This entailed gathering information away from the site (historical) and conducting reconnaissance surveys

from the site perimeter.

2. A site survey was conducted of the exterior grounds, within the property boundary and the buildings interiors. During this phase, access to the property was restricted to US Ecology survey team personnel and GNI support personnel.
3. Offsite analysis was performed at an independent, licensed laboratory. All collected field readings and laboratory data were reviewed and compared against Department of Transportation regulations, Texas Administrative Code 289.202, and various licensed radioactive waste disposal site's waste acceptance criteria (WAC).

4.1 Characterization Data

The following is a list of data and/or reports and their location:

- Analytical data are located in Attachment A.
- Photographs are located in Attachment B.
- Smear Counting Analysis Reports for each area of concern are located in Attachment E.
- Site Maps containing radiological data are located in Attachment F.
- 25 Texas Administrative Code 289.202 (Standards for Protection Against Radiation From Radioactive Material)

Radioactive Material Inventory

The facility contains many discreet sources. A complete inventory with activity levels is provided. Some of these sources contain levels of radioactivity with high enough activity to cause an over exposure within several minutes of personal contact. All sources are currently located behind locked doors in the radiologically controlled areas. The following table contains a list of sources currently stored inside locked deep wells located in the new Am-Be Lab.

Table 4.1. Webster Source Inventory Located Inside the Am-Be Lab

Source Isotope	Serial Number	Activity
Am-241/Berillium	HPB-427	50 mCi
Am-241/Berillium	CSV-N25	25 mCi
Am-241/Berillium	EL-821	100 mCi
Am-241/Berillium	CSV-651	25 mCi
Am-241/Berillium	CSV-903	250 mCi
Am-241/Berillium	A-445	100 mCi
Am-241/Berillium	NB-519	250 mCi
Am-241/Berillium	NO SERIAL PRESENT	250 mCi
Pu-238	1009-2	150 mCi

Table 4.2. Webster Radioactive Material Inventory Located Inside Waste Storage Room

Source Isotope	Description	Activity or Dose Rate
Unknown	2-capsules dark powder	320 mR/hr contact
Radium	3-poly vials (~40 needles)	280 mR/hr contact
Radium	1-lead pig (~40 needles)	800 mR/hr contact
Radium	50 needles scattered on floor	
Cd-109	Sources	3 mCi
Co-60	(3) 55-gallon drums trash	0.001 mCi
Cs-137	Source	18 Ci
Cs-137	Source	2 Ci
Cs-137	Source	100 microCi
Cs-137	(2) Sources	10 microCi
Unknown contaminate	~ 100 cubic feet of trash	Unknown
Sr-90	Source	39.7 Rad/second
Sr-90	Source	280 microCi
Ni-63	Source	5 microCi
1% Uranium	Powder	100 grams
0.5% Uranium	Powder	100 grams
2% Uranium	Powder	100 grams
4% Uranium	Powder	100 grams
1% Th & 0.04% U	Powder	50 grams
Radium	(8) Sources	3 microCi
Radium	1-lead pig (7 needles)	310 mR/hr
Radium	1-lead pig (25 needles)	220 mR/hr
Radium	1-lead pig (5 needles)	180 mR/hr
Radium	1-lead pig (1 needles)	12 mR/hr

COST SECTION

SUMMATION

Gulf Nuclear Inc.
Summation of Both Sites

<u>Cost for Financial Assurance</u>

Planning and Preparation		$ 38,685.00
Travel/Perdiem/Rental Equipment/Vehicles		$ 441,837.88
Decontamination/Dismantlement		$ 259,239.00
Waste	Containers	$ 254,250.00
Waste	Shipping	$ 432,102.50
Waste	Disposal	$ 1,291,835.00
Final Survey		$ 90,000.00
Final Report		$ 40,000.00
Total Entire Project		$ 2,847,949.38

Total On Site Man Hours	10977.5 man hours
Total Off Site Man Hours	472.5 man hours

Total Waste Volume by Type

Waste Type	Volume ft3
Sources	390
2R/Special Form	22.5
Lead	64
Hot Debris	768
Glove Boxes	960
Building Debris	115020
Soil/concrete	71280

Total Waste Volume 188504.5 cubic feet

Webster Site
Sumation Page

Building	Area		Planning and Preparation	Decontamination and Dismantling
	Office Section		$ 960.00	$ 3,920.00
	Laboratory Section		$ 1,800.00	$ 9,155.00
	Radiography Room		$ 1,950.00	$ 1,700.00
	Machine Shop		$ 1,200.00	$ 26,910.00
	Old Cs and Am-Be Labs		$ 2,850.00	$ 31,180.00
	Leak Test Lab		$ 720.00	$ 11,720.00
	New Cs and Am-Be Labs		$ 2,800.00	$ 14,400.00
	Tracer Lab		$ 2,800.00	$ 14,400.00
	Storage Area		$ 2,800.00	$ 18,780.00
	Operational Support Areas		$ 1,400.00	$ 10,180.00
	Subsurface Removal		$ 2,600.00	$ 8,620.00
	Travel For Webster		$ -	$ 215,805.13
	Final Status Survey/Report		$ 20,000.00	$ 45,000.00
		Total Cleaning	$ 41,880.00	$ 421,770.13

			Total
Waste	Containers		$ 86,650.00
	Labor		$ 25,400.00
Shipping	Transportation		$ 70,790.00
	Labor		$ 31,115.00
Waste	Disposal	Initial	$ 813,695.00
Grounds	Surface Removal		$ 24,872.00
Total For Webster			$ 1,516,172.13

Tavenor Site
Sumation Page

Building	Area		Planning and Preparation	Decontamination and Dismantling
	New Waste Storage Building		$ 4,120.00	$ 9,390.00
	Brick Office Building		$ 4,160.00	$ 6,800.00
	Fabrication/Machine Shop		$ 1,950.00	$ 5,740.00
	Am-Be Lab		$ 1,200.00	$ 4,430.00
	Radiography Lab		$ 2,115.00	$ 4,510.00
	Subsurface Removal		$ 3,260.00	$ 14,860.00
	Travel For Webster		$ -	$ 226,032.75
	Final Status Survey/Report		$ 20,000.00	$ 45,000.00
		Total Cleaning	$ 36,805.00	$ 316,762.75

			Total
Waste	Containers		$ 167,600.00
	Labor		$ 46,900.00
Shipping	Transportation		$ 176,935.00
	Labor		$ 80,962.50
Waste	Disposal	Initial	$ 478,140.00
Grounds	Surface Removal		$ 27,672.00
Total For Tavenor			$ 1,331,777.25

LONG TERM STORAGE

Gulf Nuclear Inc.
Long Term Storage

There has been identified several glove boxes and hot cells that have a large amount of contamination on the internal surfaces. Additionally there are a significant number of sources that do not have adequate markings and identifications. The likely hood of material being identified that will have no disposal option is high.

There are two options for the materials identified as such: 1) Long term Storage at a Texas Licensed Facility, or 2) Long term storage at the Tavenor facility.

Option 1 Estimate:

a. Preparation Shipping:

Item	Number	Cost	
Truck	10	90000 (Type B Box Cask)	3k/day and 3 days each
Packaging	10	4000 Included in Area Sheets	
Labor	4	8000 (4 guys 10 days)	
Crane	2	20000 (10 k each time)	
Total	$	118,000.00	

This applies to either scenario.

b. Storage at Texas Licensed Facility

Gate Rate estimate: 10 $/day/drum

Drum Volume 7.5 ft3

	ft3	$/day/ft3	days/yr.	Total/Year
Webster	768	1.333333333	365	$ 373,760.00
Tavenor	192	1.333333333	365	$ 93,440.00
				$ 467,200.00

c. Storage at Tavenor Site

Cost Savings on Shipping estimated at $24,000.

		Total/Year
Quarterly Visit Surveillance	5000 qtr	$ 20,000.00
Alarm Monitor	25 mo.	$ 300.00
False alarms	500 qtr	$ 2,000.00
		$ 22,300.00

First Option Benefit: a and c.

All material removed from both Sites allowing a closure of the facilities.

First Option Detractor:

Cost of implementation.

Second Option Benefit

Cost of implementation

Second Option Detractor:

The time for disposal options to become available may be 2 years or longer.

The only possible future options will be WIPP or storage at Los Alamos, until WIPP.

WEBSTER BREAK DOWN

Webster Site
Office Section

The front office section is common residential construction with wood paneling inside and frame and brick construction on the outside. The building sits on a concrete pad foundation. The floor in this section is covered with asphalt tile and carpet. There are two air conditioning systems, one overhead system (top of the roof) and one closet type.

Planning and Preparation

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Certified Health Physicist	80	4	320
Foreman	55	4	220
Craftsman	50	1	50
Health Physics	50	2	100
Clerical	30	1	30
		Total	960

Planning and Preparation Total	960

Facility Description

	Receipt	Use	Storage
This room was used for:			

Area of:	Square Feet			
floor	1584	18	88	1584
walls	2816	8	176	2
ceilings	1584			

ventilation system	yes	yes/no
plumbing system	yes	yes/no

Components:			No.	Dimensions	Location
sinks and drains	yes	yes/no	2	normal	restrooms
sinks and drains	yes	yes/no	1	normal	break room
other:					
showers	yes	yes/no	2	normal	restrooms
toilets	yes	yes/no	2	normal	restrooms
a/c drain	yes	yes/no	1	normal	outside

Facility Characterization

Characterization has been completed prior to this report

Decontamination Efforts

Labor

	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	1	50
Health Physics	50	2	100
Laborer	40	2	80
Clerical	30	1	30
		Total	720

Equipment Required

	Required Number	Cost each	Total $
survey instruments	4	100	400
personal protective equipment	12	8	96
labels	7	1	7
ladders	1	150	150
scaffolding	1	100	100
		Total	753

Components to Decontaminate

Monitor for Compliance

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	1	60
Foreman	55	1	55
Technician	45	20	900
Health Physics	50	10	500
Clerical	30	1	30
		Total	1545

Components to Disassemble

<u>sinks and drains</u>

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	2	120
Foreman	55	2	110
Craftsman	50	3	150
Technician	45	2	90
Health Physics	50	1	50
Laborer	40	2	80
Clerical	30	1	30
		Total	630

<u>ventilation system</u>

Labor	Rate	Time	Total

WEBSTER

	$/hr	Hrs	$
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	10	500
Technician	45	5	225
Health Physics	50	3	150
Laborer	40	8	320
Clerical	30	3	90
		Total	1745

Decontamination Cost	$ 1,545.00
Dismantling Cost	$ 2,375.00
Total D&D Cost	$ 3,920.00

Webster Site
Laboratory Section

The Laboratory Section of the front building contains four labs and one storage area. These labs are 2 x 4 frame construction with sheet rock walls. The floors are covered with poured in place urethane material.

Planning and Preparation

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Certified Health Physicist	80	8	640
Foreman	55	8	440
Craftsman	50	1	50
Health Physics	50	2	100
Clerical	30	3	90
		Total	1800

Planning and Preparation Total	1800

Facility Description

	Receipt	Use	Storage
This room was used for:	x	x	x

Area of:	Square Feet			
floor	720	18	40	720
walls	1280	8	80	2
ceilings	720			

ventilation system	yes	yes/no
plumbing system	yes	yes/no

Components:			No.	Dimensions	Location
glove boxes	yes	yes/no			
hot cells	yes	yes/no			
lab benches	yes	yes/no			

Facility Characterization

Characterization has been completed prior to this report.

Decontamination Efforts

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	2	100
Technician	45	16	720

Health Physics	50	8	400
Laborer	40	8	320
Clerical	30	3	90
		Total	2090

Equipment Required	Required Number	Cost each	Total $
survey instruments	4	100	400
personal protective equipment	16	8	128
labels	12	1	12
ladders	1	150	150
scaffolding	1	100	100
		Total	790

Components to Decontaminate

Monitor for Compliance

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	1	60
Foreman	55	1	55
Craftsman	50	0	0
Technician	45	20	900
Health Physics	50	10	500
Laborer	40	0	0
Clerical	30	1	30
		Total	1545

Components to Disassemble

ventilation system

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	2	120
Foreman	55	2	110
Craftsman	50	3	150
Technician	45	2	90
Health Physics	50	1	50
Laborer	40	2	80
Clerical	30	1	30
		Total	630

plumbing system

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	10	500

Technician	45	5	225
Health Physics	50	3	150
Laborer	40	8	320
Clerical	30	3	90
		Total	1745

glove boxes

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	10	500
Technician	45	5	225
Health Physics	50	3	150
Laborer	40	8	320
Clerical	30	3	90
		Total	1745

hot cells

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	10	500
Technician	45	5	225
Health Physics	50	3	150
Laborer	40	8	320
Clerical	30	3	90
		Total	1745

lab benches

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	10	500
Technician	45	5	225
Health Physics	50	3	150
Laborer	40	8	320
Clerical	30	3	90
		Total	1745

Decontamination Cost	$ 1,545.00
Dismantling Cost	$ 7,610.00
Total D&D Cost	$ 9,155.00

Webster Site
Radiography Room

The Radiography room contains a lead shot hot cell. The double walls are 6" apart and the mild steel in 1/8" thick.

Planning and Preparation

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Certified Health Physicist	80	8	640
Foreman	55	8	440
Craftsman	50	2	100
Health Physics	50	4	200
Clerical	30	3	90
		Total	1950

Planning and Preparation Total 1950

Facility Description

	Receipt	Use	Storage
This room was used for:	x	x	x

Area of:	Square Feet			
floor	400	20	20	400
walls	640	8	40	2
ceilings	400			

ventilation system yes yes/no

Components:			No.	Dimensions	Location
glove boxes	yes	yes/no			
lab benches	yes	yes/no			

Facility Characterization

Characterization has been completed prior to this report.

Decontamination Efforts

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	2	100
Technician	45	16	720
Health Physics	50	8	400

Laborer	40	8	320
Clerical	30	3	90
		Total	2090

Equipment Required	Required Number	Cost each	Total $
survey instruments	4	100	400
personal protective equipment	16	8	128
labels	12	1	12
ladders	1	150	150
scaffolding	1	100	100
		Total	790

Components to Decontaminate

Floors and Walls

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	4	200
Technician	45	32	1440
Health Physics	50	16	800
Laborer	40	32	1280
Clerical	30	8	240
		Total	4880

Monitor for Compliance

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Technician	45	20	900
Health Physics	50	10	500
Clerical	30	4	120
		Total	1980

Components to Disassemble

ventilation system

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	2	120
Foreman	55	2	110
Craftsman	50	1	50
Technician	45	8	360
Health Physics	50	4	200
Laborer	40	8	320
Clerical	30	2	60

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Total	1220

glove boxes

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	4	200
Technician	45	8	360
Health Physics	50	4	200
Laborer	40	8	320
Clerical	30	4	120
		Total	1660

lab benches

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	10	500
Technician	45	8	360
Health Physics	50	4	200
Laborer	40	8	320
Clerical	30	4	120
		Total	1960

Decontamination Cost	$ 6,860.00
Dismantling Cost	$ 4,840.00
Total D&D Cost	$ 11,700.00

Webster Site
Machine Shop

The Building Two area is the mechanical shop and at one time contained lathes and metal working machines. This area has a concrete floor that has been painted. The walls and ceiling are sheet rock. All of the partitions are 2 x 4 framing with sheet rock covering.

Planning and Preparation

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Certified Health Physicist	80	4	320
Foreman	55	4	220
Craftsman	50	2	100
Health Physics	50	4	200
Clerical	30	4	120
		Total	1200

Planning and Preparation Total 1200

Facility Description

	Receipt	Use	Storage
This room was used for:	x	x	x

Area of:	Square Feet			
floor	1320	44	30	1320
walls	2368	8	143	2
ceilings	1320			

ventilation system	yes	yes/no
plumbing system	yes	yes/no

Components:			No.	Dimensions	Location
lab benches	yes	yes/no			

Facility Characterization

Characterization has been completed prior to this report.

Decontamination Efforts

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220

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Craftsman	50	2	100
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	8	320
Clerical	30	3	90
		Total	2090

Equipment Required	Required Number	Cost each	Total $
survey instruments	4	100	400
personal protective equipment	16	8	128
labels	12	1	12
ladders	1	150	150
scaffolding	1	100	100
		Total	790

Components to Decontaminate

Floors and Walls

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	16	960
Foreman	55	16	880
Craftsman	50	10	500
Technician	45	80	3600
Health Physics	50	40	2000
Laborer	40	80	3200
Clerical	30	16	480
		Total	11620

Monitor for Compliance

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	0	0
Technician	45	40	1800
Health Physics	50	20	1000
Laborer	40	0	0
Clerical	30	8	240
		Total	3960

Components to Disassemble

ventilation system

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	2	120
Foreman	55	2	110

Craftsman	50	1	50
Technician	45	8	360
Health Physics	50	4	200
Laborer	40	8	320
Clerical	30	2	60
		Total	1220

<u>plumbing system</u>

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	8	400
Technician	45	20	900
Health Physics	50	10	500
Laborer	40	20	800
Clerical	30	8	240
		Total	3760

<u>lab benches</u>

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	10	600
Foreman	55	10	550
Craftsman	50	10	500
Technician	45	40	1800
Health Physics	50	20	1000
Laborer	40	40	1600
Clerical	30	10	300
		Total	6350

Decontamination Cost	$ 15,580.00
Dismantling Cost	$ 11,330.00
Total D&D Cost	$ 26,910.00

Webster Site
Old Cs and Am-Be Labs

The (Old) Cs-137 room contains two hot cells that have not been used for several years. One hot cell is 2' x 2' x 2' and the other is 4' x 4' x 4'. The cells are constructed of mild steel. The (Old) Am-Be Lab contains two Am-241 glove boxes. This room was not used for several years. The glove boxes are 2' x 3' x 4'. They are unshielded and constructed of mild steel.

Planning and Preparation

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	10	600
Certified Health Physicist	80	10	800
Foreman	55	10	550
Craftsman	50	2	100
Health Physics	50	10	500
Clerical	30	10	300
		Total	2850

Planning and Preparation Total	2850

Facility Description

	Receipt	Use	Storage
This room was used for:		x	

Area of:	Square Feet			
floor	800	20	40	800
walls	1920	8	120	2
ceilings	800			

ventilation system	yes	yes/no

Components:			No	Cimensions	Location
glove boxes	yes	yes/no	2	2x3x4	
hot cells	yes	yes/no	2	2x2x2 and 4x4x4	
lab benches	yes	yes/no			

Facility Characterization

Characterization has been completed prior to this report.

Decontamination Efforts

Labor	Rate $/hr	Time Hrs	Total $

Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	2	100
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	8	320
Clerical	30	3	90
		Total	2090

Equipment Required	Required Number	Cost each	Total $
survey instruments	4	100	400
personal protective equipment	32	8	256
labels	20	1	20
		Total	676

Components to Decontaminate

Floors and Walls

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	16	960
Foreman	55	16	880
Craftsman	50	10	500
Technician	45	80	3600
Health Physics	50	40	2000
Laborer	40	80	3200
Clerical	30	16	480
		Total	11620

Monitor for Compliance

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Technician	45	40	1800
Health Physics	50	20	1000
Clerical	30	8	240
		Total	3960

Components to Disassemble

ventilation system

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	2	100
Technician	45	16	720

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Health Physics	50	8	400
Laborer	40	16	640
Clerical	30	4	120
		Total	2440

glove boxes

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	4	200
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	16	640
Clerical	30	8	240
		Total	3120

hot cells

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	16	960
Foreman	55	16	880
Craftsman	50	8	400
Technician	45	32	1440
Health Physics	50	16	800
Laborer	40	32	1280
Clerical	30	16	480
		Total	6240

lab benches

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	10	500
Technician	45	20	900
Health Physics	50	10	500
Laborer	40	20	800
Clerical	30	6	180
		Total	3800

Decontamination Cost	$ 15,580.00
Dismantling Cost	$ 15,600.00
Total D&D Cost	$ 31,180.00

Webster Site
Leak Test Lab

The Leak Test Lab contains a wooden hood and two glove boxes. These units are small and were used for Tritium and I-125 operations. The cabinets are wooden and can be easily removed if necessary

Planning and Preparation

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	2	120
Certified Health Physicist	80	2	160
Foreman	55	2	110
Craftsman	50	2	100
Health Physics	50	4	200
Clerical	30	1	30
		Total	720

Planning and Preparation Total	720

Facility Description

	Receipt	Use	Storage
This room was used for:		x	

Area of:	Square Feet			
floor	144	12	12	144
walls	768	8	48	2
ceilings	144			

ventilation system: yes (yes/no)

Components:			No.	Dimensions	Location
glove boxes	yes	yes/no	2	small	
other:					
wooden shelf's	yes				

Facility Characterization

Characterization has been completed prior to this report

Decontamination Efforts

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240

Foreman	55	4	220
Craftsman	50	2	100
Technician	45	8	360
Health Physics	50	4	200
Laborer	40	8	320
Clerical	30	2	60
		Total	1500

Equipment Required	Required Number	Cost each	Total $
survey instruments	4	100	400
personal protective equipment	8	8	64
labels	4	1	4
		Total	468

Components to Decontaminate

Floors and Walls

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	2	100
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	16	640
Clerical	30	4	120
		Total	2900

Monitor for Compliance

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Technician	45	16	720
Health Physics	50	8	400
Clerical	30	4	120
		Total	1700

Components to Disassemble

ventilation system

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	2	100
Technician	45	16	720
Health Physics	50	8	400

Laborer	40	16	640
Clerical	30	4	120
		Total	2440

glove boxes

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	2	100
Technician	45	8	360
Health Physics	50	4	200
Laborer	40	8	320
Clerical	30	4	120
		Total	1560

wooden shelf's

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	4	200
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	16	640
Clerical	30	8	240
		Total	3120

Decontamination Cost	$ 4,600.00
Dismantling Cost	$ 7,120.00

Total D&D Cost	$ 11,720.00

Webster Site
New Cs and Am-Be Lab

The Cesium area is a lab that contains Cs-137 hot cells. The floor is covered with tile and the walls are covered with sheet rock. The walls are stacked 8" x 8" x 16" solid concrete blocks. Care must be taken to keep these blocks from being contaminated. The Am-Be Lab is a double contained Am-241 hot lab. The walls are concrete blocks covered with sheet rock. The floor is concrete covered with tile. Caution must be exercised to keep the blocks free of contamination.

Planning and Preparation

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Certified Health Physicist	80	8	640
Foreman	55	8	440
Craftsman	50	4	200
Health Physics	50	16	800
Clerical	30	8	240
		Total	2800

Planning and Preparation Total: 2800

Facility Description

	Receipt	Use	Storage
This room was used for:	x	x	x

Area of:	Square Feet			
floor	400	20	20	400
walls	1280	8	80	2
ceilings	400			

ventilation system: yes (yes/no)

Components:			No.	Dimensions	Location
hot cells	yes	yes/no			
lab benches	yes	yes/no			
other:					
concrete blocks	yes				

Facility Characterization

Characterization has been completed prior to this report.

Decontamination Efforts

Labor	Rate	Time	Total

	$/hr	Hrs	$
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	2	100
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	16	640
Clerical	30	8	240
		Total	3020

Equipment Required	Required Number	Cost each	Total $
survey instruments	4	100	400
personal protective equipment	8	8	64
labels	4	1	4
		Total	468

Components to Decontaminate

<u>Floors and Walls</u>

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	2	100
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	16	640
Clerical	30	4	120
		Total	2900

Monitor for Compliance

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Technician	45	16	720
Health Physics	50	8	400
Clerical	30	4	120
		Total	1700

Components to Disassemble

<u>ventilation system</u>

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	2	100

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Technician	45	16	720
Health Physics	50	8	400
Laborer	40	16	640
Clerical	30	4	120
		Total	2440

<u>glove boxes</u>

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	2	100
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	16	640
Clerical	30	4	120
		Total	2440

<u>concrete blocks</u>

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	16	800
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	40	1600
Clerical	30	16	480
		Total	4920

Decontamination Cost	$ 4,600.00
Dismantling Cost	$ 9,800.00
Total D&D Cost	$ 14,400.00

Webster Site
Tracer Lab

The Tracer Lab contains an area which was used for packaging and shipping of radioactive material. This building is a metal building with exposed surfaces. The inside surfaces are coated with blown on insulation. There is an inside area that contains hoods and glove boxes that were used for tracer materials. The devices are constructed of wood. This Tracer Lab contains two hot cells. One cell was used for work with Gd-153 and Sc-46. This cell is a double walled cell filled with lead shot. The second cell is constructed of concrete blocks covered with hard board. This cell contained Ir-192.

Planning and Preparation

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Certified Health Physicist	80	8	640
Foreman	55	8	440
Craftsman	50	4	200
Health Physics	50	16	800
Clerical	30	8	240
		Total	2800

Planning and Preparation Total: 2800

Facility Description

	Receipt	Use	Storage
This room was used for:	x	x	x

Area of:	Square Feet			
floor	400	20	20	400
walls	1280	8	80	2
ceilings	400			

ventilation system: yes (yes/no)

Components:			No.	Dimensions	Location
hot cells	yes	yes/no			
other:					
concrete blocks	yes				

Facility Characterization

Characterization has been completed prior to this report.

Decontamination Efforts

WEBSTER

Labor

	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	2	100
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	16	640
Clerical	30	8	240
		Total	3020

Equipment Required

	Required Number	Cost each	Total $
survey instruments	4	100	400
personal protective equipment	8	8	64
labels	4	1	4
		Total	468

Components to Decontaminate

Floors and Walls

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	2	100
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	16	640
Clerical	30	4	120
		Total	2900

Monitor for Compliance

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Technician	45	16	720
Health Physics	50	8	400
Clerical	30	4	120
		Total	1700

Components to Disassemble

ventilation system

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220

Craftsman	50	2	˙00
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	16	640
Clerical	30	4	120
		Total	2440

glove boxes

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	2	100
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	16	640
Clerical	30	4	120
		Total	2440

concrete blocks

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	16	800
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	40	1600
Clerical	30	16	480
		Total	4920

Decontamination Cost	$ 4,600.00
Dismantling Cost	$ 9,800.00
Total D&D Cost	$ 14,400.00

Webster Site
Storage Area

The back building was used for storage. The building is metal with a concrete floor. There is a radioactive waste bunker that is constructed of concrete blocks. There is an enclosed area behind the Gd-153 cell to prevent the spread of contamination from the hot cell. There is a down hole high pressure unit in the floor. This unit is approximately 6' deep. The open area inside the security fence is covered with asphalt which is approximately 2" thick.

Planning and Preparation

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Certified Health Physicist	80	8	640
Foreman	55	8	440
Craftsman	50	4	200
Health Physics	50	16	800
Clerical	30	8	240
		Total	2800

Planning and Preparation Total 2800

Facility Description

	Receipt	Use	Storage
This room was used for:	x	x	x

Area of:	Square Feet			
floor	1400	20	70	1400
walls	2880	8	180	2
ceilings	1400			

ventilation system: yes (yes/no)

Components:		No	Dimensions	Location
other:				
concrete blocks	yes			
empty packaging	yes			

Facility Characterization

Characterization has been completed prior to this report.

Decontamination Efforts

Labor	Rate	Time	Total

	$/hr	Hrs	$
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	2	100
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	16	640
Clerical	30	8	240
		Total	3020

Equipment Required	Required Number	Cost each	Total $
survey instruments	4	100	400
personal protective equipment	8	8	64
labels	4	1	4
		Total	468

Components to Decontaminate

Floors and Walls

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	2	100
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	32	1280
Clerical	30	4	120
		Total	3540

Monitor for Compliance

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	8	400
Technician	45	32	1440
Health Physics	50	16	800
Clerical	30	8	240
		Total	3800

Components to Disassemble

ventilation system

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220

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Craftsman	50	2	100
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	24	960
Clerical	30	4	120
		Total	2760

empty packaging

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	4	200
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	32	1280
Clerical	30	8	240
		Total	3760

concrete blocks

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	16	800
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	40	1600
Clerical	30	16	480
		Total	4920

Decontamination Cost	$ 7,340.00
Dismantling Cost	$ 11,440.00
Total D&D Cost	$ 18,780.00

Webster Site
Operational Support Area

The room labeled "Pipeliner" was used for shipping and contains only wooden cabinets. The room that is not labeled was used as a lunchroom and as a storage room. This room does not contain any radioactive equipment.

Planning and Preparation

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Certified Health Physicist	80	4	320
Foreman	55	4	220
Craftsman	50	2	100
Health Physics	50	8	400
Clerical	30	4	120
		Total	1400

Planning and Preparation Total 1400

Facility Description

	Receipt	Use	Storage
This room was used for:	x		x

Area of:	Square Feet			
floor	800	20	40	800
walls	1920	8	120	2
ceilings	800			

ventilation system: yes (yes/no)

Components:		No	Dimensions	Location
other:				
wooden cabinets	yes			

Facility Characterization

Characterization has been completed prior to this report

Decontamination Efforts

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	2	100

Technician	45	8	360
Health Physics	50	4	200
Laborer	40	4	160
Clerical	30	4	120
		Total	1400

Equipment Required	Required Number	Cost each	Total $
survey instruments	4	100	400
personal protective equipment	8	8	64
labels	4	1	4
		Total	468

Components to Decontaminate

Floors and Walls

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	2	100
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	32	1280
Clerical	30	4	120
		Total	3540

Monitor for Compliance

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	4	200
Technician	45	16	720
Health Physics	50	8	400
Clerical	30	4	120
		Total	1900

Components to Disassemble

ventilation system

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	2	100
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	24	960

Clerical	30	4	120
		Total	2760

<u>wooden cabinets</u>

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	4	200
Technician	45	8	360
Health Physics	50	4	200
Laborer	40	16	640
Clerical	30	4	120
		Total	1980

Decontamination Cost	$ 5,440.00
Dismantling Cost	$ 4,740.00
Total D&D Cost	$ 10,180.00

Webster Site
Subsurface Removal

The entire Septic System to the fence line requires removal. The source holders require removal.

Planning and Preparation

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Certified Health Physicist	80	8	640
Foreman	55	8	440
Craftsman	50	8	400
Health Physics	50	8	400
Clerical	30	8	240
		Total	2600

Planning and Preparation Total 2600

Facility Description

	Receipt	Use	Storage
This room was used for:		x	x

Area of: Square Feet

linear feet of piping 200 feet

plumbing system(including source holders) yes yes/no

Facility Characterization

Characterization has been completed prior to this report.

Decontamination Efforts

Equipment Required	Required Number	Cost each	Total $
survey instruments	4	100	400
personal protective equipment	4	8	32
sampling tools	109	25	2725
sample containers	109	3	327
backhoe	1	1200	1200
		Total	4684

Services Required	Required Number	Cost each	Total $
Analytical Analysis			
Soil	109	410	44690
		Total	44690

Components to Decontaminate

Monitor for Compliance

Labor

	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	4	200
Technician	45	16	720
Health Physics	50	8	400
Clerical	30	4	120
		Total	1900

Components to Disassemble

plumbing system(including source holders)

Labor

	Rate $/hr	Time Hrs	Total $
Supervisor	60	16	960
Foreman	55	16	880
Craftsman	50	16	800
Technician	45	32	1440
Health Physics	50	16	800
Laborer	40	40	1600
Clerical	30	8	240
		Total	6720

Decontamination Cost	$ 1,900.00
Dismantling Cost	$ 6,720.00
Total D&D Cost	$ 8,620.00

W.   TER

Webster Travel

Note
1 Planning to occur 1/2 off site and 1/2 on site
2 All D&D on Site
3 Rental Vehicle for Supervisor and Foreman
4 Rental Truck/Van for workers
5 All CHP Time offsite
6 Per diem rate 115 per day
7 Plane Tickets 650 round trip

	Office Section Off Site	Office Section On Site	Laboratory Section Off Site	Laboratory Section On Site	Radiography Room Off Site	Radiography Room On Site	Machine Shop Off Site	Machine Shop On Site
Supervisor	2	13	4	27	4	30	2	50
Certified Health Physicist	4	0	8	0	8	0	4	0
Foreman	2	13	4	27	4	30	2	50
Craftsman	0 5	14 5	0 5	45 5	1	22	1	32
Technician	0	27	0	58	0	92	0	204
Health Physics	1	17	1	32	2	48	2	104
Laborer	0	12	0	42	0	64	0	156
Clerical	0 5	6 5	1 5	18 5	1 5	26 5	2	49

	Total Labor Hours Off Site	Total Labor Hours On Site	Weeks on Site	Number of personnel	Per Diem	Number Personnel	Total Per Diem
1 Supervisor	40	553	13 825	1	115	1	11129 125
1 Certified Health Physicist	80	0	0	0 0	0	1	0
1 Foreman	40	553	13 825	1 0	115	1	11129 125
1 Craftsman	20	444	11 1	0 8	0	1	0
3 Technician	0	1565	39 125	2 8	115	3	94486 875
1 5 Health Physics	49	840	21	1 5	115	2	33810
3 Laborer	0	1446	36.15	2 6	0	3	0
1 Clerical	33	524	13 1	0 9	0	1	0
	262	5925					$ 150,555 13

	No Personnel	No Trips	Cost	Total
Plane Tickets	7	3	650	13650

Rental Vehicles	Number	Months	Cost	Total
Car	2	3	1000	6000
Truck	1	3	1200	3600
Backhoe	3	2	3000	18000
Bob Cat	3	2	3000	18000
Dowser	1	2	3000	6000
			Total	51600

Total Travel and Vehicle Rental $ 215,805 13

W TER

Old Cs and Am-Be Labs		Leak Test Lab		New Cs and Am-Be Labs		Tracer Lab		Storage Area		Operational Support Areas		Subsurfac
Off Site	On Site	Off Site	On Site	Off Site	On Site	Off Site	On Site	Off Site	On Site	Off Site	On Site	Off Site
5	69	1	33	4	40	4	40	4	48	2	26	4
10	0	2	0	8	0	8	0	8	0	4	0	8
5	69	1	33	4	40	4	40	4	48	2	26	4
1	37	1	13	2	26	2	26	2	36	1	15	4
0	220	0	80	0	96	0	96	0	112	0	64	0
5	115	2	42	8	56	8	56	8	64	4	36	4
0	172	0	64	0	104	0	104	0	144	0	76	0
5	66	0 5	26 5	4	44	4	44	4	52	2	22	4

W TER

Removal	Waste		Grounds	
On Site	Off Site	On Site	Off Site	On Site
24	0	89	4	64
0	0	0	8	0
24	0	89	4	64
24	0	89	4	64
48	0	356	0	112
28	0	178	4	64
40	0	356	0	112
16	0	89	4	64

Webster
Waste

Container Costs

Waste Type	Volume ft3	Containers No	Containers Type	Price each	Total Cost		
Sources	375	50	7A Drums	50	2500		
2R/Special Form	7.5	20	Special Form	800	16000		
Lead	54	1	B-12 Boxes	400	400		
Hot Debris	384	4	7A Boxes	500	2000		
Glove Boxes	768	8	7A Boxes	500	4000	drop off	
Building Debris	34020	63	Rolloffs	650	40950		500
Soil/concrete	17280	32	Rolloffs	650	20800		
			Total Containers		86650		

Labor Cost

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	40	2400
Foreman	55	40	2200
Craftsman	50	40	2000
Technician	45	160	7200
Health Physics	50	80	4000
Laborer	40	160	6400
Clerical	30	40	1200
		Total	25400

Transportation Costs

	Disposal Facility		Tx Disposal
	Distance to Facility		200
$/mile/truck	Unit Cost		1.85
	Additional Costs	weight	0
		surcharge	0
	50/hr for 4 hr	demurge	200

Truck	Type	Number	Cost	Total
	Rolloffs	91	570	51870

	Disposal Facility		Utah Disposal
	Distance to Facility		800
$/mile/truck	Unit Cost		1.85
	Additional Costs	weight	0
		surcharge	0
	50/hr for 16 hr	demurge	800

Truck	Type	Number	Cost	Total

WEBSTER

	Rolloffs		4	2280	9120
	Flatbed		1	2280	2280
			Total		11400
	Disposal Facility			TN Processor	
	Distance to Facility			1600	
$/mile/truck	Unit Cost			1.85	
	Additional Costs	weight		0	
		surcharge		0	
	50/hr for 8 hr	demurge		800	
Truck	Type	Number	Cost		Total
	Van	2		3760	7520
		Total Transportation			70790

Labor Cost

Labor	Rate $/hr	Time Hrs	Total $	Total trucks	Truck Factor
Supervisor	60	49	2940	98	2
Foreman	55	49	2695		
Craftsman	50	49	2450		
Technician	45	196	8820		
Health Physics	50	98	4900		
Laborer	40	196	7840		
Clerical	30	49	1470		
		Total	31115		

Disposal

	ft3	cost	Total	
Tx Disposal	49140	6	294840	
Pa Processing Facilty	9000	6	54000	Cost on per pound Trans. In Tavenor
Utah Disposal	2160	103	222480	
TN Processor	562 5	278	156375	140000 mci sur charge
			813695	

Webster Site
Grounds

This includes removal of building and pavement.

Planning and Preparation

Labor

	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Certified Health Physicist	80	8	640
Foreman	55	8	440
Craftsman	50	8	400
Health Physics	50	8	400
Clerical	30	8	240
		Total	2600

Planning and Preparation Total 2600

Facility Description

	Receipt	Use	Storage
This room was used for:	x	x	x

Area of:	Square Feet			
grounds	19550	ft2	230	85

Facility Characterization

Characterization has been completed prior to this report.

Decontamination Efforts

Equipment Required

	Required Number	Cost each	Total $
survey instruments	4	100	400
personal protective equipment	4	8	32
backhoe	1	1200	1200
		Total	1632

Components to Decontaminate

Monitor for Compliance

Labor

Apply Fixative for Raising Building

	Rate $/hr	Time Hrs	Total $
Supervisor	60	16	960
Foreman	55	16	880
Craftsman	50	16	800
Technician	45	32	1440

WEBSTER

Health Physics	50	16	800
Laborer	40	32	1230
Clerical	30	16	430
		Total	6640

Components to Disassemble

Building and pavement

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	40	2400
Foreman	55	40	2200
Craftsman	50	40	2000
Technician	45	80	3600
Health Physics	50	40	2000
Laborer	40	80	3200
Clerical	30	40	1200
		Total	16600

Decontamination Cost	$ 6,640.00
Dismantling Cost	$ 16,600.00
Total D&D Cost	$ 23,240.00

TAVENOR BREAKDOWN

Tavenor Site
New Waste Storage Building

The new waste storage building is constructed from sheet metal with a concrete slab floor. The building is elevated ~ 2-feet above grade. The ceiling is 20-feet high with a double-pitch. The interior space is ~2,800 square feet. There are 52 B-25 boxes of waste currently stored inside. These boxes are single stacked and comprise approximately 80% of the available floor space. Fifty B-25 boxes contain soil and gravel from remediation of Tavenor's radioactive contaminated leach fields. Two boxes contain Am-Be hot cells. These boxes are easily identified as they are 1.5-feet taller than the rest of the boxes. They were staged in the middle of the storage building with the soil boxes placed around them for shielding. There are two equipment roll-up doors and one personnel door. The building does not have a ventilation system. This building does have electrical and is equipped with an alarm system.

Planning and Preparation

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	16	960
Certified Health Physicist	80	16	1280
Foreman	55	8	440
Craftsman	50	8	400
Health Physics	50	16	800
Clerical	30	8	240
		Total	4120

Planning and Preparation Total	4120

Facility Description

	Receipt	Use	Storage
This room was used for:	x	x	x

Area of:	Square Feet
floor	2800
walls	9800
ceilings	2800

Components:			No.	Dimensions	Location
other:					
machinery	yes	yes/no	2	normal	restrooms

Facility Characterization

Characterization has been completed prior to this report

Decontamination Efforts

Labor	Rate	Time	Total
Floors/Walls	$/hr	Hrs	$
Supervisor	60	16	960

Foreman	55	16	880
Craftsman	50	4	200
Technician	45	32	1440
Health Physics	50	16	800
Laborer	40	64	2560
Clerical	30	16	480
		Total	7320

Equipment Required	Required Number	Cost each	Total $	
survey instruments	4	100	400	
personal protective equipment	64	8	512	
needle guns	2	50	100	Rental
labels	10	1	10	
ladders	1	150	150	
scaffolding	1	100	100	
		Total	1272	

Components to Decontaminate

Monitor for Compliance

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Technician	45	64	2880
Health Physics	50	32	1600
Clerical	30	16	480
		Total	5880

Components to Disassemble

machinery

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	3	150
Technician	45	20	900
Health Physics	50	10	500
Laborer	40	20	800
Clerical	30	8	240
		Total	3510

Decontamination Cost	$ 5,880.00
Dismantling Cost	$ 3,510.00
Total D&D Cost	$ 9,390.00

Tavenor Site
Brick Office Building

The one story brick office building comprises ~4,500 square feet of floor space. This building has been partially remediated. This building is in a deteriorated condition and is unsafe for personnel entry. Many of the interior structural supports and roof beams have collapsed. Sections of the roof have collapsed. The floor in some areas has been removed. Carpet from this building was removed during remediation and placed outside for storage. The carpet is radiologically contaminated. Readings were collected with a G-M Detector that ranged between 20,000 counts per minute (cpm) to 50,000 cpm.

Planning and Preparation

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	16	960
Certified Health Physicist	80	8	640
Foreman	55	16	880
Craftsman	50	16	800
Health Physics	50	8	400
Clerical	30	16	480
		Total	4160

Planning and Preparation Total: 4160

Facility Description

	Receipt	Use	Storage
This room was used for:	x	x	x

Area of:	Square Feet
floor	4500
walls	15750
ceilings	4500

ventilation system	yes	yes/no
plumbing system	yes	yes/no

Components:			No.	Dimensions	Location
shields	yes	yes/no			

Facility Characterization

Characterization has been completed prior to this report

Decontamination Efforts

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	16	960
Foreman	55	16	880

Craftsman	50	32	1600
Technician	45	32	1440
Health Physics	50	16	800
Laborer	40	48	1920
Clerical	30	8	240
		Total	7840

Equipment Required

	Required Number	Cost each	Total $
survey instruments	4	100	400
personal protective equipment	32	8	256
labels	12	1	12
lighting	4	200	800
ladders	5	150	750
scaffolding	3	100	300
		Total	2518

Components to Decontaminate

Monitor for Compliance

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Technician	45	20	900
Health Physics	50	10	500
Clerical	30	8	240
		Total	2560

Components to Disassemble

<u>ventilation system</u>

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	2	120
Foreman	55	2	110
Craftsman	50	3	150
Technician	45	8	360
Health Physics	50	4	200
Laborer	40	6	240
Clerical	30	1	30
		Total	1210

<u>plumbing system</u>

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220

TAVENOR

Craftsman	50	5	250
Technician	45	5	225
Health Physics	50	3	150
Laborer	40	16	640
Clerical	30	4	120
		Total	1845

<u>shields</u>

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	2	100
Technician	45	5	225
Health Physics	50	3	150
Laborer	40	4	160
Clerical	30	3	90
		Total	1185

Decontamination Cost	$ 2,560.00
Dismantling Cost	$ 4,240.00
Total D&D Cost	$ 6,800.00

Tavenor Site
Fabrication/Machine Shop

The fabrication/machine shop is a 785 square foot metal building with a small storage loft. The floor area is littered with old fabrication equipment and an assortment of discarded junk. Several items, such as drill bits, had elevated readings of radioactivity up to ten times background.

Planning and Preparation

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Certified Health Physicist	80	8	640
Foreman	55	8	440
Craftsman	50	2	100
Health Physics	50	4	200
Clerical	30	3	90
		Total	1950

Planning and Preparation Total	1950

Facility Description

	Receipt	Use	Storage
This room was used for:	x	x	x

Area of:	Square Feet
floor	785
walls	2747.5
ceilings	785

Components:			No.	Dimensions	Location
tools/debris	yes	yes/no			

Facility Characterization

Characterization has been completed prior to this report

Decontamination Efforts

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	2	120
Foreman	55	2	110
Craftsman	50	1	50
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	32	1280
Clerical	30	2	60
		Total	2740

TAVENOR

Equipment Required

	Required Number	Cost each	Total $
survey instruments	4	100	400
personal protective equipment	8	8	64
labels	4	1	4
		Total	468

Components to Decontaminate

Floors and Walls

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	4	200
Technician	45	16	720
Health Physics	50	8	400
Laborer	40	16	640
Clerical	30	4	120
		Total	2540

Monitor for Compliance

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Technician	45	20	900
Health Physics	50	10	500
Clerical	30	4	120
		Total	1980

Components to Disassemble

tools/debris

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	2	120
Foreman	55	2	110
Craftsman	50	1	50
Technician	45	8	360
Health Physics	50	4	200
Laborer	40	8	320
Clerical	30	2	60
		Total	1220

Decontamination Cost	$ 4,520.00
Dismantling Cost	$ 1,220.00
Total D&D Cost	$ 5,740.00

Tavenor Site
Am-Be Lab

The Am-Be Lab has been 90% demolished. One sheet metal wall, several steel wall support beams and approximately 20% of the sheet metal roof still exist. The concrete floor has undergone scabbling to remove contamination. The scabbling was performed by GNI personnel. The building sits on concrete slab footprint of 795 square feet. GNI believes that Cs-137 sources may have been historically manufactured in this building as well.

Planning and Preparation

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Certified Health Physicist	80	4	320
Foreman	55	4	220
Craftsman	50	2	100
Health Physics	50	4	200
Clerical	30	4	120
		Total	1200

Planning and Preparation Total	1200

Facility Description

	Receipt	Use	Storage
This room was used for:	x	x	x

Area of:	Square Feet			
floor	795	44	30	1320
walls	200	8	148	2
ceilings	10			

Components:			No.	Dimensions	Location
walls/ceiling	yes	yes/no			

Facility Characterization

Characterization has been completed prior to this report.

Decontamination Efforts

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	1	50
Technician	45	8	360
Health Physics	50	4	200
Laborer	40	16	640

	Rate	Time	Total
Clerical	30	4	120
		Total	1830

Equipment Required

	Required Number	Cost each	Total $
survey instruments	4	100	400
personal protective equipment	16	8	128
labels	12	1	12
		Total	540

Components to Decontaminate

Monitor for Compliance

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Technician	45	16	720
Health Physics	50	8	400
Clerical	30	4	120
		Total	1700

Components to Disassemble

walls/ceiling

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	1	50
Technician	45	8	360
Health Physics	50	4	200
Laborer	40	24	960
Clerical	30	8	240
		Total	2730

Decontamination Cost	$ 1,700.00
Dismantling Cost	$ 2,730.00
Total D&D Cost	$ 4,430.00

Tavenor Site
Radiography Lab

The radiography lab is a concrete building with 624 square feet of floor space. It has two rooms of about equal size. Each room has had partial remediation performed in the interior areas, i.e., concrete floor scabbling, sub-floor soil removal, and equipment removal. This building still has extensive radioactive contamination. Readings of 1mR/hr were found on the floor and walls.

Planning and Preparation

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	5	300
Certified Health Physicist	80	8	640
Foreman	55	5	275
Craftsman	50	1	50
Health Physics	50	14	700
Clerical	30	5	150
		Total	2115

Planning and Preparation Total	2115

Facility Description

	Receipt	Use	Storage
This room was used for:	x	x	x

Area of:	Square Feet
floor	624
walls	2184
ceilings	624

Facility Characterization

Characterization has been completed prior to this report.

Decontamination Efforts

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	2	100
Technician	45	32	1440
Health Physics	50	16	800
Laborer	40	40	1600
Clerical	30	8	240
		Total	5100

TAVENOR

Equipment Required	Required Number	Cost each	Total $
survey instruments	4	100	400
personal protective equipment	32	8	256
needle guns	2	50	100
air compressor	1	250	250
labels	20	1	20
		Total	1026

Components to Decontaminate

Floors and Walls

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	5	300
Foreman	55	5	275
Craftsman	50	2	100
Technician	45	8	360
Health Physics	50	8	400
Laborer	40	20	800
Clerical	30	5	150
		Total	2385

Monitor for Compliance

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	5	300
Foreman	55	5	275
Technician	45	20	900
Health Physics	50	10	500
Clerical	30	5	150
		Total	2125

Components to Disassemble

Decontamination Cost	$ 4,510.00
Dismantling Cost	$ -

Total D&D Cost	$ 4,510.00

Tavenor Site
Subsurface Removal

The Entire property surface requires removal of brush and soil to facilite compliance investigation.

Planning and Preparation

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Certified Health Physicist	80	8	640
Foreman	55	20	1100
Craftsman	50	8	400
Health Physics	50	8	400
Clerical	30	8	240
		Total	3260

Planning and Preparation Total 3260

Facility Description

	Receipt	Use	Storage
This room was used for:		x	x

Area of:	Square Feet	
linear feet of piping	1000	feet
brush	yes	yes/no
plumbing system	yes	yes/no

Facility Characterization

Characterization has been completed prior to this report.

Decontamination Efforts

Equipment Required	Required Number	Cost each	Total $
survey instruments	4	100	400
personal protective equipment	4	8	32
sampling tools	109	25	2725
sample containers	109	3	327
backhoe	1	1200	1200
		Total	4684

Services Required	Required Number	Cost each	Total $	
Analytical Analysis				
Soil	109	410	44690	340
Water	10	210	2100	30
other				
		Total	46790	

TAVENOR

Components to Decontaminate

Monitor for Compliance

Labor

	Rate $/hr	Time Hrs	Total $
Supervisor	60	4	240
Foreman	55	4	220
Craftsman	50	4	200
Technician	45	16	720
Health Physics	50	8	400
Clerical	30	4	120
		Total	1900

Components to Disassemble

brush

Labor

	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	4	200
Technician	45	20	900
Health Physics	50	10	500
Laborer	40	120	4800
Clerical	30	8	240
		Total	7560

plumbing system

Labor

	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Foreman	55	8	440
Craftsman	50	8	400
Technician	45	32	1440
Health Physics	50	16	800
Laborer	40	40	1600
Clerical	30	8	240
		Total	5400

Decontamination Cost	$ 1,900.00
Dismantling Cost	$ 12,960.00
Total D&D Cost	$ 14,860.00

Tavenor

Travel

Note
1 Planning to occur 1/2 off site and 1/2 on site
2 All D&D on Site
3 Rental Vehicle for Supervisor and Foreman
4 Rental Truck/Van for workers
5 All CHP Time offsite
6 Per diem rate 115 per day
7 Plane Tickets 650 round trip

	New Waste Storage Building		Brick Office Building		Fabrication/Machine Shop		Am-Be Lab	
	Off Site	On Site	Off Site	On Site	Off Site	On Site	Off Site	On Site
Supervisor	8	40	8	42	4	16	2	18
Certified Health Physicist	16	0	8	0	8	0	4	0
Foreman	4	36	8	42	4	16	2	18
Craftsman	4	11	8	50	1	7	1	3
Technician	0	116	0	70	0	60	0	32
Health Physics	8	66	4	40	2	32	2	18
Laborer	0	84	0	74	0	56	0	40
Clerical	4	44	8	32	1 5	13 5	2	18

	Total Labor Hours Off Site	On Site	Weeks on Site	Number of personnel	Per Diem	Number Personnel	Total Per Diem
1 Supervisor	32 5	392	9 8	1	115	1	7889
1 Certified Health Physicist	60	0	0	0 0	0	1	0
1 Foreman	34 5	394	9 85	1 0	115	1	7929 25
1 Craftsman	26 5	335	8 375	0 9	0	1	0
3 Technician	0	1188	29 7	3 0	115	3	71725 5
3 Health Physics	31	1064	26 6	2 7	115	3	64239
3 Laborer	0	1296	32.4	3 3	0	3	0
1 Clerical	26	383 5	9 5875	1 0	0	1	0
	210 5	5052 5	126 3125	12 9			$ 151,782 75

	No Personnel	No Trips	Cost	Total
Plane Tickets	7	3	650	13650

Rental Vehicles	Number	Months	Cost	Total
Car	1	3	1000	3000
Truck	1	3	1200	3600
Backhoe	2	3	3000	18000
Bob Cat	3	3	3000	27000
Dowser	1	3	3000	9000
			Total	60600

Total Travel and Vehicle Rental $ 226,032 75

Radiography Lab		Subsurface Removal		Waste		Grounds	
Off Site	On Site	Off Site	On Site	Off Site	On Site	Off Site	On Site
2 5	20 5	4	24	0	167 5	4	64
8	0	8	0	0	0	8	0
2 5	20 5	10	30	0	167 5	4	64
0 5	4 5	4	20	0	167 5	8	72
0	60	0	68	0	670	0	112
7	41	4	38	0	765	4	64
0	60	0	160	0	670	0	152
2 5	20 5	4	24	0	167 5	4	64

Tavenor Site

Waste

Container Costs

Waste Type	Volume ft3	Containers No.	Containers Type	Price each	Total Cost	
Sources	15	2	7A Drums	50	100	
2R/Special Form	15	2	Special Form	800	1600	
Hot Debris	384	4	7A Boxes	500	2000	
Lead	10	1	B-12	400	400	
Glove Boxes	192	2	7A Boxes	500	1000	drop off
Building Debris	81000	150	Rolloffs	650	97500	500
Soil	54000	100	Rolloffs	650	65000	
			Total Containers		167600	

Labor Cost

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	40	2400
Foreman	55	40	2200
Craftsman	50	40	2000
Technician	45	160	7200
Health Physics	50	510	25500
Laborer	40	160	6400
Clerical	30	40	1200
		Total	46900

Transportation Costs

	Disposal Facility		Texas Burial Site
	Distance to Facility		200
$/mile/truck	Unit Cost		1.85
	Additional Costs	weight	0
		surcharges	0
	50/hr for 4 hr	demurge	200

Truck	Type	Number	Cost	Total
	Rolloffs	240	570	136800

	Disposal Facility		Pa Processor
	Distance to Facility		1500
$/mile/truck	Unit Cost		1.85
	Additional Costs	weight	0
		surcharges	0

TAVENOR

	50/hr for 4 hr	demurge		200

Truck	Type	Number	Cost	Total
	Rolloffs	1	2975	2975

	Disposal Facility		Utah Burial Site
	Distance to Facility		800
$/mile/truck	Unit Cost		1.85
	Additional Costs	weight	0
		surcharges	0
	50/hr for 16 hr	demurge	800

Truck	Type	Number	Cost	Total
	Rolloffs	10	2280	22800
	Flatbed	3	2280	6840
			Total	29640

	Disposal Facility		TN Process Facility
	Distance to Facility		1600
$/mile/truck	Unit Cost		1.85
	Additional Costs	weight	0
		surcharges	0
	50/hr for 8 hr	demurge	800

Truck	Type	Number	Cost	Total
	Van	2	3760	7520

Total Transportation 176935

Labor Cost

Labor	Rate $/hr	Time Hrs	Total $	Total trucks	Truck Factor
Supervisor	60	127.5	7650	255	2
Foreman	55	127.5	7012.5		
Craftsman	50	127.5	6375		
Technician	45	510	22950		
Health Physics	50	255	12750		
Laborer	40	510	20400		
Clerical	30	127.5	3825		
		Total	80962.5		

Disposal		ft3	cost	Total	
	Texas Burial Site	4320	6	25920	
	Utah Burial Site	4320	103	444960	
	Pa Processor	9000	6	54000	Cost By Pound
	TN Process Facility	15	484	7260	0 mci sur charge
				478140	

Tavenor Site
Grounds

This includes removal of buildings and pavement.

Planning and Preparation

Labor

	Rate $/hr	Time Hrs	Total $
Supervisor	60	8	480
Certified Health Physicist	80	8	640
Foreman	55	8	440
Craftsman	50	16	800
Health Physics	50	8	400
Clerical	30	8	240
		Total	3000

Planning and Preparation Total 3000

Facility Description

	Receipt	Use	Storage
This room was used for:	x	x	x

Area of:

	Square Feet			
grounds	17000	ft2	200	85

Facility Characterization

Characterization has been completed prior to this report

Decontamination Efforts

Equipment Required

	Required Number	Cost each	Total $
survey instruments	4	100	400
personal protective equipment	4	8	32
backhoe	2	1200	2400
		Total	2832

Components to Decontaminate

Monitor for Compliance

Labor

Apply Fixative for Raising Building	Rate $/hr	Time Hrs	Total $
Supervisor	60	16	960
Foreman	55	16	880
Craftsman	50	16	800
Technician	45	32	1440

Health Physics	50	16	800
Laborer	40	32	1280
Clerical	30	16	480
		Total	6640

Components to Disassemble

<u>Building and pavement</u>

Labor	Rate $/hr	Time Hrs	Total $
Supervisor	60	40	2400
Foreman	55	40	2200
Craftsman	50	40	2000
Technician	45	80	3600
Health Physics	50	40	2000
Laborer	40	120	4800
Clerical	30	40	1200
		Total	18200

Decontamination Cost	$ 6,640.00
Dismantling Cost	$ 18,200.00
Total D&D Cost	$ 24,840.00

Attachment A

Analytical

Enviro•Test
LABORATORIES INC

FACSIMILE COVER PAGE

DATE: 9-24-01 FAX NUMBER: 865-220-5365

FOR: Neal Whatley

COMPANY: US Ecology

FROM: Michelle Puder

TOTAL NUMBER OF PAGES INCLUDING COVER PAGE: 28

MESSAGE: Final Gamma Report

ETL LABORATORIES OFFERS A FULL SPECTRUM OF LABORATORY SERVICES

- *Air Toxics*
- *Mixed Waste Analysis*
- *Radionuclide Testing*
- *Hydrocarbon Characterization and Fingerprinting*

PLEASE CALL FOR MORE DETAILS

IF YOU HAVE ANY DIFFICULTY WITH THIS TRANSMISSION, PLEASE CALL 307-235-5741

420 West First Street Casper, Wyoming 82601 (307) 235-5741 (800) 666-0306 Fax (307) 256-1676

Enviro-Test Laboratories LLC.

Chemical Analysis Report

USEcology NMMC Brokerage Services
Attn: NEAL WHATLEY
109 Flint Road
Oak Ridge TN 37830

Date: 24 SEP 2001

Lab Work Order #: L3686

Date Received: 14 SEP 2001

Project P.O. #:

Project Reference:

Comments:

APPROVED BY: ______________________

Project Manager

1-of 2

4054

Enviro • Test LABORATORIES LLC.

CHAIN OF CUSTODY RECORD

CUSTOMER INFORMATION

COMPANY: US Ecology
SENT REPORT TO: Neal Whatley
ADDRESS: 109 Flint rd
Oak Ridge Tn
37830
PHONE: 865 220 5210
FAX: 865 220 5365

PROJECT INFORMATION

PROJECT NAME/NUMBER:

BILLING INFORMATION

BILL TO: US Ecology, F.S.
ADDRESS: 109 Flint rd
Oak Ridge tn 37830
PHONE: 865 220 5210
FAX: 865 220 5365 PO NO: GNI

NUMBER OF CONTAINERS

ANALYSIS / METHOD REQUEST: Gamma Screen

LAB JOB NO. 63686

SAMPLE NO	SAMPLE DESCRIPTION	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	CONTAINER	PRESERV.	NUMBER OF CONTAINERS	Gamma Screen								REMARKS / PRECAUTIONS
090801-SB	Soil	9/8/01	0800	Soil	baggy	N/A	1	X								
-S-12	Soil	9/8/01	0805	Soil	baggy	N/A	1	X								
-S-10	Soil	9/8/01	0810	Soil	bag	N/A	1	X								
-S-01	Soil	9/8/01	0815	Soil	bag	N/A	1	X								
-S-04	Soil	9/8/01	0820	Soil	bag	N/A	1	X								
-BKG-1	Soil	9/8/01	0825	Soil	bag	N/A	1	X								
-S-8	Soil	9/8/01	0830	Soil	bag	N/A	1	X								
-S7	Soil	9/8/01	0835	Soil	bag	N/A	1	X								
-SH	Soil	9/8/01	0840	Soil	bag	N/A	1	X								
-S09	Soil	9/8/01	0845	Soil	bag	N/A	1	X								

SAMPLER: B. Richards SHIPMENT METHOD: Fed eX AIRBILL NO

REQUIRED TURNAROUND: ☐ SAME DAY ☐ 24 HOURS ☐ 48 HOURS ☐ 72 HOURS X 5 DAYS ☐ 10 DAYS ☐ ROUTINE OTHER

1. RELINQUISHED BY:	DATE	2. RELINQUISHED BY:	DATE	3. RELINQUISHED BY:	DATE
SIGNATURE: [signature]	9/13/05	SIGNATURE:		SIGNATURE:	
PRINTED NAME/COMPANY: Bryan Richards USE F.S.	TIME 1330	PRINTED NAME/COMPANY:	TIME	PRINTED NAME/COMPANY:	TIME
1. RECEIVED BY:	DATE	2. RECEIVED BY:	DATE	3. RECEIVED BY:	DATE
SIGNATURE: Tammie Schultz	9/14/01	SIGNATURE:		SIGNATURE:	
PRINTED NAME/COMPANY: Tammie Schultz	TIME 0930	PRINTED NAME/COMPANY:	TIME	PRINTED NAME/COMPANY:	TIME

RUSH TURNAROUND MAY REQUIRE SURCHARGE

Edmonton (Head Office) ... Edmonton (Downtown) ... Calgary ... Grande Prairie ... Saskatoon ... Winnipeg ... Thunder Bay ... Ottawa ... Canada Wide Toll Free 1 800 668 9878 ... Casper, Wyoming ... www.envirotest.com

Enviro • Test LABORATORIES LLC.

4054

CHAIN OF COSTODY RECORD

CUSTOMER INFORMATION	PROJECT INFORMATION
COMPANY	PROJECT NAME/NUMBER
SEND REPORT TO	BILLING INFORMATION
ADDRESS:	BILL TO:
	ADDRESS
PHONE	PHONE:
FAX	FAX: PO NO.:

NUMBER OF CONTAINERS

ANALYSIS / METHOD REQUEST: 6010 A Soil

LAB JOB NO. L5686

SAMPLE NO.	SAMPLE DESCRIPTION	SAMPLE DATE	SAMPLE TIME	SAMPLE MATRIX	CONTAINER	PRESERV.	REMARKS / PRECAUTIONS
506	Soil	9/9/01	1200	Soil	bag	N/A	
-L7	Lead	9/9/01	1205	lead	bag		
-514	Soil	9/9/01	1210	Soil	bag		
V-53	Soil	9/9/01	1215	Soil	bag		
-502	Soil	9/9/01	1220	Soil	bag		
501	Soil	9/9/01	1225	Soil	bag		
060101F	Soil	9/9/01	1230	Soil	bag		
-06F	Soil	9/9/01	1235	Soil	bag		
08F	Soil	9/9/01	1240	Soil	bag		
HCSL-03	Soil	9/9/01	1245	Soil	bag	N/A	

SAMPLER | SHIPMENT METHOD: | AIRBILL NO.

REQUIRED TURNAROUND: ☐ SAME DAY ☐ 24 HOURS ☐ 48 HOURS ☐ 72 HOURS ☐ 5 DAYS ☐ 10 DAYS ☐ ROUTINE OTHER

1. RELINQUISHED BY:	DATE	2. RELINQUISHED BY:	DATE	3. RELINQUISHED BY:	DATE
SIGNATURE		SIGNATURE:		SIGNATURE:	
PRINTED NAME/COMPANY	TIME	PRINTED NAME/COMPANY	TIME	PRINTED NAME/COMPANY	TIME
1. RECEIVED BY	DATE	2. RECEIVED BY:	DATE	3. RECEIVED BY:	DATE
SIGNATURE: Tommie Scheetz	9/14/01	SIGNATURE:		SIGNATURE:	
PRINTED NAME/COMPANY: Tommie Scheetz	TIME 0930	PRINTED NAME/COMPANY:	TIME	PRINTED NAME/COMPANY:	TIME

ETL | Enviro • Test LABORATORIES LLC

Sample Receipt Checklist

Client	E US Ecology,	Job Number	L3686

Samples Shipped	UPS	Federal Express	Airborn:
Samples Hand Delivered	Client	ETL Lab Courier	Other:

*Air Bill #: 8262646 24892	# of Packages Received:

	Yes	No	N\A	Comments
1. Chain - of - Custody present?	X			If no, please fill one out.
2. Are the COC and sample labels legible?	X			
3. Custody Seal on shipping container?		X		
If yes, intact on shipping container?				
4. Custody seals on sample containers?		X		
If yes, intact on sample container?				
5. Samples chilled?		X		
Is temperature of cooler: 4 ± 2°C ?		X		*Record temp: 21°C
6. Samples received intact (good condition)?	X			
If volatiles required, any with headspace?				
7. Adequate sample volume provided?				
8. Samples preserved correctly?	X			$Na_2S_2O_3$, ZnAc, HNO_3, HCl
Circle preservative types in shipment				H_2SO_4, NaOH, Plain, Other
9. Correct containers used?	X			
10. Samples received within holding time?	X			
11. Agreement between COC and sample labels?	X			
12. Gamma Screen µR/Hr @ surface within Bkg?	X			FOR INTERNAL USE ONLY @ 13Kg
13. Samples OK to release to Lab/Screening?	X			

Additional Comments:

Sample Container (size/material): 20 bags

Received and inspected by: ZRS Date/Time: 9/14/01 07:30

* = for multiple packages, see attached page(s) for shipping numbers and temperatures.

Chemical Analysis Report

..Ecology NMMC Brokerage Services
109 Flint Road
Oak Ridge TN 37830
ATTN: NEAL WHATLEY

Report Date: 24-SEP-01
Page: 18 of 22
PO No.:
WO NO.: L3686

Sample ID: 090901-01F
Job Name:
Sampled By: CLIENT

Date Collected: 09-SEP-01
Lab Sample ID: L3686-17
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Potassium-40	15.7 +/- 1.5	pCi/g	0.7		19-SEP-01	DMF
Cesium-137	0.7 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Thallium-208	0.4 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Lead-212	0.9 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Bismuth-214	1.0 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF
Lead-214	0.9 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF
Actinium-228	1.0 +/- 0.2	pCi/g	0.3		19-SEP-01	DMF

Chemical Analysis Report

.cology NMMC Brokerage Services
109 Flint Road
Oak Ridge TN 37830

ATTN: NEAL WHATLEY

Report Date: 24-SEP-01
Page: 19 of 22
PO No.:
WO NO.: L3686

Sample ID: 090901-06F
Job Name:
Sampled By: CLIENT

Date Collected: 09-SEP-01
Lab Sample ID: L3686-18
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Potassium-40	13.3 +/- 1.8	pCi/g	1.2		19-SEP-01	DMF
Cesium-137	7.0 +/- 0.3	pCi/g	0.1		19-SEP-01	DMF
Thallium-208	0.4 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Lead-212	1.1 +/- 0.3	pCi/g	0.2		19-SEP-01	DMF
Lead-214	1.0 +/- 0.2	pCi/g	0.3		19-SEP-01	DMF

Chemical Analysis Report

cology NMMC Brokerage Services
ı‹ɟ Flint Road
Oak Ridge TN 37830
ATTN: NEAL WHATLEY

Report Date: 24-SEP-01

PO No.:
WO NO.: L3686

Sample ID: 090901-08F
Job Name:
Sampled By: CLIENT

Date Collected: 09-SEP-01
Lab Sample ID: L3686-19
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Potassium-40	14.9 +/- 1.4	pCi/g	0.7		19-SEP-01	DMF
Cesium-137	5.6 +/- 0.2	pCi/g	0.1		19-SEP-01	DMF
Thallium-208	0.3 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Lead-212	1.0 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Bismuth-214	1.0 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF
Lead-214	0.8 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF
Actinium-228	0.8 +/- 0.2	pCi/g	0.3		19-SEP-01	DMF
Thorium-234	3.0 +/- 1.9	pCi/g	1		19-SEP-01	DMF

Enviro • Test
LABORATORIES LLC.
420 West 1st Street Casper, Wyoming 82601
Phone (307) 235-5741 Fax (307) 266-1676

Methodology Reference

ΓL Test Code	Matrix	Test Description	Methodology Reference
AMMA-ALL-CA	Soil	Gamma Spectroscopy	Mod.EPA.901.1

GAMMA QA/QC DATA SUMMARY SHEET

Date Analyzed	Work Group	Run ID	Job Numbers
August 14, 2001	WG10283	R12306	L 3686

DUPLICATE SAMPLE ID L 3686-9

ANALYTE	Sample Activity pCi/g	Duplicate Activity pCi/g	Sample Error pCi/g	Duplicate Error pCi/g	Duplicate RER
Potassium 40	14.1	13.5	1.3	1.4	0.3
Cesium 137	11.7	11.4	0.3	0.3	0.7
Thallium 208	0.3	0.3	0.1	0.1	0.0
Bismuth 214	1.4	0.9	0.2	0.2	1.8
Lead 214	0.9	0.8	0.2	0.2	0.4
Actinium 228	1.0	1.0	0.2	0.2	0.0

ENVIROTEST LABORATORIES

Login Chain of Custody Report (In01)

Sep. 18, 2001

08:49 AM

Login Number: L3686 **Quote Number:**

Account: 10286 USEcology NMMC Brokerage Services

Project:

Contact: NEAL WHATLEY

Report Address: 109 Flint Road,

Oak Ridge, TN 37830

Phone: 800-398-3859 Fax: Fax Flag: N

Email: ctrandle@americanecology.com Email Flag: N

Report Type: Export Type:

Lab SMP#	Client Sample Number	Collect Date	Receive Date	PR	Due Date	Comments
3686-1	090801-S13	08-SEP-01 08:00	14-SEP-01		24-SEP-01	
Soil	S GAMMA-ALL-CA	Hold: 07-MAR-02				BAG 1 Bottles
3686-2	090801-S12	08-SEP-01 08:05	14-SEP-01		24-SEP-01	
Soil	S GAMMA-ALL-CA	Hold: 07-MAR-02				
3686-3	090801-S10	08-SEP-01 08:10	14-SEP-01		24-SEP-01	
Soil	S GAMMA-ALL-CA	Hold: 07-MAR-02				
3686-4	090801-S01	08-SEP-01 08:15	14-SEP-01		24-SEP-01	
Soil	S GAMMA-ALL-CA	Hold: 07-MAR-02				
[illegible]	090801-S04	08-SEP-01 08:20	14-SEP-01		24-SEP-01	
So[illegible]	S GAMMA-ALL-CA	Hold: 07-MAR-02				
3686-6	090801-BKG-1	08-SEP-01 08:25	14-SEP-01		24-SEP-01	
Soil	S GAMMA-ALL-CA	Hold: 07-MAR-02				
3686-7	090801-S8	08-SEP-01 08:30	14-SEP-01		24-SEP-01	
Soil	S GAMMA-ALL-CA	Hold: 07-MAR-02				
3686-8	090801-S2	08-SEP-01 08:35	14-SEP-01		24-SEP-01	
Soil	S GAMMA-ALL-CA	Hold: 07-MAR-02				
3686-9	090801-S11	08-SEP-01 08:40	14-SEP-01		24-SEP-01	
Soil	S GAMMA-ALL-CA	Hold: 07-MAR-02				
3686-10	090801-S09	08-SEP-01 08:45	14-SEP-01		24-SEP-01	
Soil	S GAMMA-ALL-CA	Hold: 07-MAR-02				
3686-11	090801-S06	09-SEP-01 12:00	14-SEP-01		24-SEP-01	
Soil	S GAMMA-ALL-CA	Hold: 08-MAR-02				
3686-12	090801-L7	09-SEP-01 12:05	14-SEP-01		24-SEP-01	
Soil	S GAMMA-ALL-CA	Hold: 08-MAR-02				
3686-13	090801-S5	09-SEP-01 12:10	14-SEP-01		24-SEP-01	
Soil	S GAMMA-ALL-CA	Hold: 08-MAR-02				
3686-14	090801-S3	09-SEP-01 12:15	14-SEP-01		24-SEP-01	
Soil	S GAMMA-ALL-CA	Hold: 08-MAR-02				
3686-15	TCSL-S02	09-SEP-01 12:20	14-SEP-01		24-SEP-01	
Soil	S GAMMA-ALL-CA	Hold: 08-MAR-02				

Signature : Michelle Rendle

Date : 9-18-01

ENVIROTEST LABORATORIES

Login Chain of Custody Report (In01)

Sep. 18, 2001

08:49 AM

Login Number: L3686 **Quote Number:**

Account: 10286 USEcology NMMC Brokerage Services

Project:

Contact:

Report Address:

Phone:

Email:

Report Type:

Lab SMP#	Client Sample Number	Collect Date	Receive Date	PR	Due Date	Comments
.3686-16	TCSL-S01	09-SEP-01 12:25	14-SEP-01		24-SEP-01	
Soil	S GAMMA-ALL-CA	Hold: 08-MAR-02				
.3686-17	090901-01F	09-SEP-01 12:30	14-SEP-01		24-SEP-01	
Soil	S GAMMA-ALL-CA	Hold: 08-MAR-02				
.3686-18	090901-06F	09-SEP-01 12:35	14-SEP-01		24-SEP-01	
Soil	S GAMMA-ALL-CA	Hold: 08-MAR-02				
.3686-19	090901-08F	09-SEP-01 12:40	14-SEP-01		24-SEP-01	
S[illegible]	S GAMMA-ALL-CA	Hold: 08-MAR-02				
[illegible]20	TCSL-03	09-SEP-01 12:45	14-SEP-01		24-SEP-01	
Soil	S GAMMA-ALL-CA	Hold: 08-MAR-02				

Signature : ____________________

Date :

Chemical Analysis Report

DuEcology NMMC Brokerage Services
109 Flint Road
Oak Ridge TN 37830
ATTN: NEAL WHATLEY

Report Date: 24-SEP-01

PO No.:
WO NO.: L3686

Sample ID: 090801-BKG-1
Job Name:
Sampled By: CLIENT

Date Collected: 08-SEP-01
Lab Sample ID: L3686-6
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Potassium-40	13.5 +/- 1.5	pCi/g	0.6		19-SEP-01	DMF
Cesium-137	0.9 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Thallium-208	0.2 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Bismuth-212	1.6 +/- 1.0	pCi/g	0.9		19-SEP-01	DMF
Lead-212	0.7 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Bismuth-214	0.7 +/- 0.2	pCi/g	0.1		19-SEP-01	DMF
Lead-214	0.7 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Actinium-228	0.9 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF

Chemical Analysis Report

Ecology NMMC Brokerage Services
109 Flint Road
Oak Ridge TN 37830
ATTN: NEAL WHATLEY

Report Date: 24-SEP-01
Page: 5 of 22
PO No.:
WO NO.: L3586

Sample ID: 090801-S01
Job Name:
Sampled By: CLIENT

Date Collected: 08-SEP-01
Lab Sample ID: L3686-4
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Potassium-40	13.6 +/- 1.6	pCi/g	1.2		19-SEP-01	DMF
Cesium-137	3.5 +/- 0.2	pCi/g	0.1		19-SEP-01	DMF
Thallium-208	0.3 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Lead-212	0.9 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF
Bismuth-214	1.6 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF
Lead-214	0.9 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF

Chemical Analysis Report

USEcology NMMC Brokerage Services
109 Flint Road
Oak Ridge TN 37830
ATTN: NEAL WHATLEY

Report Date: 24-SEP-01

PO No.:
WO NO.: L3686

Sample ID: 090801-S2
Job Name:
Sampled By: CLIENT

Date Collected: 08-SEP-01
Lab Sample ID: L3686-8
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Beryllium-7	4.5 +/- 2.5	pCi/g	2.8		19-SEP-01	DMF
Potassium-40	15.5 +/- 1.6	pCi/g	0.8		19-SEP-01	DMF
Cobalt-60	0.4 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Cesium-137	15C +/- 1.1	pCi/g	0.2		19-SEP-01	DMF
Thallium-208	0.3 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF
Lead-210	17.3 +/- 8.0	pCi/g	9.2		19-SEP-01	DMF
Lead-212	0.8 +/- 0.3	pCi/g	0.3		19-SEP-01	DMF
Bismuth-214	1.8 +/- 0.2	pCi/g	0.3		19-SEP-01	DMF
Lead-214	0.9 +/- 0.3	pCi/g	0.5		19-SEP-01	DMF
Actinium-228	0.9 +/- 0.3	pCi/g	0.3		19-SEP-01	DMF

Enviro • Test
LABORATORIES LLC.
420 West 1st Street Casper, Wyoming 82601
Phone: (307) 235-5741 Fax (307) 266-1676
Toll Free 1(800)666-0301

nelac

Chemical Analysis Report

Duratek/Ecology NMMC Brokerage Services
109 Flint Road
Oak Ridge TN 37830
ATTN: NEAL WHATLEY

Report Date: 24-SEP-01
Page: 15 of 22
PO No.:
WO NO.: L3686

Sample ID: 090801-S3
Job Name:
Sampled By: CLIENT

Date Collected: 09-SEP-01
Lab Sample ID: L3686-14
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Potassium-40	13.6 +/- 1.8	pCi/g	1.1		19-SEP-01	DMF
Cesium-137	323 +/- 1.8	pCi/g	0.3		19-SEP-01	DMF
Bismuth-214	1.4 +/- 0.4	pCi/g	0.5		19-SEP-01	DMF

Chemical Analysis Report

:cology NMMC Brokerage Services
109 Flint Road
Oak Ridge TN 37830
ATTN: NEAL WHATLEY

Report Date: 24-SEP-01

PO No.:
WO NO.: L3686

Sample ID: 090801-S04
Job Name:
Sampled By: CLIENT

Date Collected: 08-SEP-01
Lab Sample ID: L3586-5
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Potassium-40	13.5 +/- 1.6	pCi/g	1		19-SEP-01	DMF
Cobalt-60	0.4 +/- 0.1	pCi/g	0.'		19-SEP-01	DMF
Cesium-137	89.0 +/- 0.9	pCi/g	0.2		19-SEP-01	DMF

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Toll Free 1(800)866-0301

Chemical Analysis Report

Ecology NMMC Brokerage Services
109 Flint Road
Oak Ridge TN 37830
ATTN: NEAL WHATLEY

Report Date: 24-SEP-01
Page: 14 of 22
PO No.:
WO NO.: L3686

Sample ID: 090801-S5
Job Name:
Sampled By: CLIENT

Date Collected: 09-SEP-01
Lab Sample ID: L3686-13
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Potassium-40	14.9 +/- 1.8	pCi/g	0.9		19-SEP-01	DMF
Cesium-137	1.1 +/- 0.2	pCi/g	0.1		19-SEP-01	DMF
Lead-212	0.3 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Lead-214	0.7 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF

Chemical Analysis Report

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109 Flint Road
Oak Ridge TN 37830
ATTN: NEAL WHATLEY

Report Date: 24-SEP-01

PO No.:
WO NO.: L3886

Sample ID: 090801-S06
Job Name:
Sampled By: CLIENT

Date Collected: 09-SEP-0'
Lab Sample ID: L3686-11
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
llsc						
Gamma Spectroscopy						
Potassium-40	54.7 +/- 8.5	pCi/g	6.3		19-SEP-01	DMF
Cesium-137	0.9 +/- 0.8	pCi/g	0.7		19-SEP-01	DMF
Bismuth-214	4.7 +/- 1.3	pCi/g	1.4		19-SEP-01	DMF
Lead-214	2.5 +/- 1.1	pCi/g	1.2		19-SEP-01	DMF

Sent by: Enviro Test Laboratories,LLC

Chemical Analysis Report

USEcology NMMC Brokerage Services
109 Flint Road
Oak Ridge TN 37830
ATTN: NEAL WHATLEY

Report Date: 24-SEP-01

PO No.:
WO NO.: L3686

Sample ID: 090801-L7
Job Name:
Sampled By: CLIENT

Date Collected: 09-SEP-01
Lab Sample ID: L3686-12
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Potassium-40	1.4 +/- 0.4	pCi/g	0.3		19-SEP-01	DMF
Cobalt-60	0.3 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Cadmium-109	13.8 +/- 1.7	pCi/g	2.3		19-SEP-01	DMF
Cesium-137	345 +/- 0.9	pCi/g	0.1		19-SEP-01	DMF
Bismuth-214	3.3 +/- 0.2	pCi/g	0.3		19-SEP-01	DMF
Lead-214	6.6 +/- 2.9	pCi/g	0.4		19-SEP-01	DMF

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Chemical Analysis Report

.cology NMMC Brokerage Services
109 Flint Road
Oak Ridge TN 37830
ATTN: NEAL WHATLEY

Report Date: 24-SEP-01

PO No.:
WO NO.: L3686

Sample ID: 090801-S8
Job Name:
Sampled By: CLIENT

Date Collected: 08-SEP-01
Lab Sample ID: L3686-7
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Potassium-40	9.8 +/- 1.7	pCi/g	0.8		19-SEP-01	DMF
Cobalt-60	0.3 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Cesium-137	2132 +/- 6.5	pCi/g	0.9		19-SEP-01	DMF

Chemical Analysis Report

Ecology NMMC Brokerage Services
109 Flint Road
Oak Ridge TN 37830
ATTN: NEAL WHATLEY

Report Date: 24-SEP-01
Page: 11 of 22
PO No.:
WO NO.: L3686

Sample ID: 090801-S09
Job Name:
Sampled By: CLIENT

Date Collected: 08-SEP-01
Lab Sample ID: L3686-10
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Potassium-40	11.2 +/- 1.7	pCi/g	1.2		19-SEP-01	DMF
Cesium-137	6.0 +/- 0.3	pCi/g	0.1		19-SEP-01	DMF
Thallium-208	0.2 +/- 0.2	pCi/g	0.1		19-SEP-01	DMF
Bismuth-214	0.8 +/- 0.3	pCi/g	0.2		19-SEP-01	DMF
Lead-214	0.8 +/- 0.2	pCi/g	0.3		19-SEP-01	DMF
Thorium-234	1.4 +/- 0.7	pCi/g	1		19-SEP-01	DMF

Chemical Analysis Report

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1u9 Flint Road
Oak Ridge TN 37830
ATTN: NEAL WHATLEY

Report Date: 24-SEP-01

PO No.:
WO NO.: L3686

Sample ID: 090801-S10
Job Name:
Sampled By: CLIENT

Date Collected: 08-SEP-01
Lab Sample ID: L3686-3
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Potassium-40	16.2 +/- 1.5	pCi/g	0.6		19-SEP-01	DMF
Cobalt-60	0.1 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Cadmium-109	2.5 +/- 1.1	pCi/g	1.5		19-SEP-01	DMF
Cesium-137	11.8 +/- 0.3	pCi/g	0.[illegible]		19-SEP-01	DMF
Thallium-208	0.2 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Lead-212	0.8 +/- 0.2	pCi/g	0.1		19-SEP-01	DMF
Bismuth-214	0.7 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF
Lead-214	0.7 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF
Actinium-228	1.0 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF
Thorium-234	3.0 +/- 0.7	pCi/g	1		19-SEP-01	DMF

Chemical Analysis Report

.cology NMMC Brokerage Services
109 Flint Road
Oak Ridge TN 37830
ATTN: NEAL WHATLEY

Report Date: 24-SEP-01
Page: 10 of 22
PO No.:
WO NO.: L3686

Sample ID: 090801-S11
Job Name:
Sampled By: CLIENT

Date Collected: 08-SEP-01
Lab Sample ID: L3686-9
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Potassium-40	14.1 +/- 1.3	pCi/g	0.6		19-SEP-01	DMF
Cesium-137	11.7 +/- 0.3	pCi/g	0.1		19-SEP-01	DMF
Thallium-208	0.3 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Bismuth-212	1.2 +/- 0.9	pCi/g	0.9		19-SEP-01	DMF
Lead-212	0.8 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Bismuth-214	1.4 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF
Lead-214	0.9 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF
Actinium-228	1.0 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF

Chemical Analysis Report

:cology NMMC Brokerage Services
109 Flint Road
Oak Ridge TN 37830

ATTN: NEAL WHATLEY

Report Date: 24-SEP-01
Page: 3 of 22
PO No.:
WO NO.: L3686

Sample ID: 090801-S12
Job Name:
Sampled By: CLIENT

Date Collected: 08-SEP-01
Lab Sample ID: L3686-2
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Potassium-40	14.4 +/- 1.6	pCi/g	0.8		19-SEP-01	DMF
Cobalt-60	0.1 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Cesium-137	30.8 +/- 0.5	pCi/g	0.1		19-SEP-01	DMF
Thallium-208	0.3 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Bismuth-214	1.2 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF
Lead-214	0.8 +/- 0.2	pCi/g	0.3		19-SEP-01	DMF
Actinium-228	0.9 +/- 0.2	pCi/g	0.3		19-SEP-01	DMF

Chemical Analysis Report

.cology NMMC Brokerage Services
109 Flint Road
Oak Ridge TN 37830
ATTN: NEAL WHATLEY

Report Date: 24-SEP-01
Page: 2 of 22
PO No.:
WO NO.: L3686

Sample ID: 090801-S13
Job Name:
Sampled By: CLIENT

Date Collected: 08-SEP-01
Lab Sample ID: L3686-1
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Potassium-40	15.0 +/- 2.1	pCi/g	1.2		19-SEP-01	DMF
Cobalt-60	0.7 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Cesium-137	704 +/- 3.3	pCi/g	0.5		19-SEP-01	DMF

Chemical Analysis Report

Ecology NMMC Brokerage Services
109 Flint Road
Oak Ridge TN 37830
ATTN: NEAL WHATLEY

Report Date: 24-SEP-01

PO No.:
WO NO.: L3686

Sample ID: TCSL-S01
Job Name:
Sampled By: CLIENT

Date Collected: 09-SEP-01
Lab Sample ID: L3686-16
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Potassium-40	13.8 +/- 1.9	pCi/g	1.2		19-SEP-01	DMF
Cesium-137	0.4 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF
Thallium-208	0.5 +/- 0.2	pCi/g	0.1		19-SEP-01	DMF
Lead-212	1.6 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF
Bismuth-214	1.2 +/- 0.2	pCi/g	0.3		19-SEP-01	DMF
Lead-214	1.4 +/- 0.2	pCi/g	0.3		19-SEP-01	DMF
Actinium-228	1.2 +/- 0.3	pCi/g	0.5		19-SEP-01	DMF

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Chemical Analysis Report

.cology NMMC Brokerage Services
109 Flint Road
Oak Ridge TN 37830
ATTN: NEAL WHATLEY

Report Date: 24-SEP-01

PO No.:
WO NO.: L3686

Sample ID: TCSL-S02
Job Name:
Sampled By: CLIENT

Date Collected: 09-SEP-01
Lab Sample ID: L3686-15
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Potassium-40	14.7 +/- 1.5	pCi/g	0.6		19-SEP-01	DMF
Cesium-137	22.0 +/- 0.4	pCi/g	0.1		19-SEP-01	DMF
Thallium-208	0.4 +/- 0.1	pCi/g	0.1		19-SEP-01	DMF
Bismuth-212	1.9 +/- 1.0	pCi/g	1		19-SEP-01	DMF
Lead-212	1.1 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF
Bismuth-214	0.8 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF
Lead-214	0.8 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF
Actinium-228	1.1 +/- 0.2	pCi/g	0.2		19-SEP-01	DMF

Enviro • Test
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420 West 1st Street Casper, Wyoming 82601
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Chemical Analysis Report

:cology NMMC Brokerage Services
109 Flint Road
Oak Ridge TN 37830
ATTN: NEAL WHATLEY

Report Date: 24-SEP-01

PO No.:
WO NO.: L3686

Sample ID: TCSL-03
Job Name:
Sampled By: CLIENT

Date Collected: 09-SEP-01
Lab Sample ID: L3686-20
Matrix: SOLID

Test Description	Result	Units of Measure	D.L.	Prep Date	Analyzed	By
Misc						
Gamma Spectroscopy						
Cobalt-60	2956 +/- 20.6	pCi/g	5.6		19-SEP-01	DMF
Cesium-137	3357 +/- 26.8	pCi/g	10		19-SEP-01	DMF
Americium-241	142 +/- 10.2	pCi/g	9.2		19-SEP-01	DMF

Outreach Laboratory

Reaching beyond the standard.

311 North Aspen • Broken Arrow, OK 74012 • 918/251-2515 phone • 918/251-0008 fax

Facsimile Transmission

To: Neal Whatley ~~Brian Richard~~ Fax:

From: Brenda Hugfrat Date: 9/28/01

Re: Pages: 17

CC:

Presenting Your Report As Promised!	Due Date	Report Date

Notes:

We need an address to return samples. The levels in some are making us approach our NRC Limit for Cs 137, Sr 90.

Thank You!

OUTREACH LABORATORY

311 North Aspen
Broken Arrow, OK 74012
Phone: (918) 251-2515
Fax: (918) 251-0008

CHAIN OF CUSTODY

Results To: Company US Ecology
Name Neal Whatley
Address 109 Flint Road
City Oak Ridge State TN Zip 37830
Phone 865 2205210 Fax # 865 2205365

Bill To:
Company Same
Name
Address
City State Zip

ANALYSIS REQUESTED

PROJECT NO. FS-01-10
PROJECT NAME GNI-Webster
REQUESTED TURNAROUND TIME (ADDITIONAL CHARGES MAY APPLY) 10-days
SAMPLER Neal Whatley
Signature

	[illegible]	Client Sample #	Date	Time	Matrix	# Containers	Container Type & Volume Plastic or Glass	Preservative	Gamma Spec	TCLP Lead							Remarks
1		090501-BKGC	9/5/01	1630	Soil Concrete	1	Plastic	N/A	✓	✓							
2		090501-BKGS	9/5/01	1635	Soil	1	Plastic	N/A	✓	✓							
3		090501-BKGA	9/5/01	1615	Soil Asphalt	1	Plastic	N/A	✓	✓							
4		090501-15A	9/5/01	1600	Asphalt	1	Plastic	N/A	✓	✓							
5		090501-13A	9/5/01	1530	Asphalt	1	Plastic	N/A	✓	✓							
6		090501-14A	9/5/01	1500	Asphalt	1	Plastic	N/A	✓	✓							
		~~090501-16A~~	~~9/5/01~~	~~1430~~													
7		090501-16conc	9/5/01	1430	Soil	1	Plastic	N/A	✓	✓							
8		090501-12A	9/5/01	1400	asphalt	1	Plastic	N/A	✓								
9		090501-09P	9/5/01	1330	paint	1	Plastic	N/A	✓	✓							
10		090501-17L	9/5/01	1300	soil	1	Plastic	N/A	✓	✓							
11		090501-11S	9/5/01	1230	soil	1	Plastic	N/A	✓	✓							
12		090501-10C	9/5/01	1130	soil	1	Plastic	N/A	✓								
13		090501-08C	9/5/01	1100	soil	1	Plastic	N/A	✓	✓							

RELINQUISHED BY Neal Whatley DATE 9/7/01 TIME 1730 RECEIVED BY Brenda [illegible] DATE 9/10/01 TIME 10:00

RELINQUISHED BY DATE TIME RECEIVED BY DATE TIME

REMARKS:

SAMPLE RETURN/DISPOSAL: [illegible]

20010819

OUTREACH LABORATORY

311 North Aspen
Broken Arrow, OK 74012
Phone: (918) 251-2515
Fax: (918) 251-0008

Natalie

CHAIN OF CUSTODY

Results To:
Company US Ecology
Name Neal
Address 109 Flint Road
City Oak Ridge State TN Zip ~~37923~~ 37830
Phone 865 220 5210 Fax # 865-220-5365

Bill To:
Company Same
Name
Address
City State Zip

ANALYSIS REQUEST

PROJECT NO. FS-01-10
PROJECT NAME GNI-Webster
REQUESTED TURNAROUND TIME (ADDITIONAL CHARGES MAY APPLY) 10 days
SAMPLER Neal Whitley (Signature)

	Sample ID	Date	Time	Matrix	# Containers	Container	Preservative	Gamma Spec	TCLP-Lead	Sr-90	Tritium					Remarks
	090501-05S	9/5/01	1030	Soil	1	Plastic	N/A	✓								
	090501-01S	9/5/01	1000	Soil	4	Plastic	N/A	✓								
	090801-018	9/8/01	1600	Swipe	1	Plastic	N/A	✓		✓						
	090801-019	9/7/01	1530	oil	1	Plastic	N/A	✓								✓
	090801-20	9/7/01	1500	Soil	1	Plastic	N/A	✓								
	090701-21	9/7/01	1430	Paint	1	Plastic	N/A	✓								
	090501-06	9/5/01	9:30	Soil	1	Plastic	N/A	✓								
	090501-07R	9/5/01	9:00	solid	1	Plastic	N/A	✓								
	090501-22	9/7/01	1400	swipe	1	Plastic	N/A	✓								
	090701-23	9/7/01	1330	swipe	1	Plastic	N/A	✓								
	090701-24	9/7/01	1300	liquid	1	Plastic	N/A	✓			✓					
	090701-25	9/7/01	1100	swipe	1	Plastic	N/A	✓								
	090701-26	9/7/01	1030	swipe	1	Plastic	N/A	✓								
	090701-27	9/7/01	1000	swipe	1	Plastic	N/A	✓								

RELINQUISHED BY Neal Whitley DATE 9/7/01 TIME 1700 RECEIVED BY Brenda [illegible] DATE 9/10/01 TIME 10:02

RELINQUISHED BY DATE TIME RECEIVED BY DATE TIME

REMARKS

SAMPLE RETURN/DISPOSAL: [illegible]

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ken Arrow, OK 74012
8) 251-2515
X (918) 251-0008

PRELIMINARY REPORT

Client:	U S Ecology Inc
Client Project	GNI-Webster FS-01-10
Lab Number:	20010819
Date Reported:	9/28/2001
Date Received:	9/10/01
Page Number:	1 of 14

Analytical Report

Lab ID: 20010819-01
Client ID: 090501-BKGC
Date Sampled: 9/5/2001 4:30:00 PM
Matrix: Other

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
		Radiochemical Analyses					
K-40	HASL 300	3.90 +/- 0.377	pCi/g	0.622		9/25/2001	SD
Tl-208	HASL 300	BDL	pCi/g	0.074		9/25/2001	SD
Bi-212	HASL 300	BDL	pCi/g	0.581		9/25/2001	SD
Pb-212	HASL 300	0.174 +/- 0.018	pCi/g	0.060		9/25/2001	SD
Bi-214	HASL 300	0.399 +/- 0.046	pCi/g	0.144		9/25/2001	SD
Pb-214	HASL 300	0.373 +/- 0.031	pCi/g	0.086		9/25/2001	SD
Ac-228	HASL 300	BDL	pCi/g	0.242		9/25/2001	SD
[illegible]34	HASL 300	BDL	pCi/g	1.29		9/25/2001	SD
[illegible]5	HASL 300	BDL	pCi/g	0.338		9/25/2001	SD
Pa-234	HASL 300	BDL	pCi/g	0.181		9/25/2001	SD
Am-241	HASL 300	ND	pCi/g	0.551		9/25/2001	S/D
Co-60	HASL 300	BDL	pCi/g	0.078		9/25/2001	SD
Cs-137	HASL 300	1.40 +/- 0.069	pCi/g	0.088		9/25/2001	SD
		Metals Analyses					
TCLP-Lead	EPA 1311/6010B	BDL	mg/l	0.035	9/12/2001	9/21/2001	KS

Lab ID: 20010819-02
Client ID: 090501-BKGS
Date Sampled: 9/5/2001 4:35:00 PM
Matrix: Soil

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
		Radiochemical Analyses					
K-40	HASL 300	12.4 +/- 0.936	pCi/g	1.40		9/18/2001	SD
Tl-208	HASL 300	0.360 +/- 0.032	pCi/g	0.082		9/18/2001	SD
Bi-212	HASL 300	0.473 +/- 0.247	pCi/g	0.096		9/18/2001	SD
Pb-212	HASL 300	1.14 +/- 0.085	pCi/g	0.331		9/18/2001	SD
Bi-214	HASL 300	0.537 +/- 0.084	pCi/g	0.358		9/18/2001	SD
Pb-214	HASL 300	0.869 +/- 0.077	pCi/g	0.363		9/18/2001	SD
Ac-228	HASL 300	0.769 +/- 0.102	pCi/g	0.498		9/18/2001	SD
Th-234	HASL 300	BDL	pCi/g	1.85		9/18/2001	SD
[illegible]35	HASL 300	BDL	pCi/g	0.755		9/18/2001	SD
[illegible]4	HASL 300	BDL	pCi/g	0.172		9/18/2001	SD

BDL = Below Detection Limit

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PRELIMINARY REPORT

Client:	U S Ecology Inc
Client Project:	GNI-Webster FS-01-10
Lab Number:	20010819
Date Reported:	9/28/2001
Date Received:	9/10/01
Page Number:	2 of 14

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
Am-241	HASL 300	ND	pCi/g	0.147		9/18/2001	SD
Co-60	HASL 300	BDL	pCi/g	0.139		9/18/2001	SD
Cs-137	HASL 300	BDL	pCi/g	0.136		9/18/2001	SD
		Metals Analyses					
TCLP-Lead	EPA 1311/6010B	BDL	mg/l	0.035	9/12/2001	9/21/2001	KS

Lab ID: 20010819-03
Client ID: 090501-BKGA
Date Sampled: 9/5/2001 4:15:00 PM
Matrix: Other

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
		Radiochemical Analyses					
K-40	HASL 300	7.43 +/- 0.604	pCi/g	0.870		9/17/2001	SD
[illegible]	HASL 300	0.091 +/- 0.027	pCi/g	0.084		9/17/2001	SD
Bi-212	HASL 300	BDL	pCi/g	0.085		9/17/2001	SD
Pb-212	HASL 300	0.174 +/- 0.061	pCi/g	0.788		9/17/2001	SD
Bi-214	HASL 300	0.242 +/- 0.080	pCi/g	0.318		9/17/2001	SD
Pb-214	HASL 300	0.266 +/- 0.077	pCi/g	0.320		9/17/2001	SD
Ac-228	HASL 300	BDL	pCi/g	0.361		9/17/2001	SD
Th-234	HASL 300	BDL	pCi/g	1.57		9/17/2001	SD
U-235	HASL 300	BDL	pCi/g	0.602		9/17/2001	SD
Pa-234	HASL 300	BDL	pCi/g	0.301		9/17/2001	SD
Am-241	HASL 300	ND	pCi/g	0.108		9/17/2001	SD
Co-60	HASL 300	BDL	pCi/g	0.116		9/17/2001	SD
Cs-137	HASL 300	0.347 +/- 0.050	pCi/g	0.140		9/17/2001	SD
		Metals Analyses					
TCLP-Lead	EPA 1311/6010B	BDL	mg/l	0.035	9/12/2001	9/21/2001	KS

Lab ID: 20010819-04
Client ID: 090501-15A
Date Sampled: 9/5/2001 4:00:00 PM
Matrix: Other

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
		Radiochemical Analyses					
K-40	HASL 300	10.7 +/- 0.765	pCi/g	1.10		9/17/2001	SD
Tl-208	HASL 300	BDL	pCi/g	0.210		9/17/2001	SD
[illegible]	HASL 300	0.445 +/- 0.183	pCi/g	0.235		9/17/2001	SD
[illegible]2	HASL 300	BDL	pCi/g	0.312		9/17/2001	SD
Bi-214	HASL 300	0.305 +/- 0.072	pCi/g	0.244		9/17/2001	SD

BDL = Below Detection Limit

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PRELIMINARY REPORT

Client:	U S Ecology Inc.
Client Project:	GNI-Webster FS-01-10
Lab Number:	20010819
Date Reported.	9/28/2001
Date Received:	9/10/01
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Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
Pb-214	HASL 300	BDL	pCi/g	0.359		9/17/2001	SD
Ac-228	HASL 300	0.268 +/- 0.054	pCi/g	0.227		9/17/2001	SD
Th-234	HASL 300	BDL	pCi/g	1.85		9/17/2001	SD
U-235	HASL 300	BDL	pCi/g	0.928		9/17/2001	SD
Pa-234	HASL 300	BDL	pCi/g	0.474		9/17/2001	SD
Am-241	HASL 300	2.33 +/- 0 168	pCi/g	0.548		9/17/2001	S/D
Co-60	HASL 300	BDL	pCi/g	0.082		9/17/2001	SD
Cs-137	HASL 300	46.0 +/- 1.40	pCi/g	0.188		9/17/2001	SD
Metals Analyses							
TCLP-Lead	EPA 1311/6010B	0.025	mg/l	0.007	9/12/2001	9/21/2001	KS

Lab ID: **20010819-05**
ID: **090501-13A**
Sampled: **9/5/2001 3:30:00 PM**
Matrix: **Other**

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
Radiochemical Analyses							
K-40	HASL 300	6.35 +/- 0.533	pCi/g	0.844		9/18/2001	SD
Tl-208	HASL 300	BDL	pCi/g	0.089		9/18/2001	SD
Bi-212	HASL 300	BDL	pCi/g	0.622		9/18/2001	SD
Pb-212	HASL 300	BDL	pCi/g	0.080		9/18/2001	SD
Bi-214	HASL 300	0.234 +/- 0.056	pCi/g	0.170		9/18/2001	SD
Pb-214	HASL 300	0.135 +/- 0.026	pCi/g	0.121		9/18/2001	SD
Ac-228	HASL 300	0.197 +/- 0.053	pCi/g	0.195		9/18/2001	SD
Th-234	HASL 300	BDL	pCi/g	1.70		9/18/2001	SD
U-235	HASL 300	BDL	pCi/g	0.447		9/18/2001	SD
Pa-234	HASL 300	BDL	pCi/g	0.235		9/18/2001	SD
Am-241	HASL 300	2.89 +/- 0.205	pCi/g	0.534		9/18/2001	S/D
Co-60	HASL 300	BDL	pCi/g	0.094		9/18/2001	SD
Cs-137	HASL 300	8.11 +/- 0.274	pCi/g	0.095		9/18/2001	SD
Metals Analyses							
TCLP-Lead	EPA 1311/6010B	BDL	mg/l	0.035	9/12/2001	9/21/2001	KS

Lab ID: **20010819-06**
Client ID: **090501-14A**
Sampled: **9/5/2001 3:00:00 PM**
x: **Other**

Radiochemical Analyses

BDL = Below Detection Limit

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Client:	U S Ecology Inc.
Client Project:	GNI-Webster FS-01-10
Lab Number:	20010819
Date Reported:	9/28/2001
Date Received:	9/10/01
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Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
K-40	HASL 300	10.3 +/- 0.672	pCi/g	0.721		9/18/2001	SD
Tl-208	HASL 300	0.093 +/- 0.025	pCi/g	0.077		9/18/2001	SD
Bi-212	HASL 300	BDL	pCi/g	0.202		9/18/2001	SD
Pb-212	HASL 300	0.419 +/- 0.036	pCi/g	0.160		9/18/2001	SD
Bi-214	HASL 300	0.358 +/- 0.059	pCi/g	0.204		9/18/2001	SD
Pb-214	HASL 300	0.268 +/- 0.040	pCi/g	0.190		9/18/2001	SD
Ac-228	HASL 300	BDL	pCi/g	0.264		9/18/2001	SD
Th-234	HASL 300	1.38 +/- 0.148	pCi/g	1.06		9/18/2001	SD
U-235	HASL 300	BDL	pCi/g	0.770		9/18/2001	SD
Pa-234	HASL 300	BDL	pCi/g	0.411		9/18/2001	SD
Am-241	HASL 300	5.43 +/- 0.225	pCi/g	0.382		9/18/2001	SD
Co-60	HASL 300	0.152 +/- 0.026	pCi/g	0.080		9/18/2001	SD
[illegible]	HASL 300	15.3 +/- 0.483	pCi/g	0.141		9/18/2001	SD
Metals Analyses							
TCLP-Lead	EPA 1311/6010B	1.16	mg/l	0.035	9/12/2001	9/21/2001	KS

Lab ID: **20010819-07**
Client ID: **090501-16 comp.**
Date Sampled: **9/5/2001 2:30:00 PM**
Matrix: **Soil**

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
Radiochemical Analyses							
K-40	HASL 300	8.05 +/- 0.607	pCi/g	0.877		9/18/2001	SD
Tl-208	HASL 300	BDL	pCi/g	0.279		9/18/2001	SD
Bi-212	HASL 300	BDL	pCi/g	0.090		9/18/2001	SD
Pb-212	HASL 300	0.481 +/- 0.101	pCi/g	0.519		9/18/2001	SD
Bi-214	HASL 300	BDL	pCi/g	0.600		9/18/2001	SD
Pb-214	HASL 300	BDL	pCi/g	0.842		9/18/2001	SD
Ac-228	HASL 300	BDL	pCi/g	0.766		9/18/2001	SD
Th-234	HASL 300	BDL	pCi/g	2.47		9/18/2001	SD
U-235	HASL 300	BDL	pCi/g	1.95		9/18/2001	SD
Pa-234	HASL 300	BDL	pCi/g	0.993		9/18/2001	SD
Am-241	HASL 300	95.8 +/- 2.99	pCi/g	0.433		9/18/2001	SD
Co-60	HASL 300	7.73 +/- 0.177	pCi/g	0.178		9/18/2001	SD
Cs-137	HASL 300	174 +/- 5.23	pCi/g	0.420		9/18/2001	SD
Metals Analyses							
Lead	EPA 1311/6010B	28.6	mg/kg	0.007	9/12/2001	9/21/2001	KS

BDL = Below Detection Limit

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Client:	U S Ecology Inc
Client Project:	GNI-Webster FS-01-10
Lab Number:	20010819
Date Reported:	9/28/2001
Date Received:	9/10/01
Page Number:	5 of 14

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
ab ID:	**20010819-08**						
lient ID:	**090501-12A**						
ate Sampled:	**9/5/2001 2:00:00 PM**						
latrix:	**Other**						
	Radiochemical Analyses						
-40	HASL 300	7.55 +/- 0.625	pCi/g	1.07		9/18/2001	SD
i-208	HASL 300	BDL	pCi/g	0.100		9/18/2001	SD
i-212	HASL 300	BDL	pCi/g	0.738		9/18/2001	SD
>-212	HASL 300	1.48 +/- 0.396	pCi/g	0.218		9/18/2001	SD
i-214	HASL 300	0.230 +/- 0.071	pCi/g	0.224		9/18/2001	SD
>-214	HASL 300	BDL	pCi/g	0.223		9/18/2001	SD
c-228	HASL 300	BDL	pCi/g	0.251		9/18/2001	SD
[illegible]	HASL 300	BDL	pCi/g	1.86		9/18/2001	SD
[illegible]	HASL 300	BDL	pCi/g	0.629		9/18/2001	SD
a-234	HASL 300	BDL	pCi/g	0.212		9/18/2001	SD
m-241	HASL 300	BDL	pCi/g	0.753		9/18/2001	SD
o-60	HASL 300	BDL	pCi/g	0.094		9/18/2001	SD
s-137	HASL 300	21.4 +/- 0.675	pCi/g	0.138		9/18/2001	SD
ab ID:	**20010819-09**						
lient ID:	**090501-09 P**						
ate Sampled:	**9/5/2001 1:30:00 PM**						
latrix:	**Other**						
	Radiochemical Analyses						
-40	HASL 300	6.73 +/- 0.852	pCi/g	2.38		9/18/2001	SD
l-208	HASL 300	BDL	pCi/g	2.71		9/18/2001	SD
i-212	HASL 300	BDL	pCi/g	3.43		9/18/2001	SD
b-212	HASL 300	BDL	pCi/g	4.49		9/18/2001	SD
i-214	HASL 300	BDL	pCi/g	0.859		9/18/2001	SD
b-214	HASL 300	BDL	pCi/g	6.21		9/18/2001	SD
c-228	HASL 300	BDL	pCi/g	3.72		9/18/2001	SD
h-234	HASL 300	BDL	pCi/g	20.5		9/18/2001	SD
-235	HASL 300	BDL	pCi/g	14.1		9/18/2001	SD
a-234	HASL 300	BDL	pCi/g	7.13		9/18/2001	SD
[illegible]	HASL 300	34.1 +/- 1.45	pCi/g	3.24		9/18/2001	SD
[illegible]	HASL 300	3.90 +/- 0.132	pCi/g	0.359		9/18/2001	SD

BDL = Below Detection Limit

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PRELIMINARY REPORT

Client:	U S Ecology Inc
Client Project:	GNI-Webster FS-01-10
Lab Number:	20010819
Date Reported:	9/28/2001
Date Received:	9/10/01
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Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
Cs-137	HASL 300	18800 +/- 554	pCi/g	2.11		9/18/2001	SD
Metals Analyses							
TCLP-Lead	EPA 1311/6010B	1.71	mg/l	0.035	9/12/2001	9/21/2001	KS

Lab ID: **20010819-10**
Client ID: **090501-17 L**
Date Sampled: **9/5/2001 1:00:00 PM**
Matrix: **Soil**

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
Radiochemical Analyses							
K-40	HASL 300	0.802 +/- 0.095	pCi/g	0.225		9/18/2001	SD
Tl-208	HASL 300	0.021 +/- 0.006	pCi/g	0.020		9/18/2001	SD
Bi-212	HASL 300	0.059 +/- 0.030	pCi/g	0.038		9/18/2001	SD
P[illegible]	HASL 300	0.176 +/- 0.014	pCi/g	0.054		9/18/2001	SD
B[illegible]	HASL 300	0.056 +/- 0.011	pCi/g	0.037		9/18/2001	SD
Pb-214	HASL 300	0.071 +/- 0.009	pCi/g	0.044		9/18/2001	SD
Ac-228	HASL 300	0.103 +/- 0.020	pCi/g	0.061		9/18/2001	SD
Th-234	HASL 300	BDL	pCi/g	0.364		9/18/2001	SD
U-235	HASL 300	BDL	pCi/g	0.167		9/18/2001	SD
Pa-234	HASL 300	BDL	pCi/g	0.088		9/18/2001	SD
Am-241	HASL 300	0.461 +/- 0.020	pCi/g	0.040		9/18/2001	SD
Co-60	HASL 300	0.044 +/- 0.005	pCi/g	0.016		9/18/2001	SD
Cs-137	HASL 300	3.64 +/- 0.114	pCi/g	0.030		9/18/2001	SD
Metals Analyses							
TCLP-Lead	EPA 1311/6010B	680	mg/l	0.035	9/12/2001	9/21/2001	KS

Lab ID: **20010819-11**
Client ID: **090501-11 S**
Date Sampled: **9/5/2001 12:30:00 PM**
Matrix: **Soil**

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
Radiochemical Analyses							
K-40	HASL 300	8.54 +/- 0.353	pCi/g	0.542		9/19/2001	SD
Tl-208	HASL 300	0.292 +/- 0.035	pCi/g	0.101		9/19/2001	SD
Bi-212	HASL 300	0.229 +/- 0.257	pCi/g	0.037		9/19/2001	SD
Pb-212	HASL 300	13.5 +/- 0.054	pCi/g	0.204		9/19/2001	SD
P[illegible]4	HASL 300	0.578 +/- 0.052	pCi/g	0.308		9/19/2001	SD
[illegible]	HASL 300	0.528 +/- 0.066	pCi/g	0.402		9/19/2001	SD
Ac-228	HASL 300	BDL	pCi/g	0.580		9/19/2001	SD

BDL = Below Detection Limit

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PRELIMINARY REPORT

Client:	U S Ecology Inc
Client Project:	GNI-Webster FS-01-10
Lab Number:	20010819
Date Reported	9/28/2001
Date Received	9/10/01
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Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
234	HASL 300	BDL	pCi/g	17.1		9/19/2001	SD
35	HASL 300	BDL	pCi/g	0.291		9/19/2001	SD
234	HASL 300	BDL	pCi/g	0.273		9/19/2001	SD
-241	HASL 300	0.242 +/- 0.021	pCi/g	0.096		9/19/2001	SD
60	HASL 300	BDL	pCi/g	0.095		9/19/2001	SD
137	HASL 300	16.9 +/- 0.520	pCi/g	0.084		9/19/2001	SD
	Metals Analyses						
P-Lead	EPA 1311/6010B	BDL	mg/l	0.035	9/12/2001	9/21/2001	KS

ID: 20010819-12
nt ID: 090501-10 C
e Sampled: 9/5/2001 11:30:00 AM
ix: Soil

Radiochemical Analyses

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
0	HASL 300	7.21 +/- 0.399	pCi/g	0.514		9/19/2001	SD
208	HASL 300	BDL	pCi/g	0.381		9/19/2001	SD
212	HASL 300	BDL	pCi/g	0.497		9/19/2001	SD
212	HASL 300	BDL	pCi/g	0.691		9/19/2001	SD
214	HASL 300	BDL	pCi/g	0.291		9/19/2001	SD
214	HASL 300	BDL	pCi/g	1.14		9/19/2001	SD
228	HASL 300	BDL	pCi/g	0.283		9/19/2001	SD
234	HASL 300	BDL	pCi/g	8.21		9/19/2001	SD
35	HASL 300	BDL	pCi/g	2.69		9/19/2001	SD
234	HASL 300	BDL	pCi/g	0.467		9/19/2001	SD
-241	HASL 300	BDL	pCi/g	3.28		9/19/2001	SD
60	HASL 300	0.419 +/- 0.021	pCi/g	0.063		9/19/2001	SD
137	HASL 300	1490 +/- 44.6	pCi/g	0.656		9/19/2001	SD

ID: 20010819-13
nt ID: 090501-08 C
e Sampled: 9/5/2001 11:00:00 AM
trix: Soil

Radiochemical Analyses

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
0	HASL 300	8.93 +/- 0.474	pCi/g	0.492		9/19/2001	SD
08	HASL 300	BDL	pCi/g	0.452		9/19/2001	SD
[illegible]	HASL 300	BDL	pCi/g	0.591		9/19/2001	SD
12	HASL 300	BDL	pCi/g	0.821		9/19/2001	SD

DL = Below Detection Limit

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PRELIMINARY REPORT

Client:	U S Ecology Inc.
Client Project:	GNI-Webster FS-01-10
Lab Number:	20010819
Date Reported:	9/28/2001
Date Received:	9/10/01
Page Number:	8 of 14

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
Bi-214	HASL 300	BDL	pCi/g	0.346		9/19/2001	SD
Pb-214	HASL 300	BDL	pCi/g	1.36		9/19/2001	SD
Ac-228	HASL 300	BDL	pCi/g	0.336		9/19/2001	SD
Th-234	HASL 300	BDL	pCi/g	9.76		9/19/2001	SD
U-235	HASL 300	BDL	pCi/g	3.20		9/19/2001	SD
Am-241	HASL 300	3.34 +/- 0.124	pCi/g	0.161		9/19/2001	SD
Co-60	HASL 300	BDL	pCi/g	0.001		9/19/2001	SD
Cs-137	HASL 300	70.4 +/- 2.11	pCi/g	0.245		9/19/2001	SD
Metals Analyses							
TCLP-Lead	EPA 1311/6010B	0.083	mg/l	0.035	9/12/2001	9/21/2001	KS

Lab ID: 20010819-14
ID: 090501-05 S
Sampled: 9/5/2001 10:30:00 AM
Matrix: Soil

Radiochemical Analyses

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
K-40	HASL 300	7.81 +/- 0.729	pCi/g	1.91		9/20/2001	SD
Tl-208	HASL 300	0.307 +/- 0.028	pCi/g	0.081		9/20/2001	SD
Bi-212	HASL 300	0.103 +/- 0.315	pCi/g	0.039		9/20/2001	SD
Pb-212	HASL 300	1.46 +/- 0.053	pCi/g	0.160		9/20/2001	SD
Bi-214	HASL 300	0.609 +/- 0.059	pCi/g	0.314		9/20/2001	SD
Pb-214	HASL 300	0.741 +/- 0.077	pCi/g	0.341		9/20/2001	SD
Ac-228	HASL 300	0.543 +/- 0.119	pCi/g	0.575		9/20/2001	SD
Th-234	HASL 300	BDL	pCi/g	1.70		9/20/2001	SD
U-235	HASL 300	BDL	pCi/g	0.255		9/20/2001	SD
Co-60	HASL 300	BDL	pCi/g	0.084		9/20/2001	SD
Pa-234	HASL 300	BDL	pCi/g	0.213		9/20/2001	SD
Am-241	HASL 300	1.11 +/- 0.043	pCi/g	0.074		9/20/2001	SD
Cs-137	HASL 300	3.55 +/- 0.121	pCi/g	0.052		9/20/2001	SD

Lab ID: 20010819-15
Client ID: 090501-01 S
Date Sampled: 9/5/2001 10:00:00 AM
Matrix: Soil

Radiochemical Analyses

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
[illegible]	HASL 300	6.52 +/- 0.394	pCi/g	0.513		9/21/2001	SD
Tl-208	HASL 300	0.281 +/- 0.028	pCi/g	0.081		9/21/2001	SD

BDL = Below Detection Limit

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1 North Aspen
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8) 251-2515
((918) 251-0008

PRELIMINARY REPORT

Client:	U S Ecology Inc.
Client Project:	GNI-Webster FS-01-10
Lab Number:	20010819
Date Reported:	9/28/2001
Date Received:	9/10/01
Page Number:	9 of 14

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
Bi-212	HASL 300	0.418 +/- 0.119	pCi/g	0.405		9/21/2001	SD
Pb-212	HASL 300	0.657 +/- 0.030	pCi/g	0.050		9/21/2001	SD
Bi-214	HASL 300	0.514 +/- 0.037	pCi/g	0.126		9/21/2001	SD
Pb-214	HASL 300	0.433 +/- 0.027	pCi/g	0.076		9/21/2001	SD
Ac-228	HASL 300	0.794 +/- 0.051	pCi/g	0.215		9/21/2001	SD
Th-234	HASL 300	BDL	pCi/g	0.872		9/21/2001	SD
U-235	HASL 300	BDL	pCi/g	0.299		9/21/2001	SD
Co-60	HASL 300	BDL	pCi/g	0.061		9/21/2001	SD
Pa-234	HASL 300	BDL	pCi/g	0.872		9/21/2001	SD
Am-241	HASL 300	BDL	pCi/g	0.297		9/21/2001	SD
Cs-137	HASL 300	3.82 +/- 0.128	pCi/g	0.080		9/21/2001	SD

D: 20010819-16
ID: 090801-018
Date Sampled: 9/8/2001 4:00:00 PM
Matrix: Other

Radiochemical Analyses

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
K-40	HASL 300	ND	pCi/sample	4490		9/27/2001	RE
Bi-214	HASL 300	ND	pCi/sample	1220		9/27/2001	RE
Pb-214	HASL 300	ND	pCi/sample	17300		9/27/2001	RE
Co-60	HASL 300	ND	pCi/sample	944		9/27/2001	RE
Cs-137	HASL 300	56400 +/- 16900	pCi/sample	1360		9/27/2001	RE
Sr-90	ASTM	5.34 +/- 0.013	uCi/F	0.000335			RE

Lab ID: 20010819-17
Client ID: 090801-20
Date Sampled: 9/7/2001 3:00:00 PM
Matrix: Soil

Radiochemical Analyses

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
K-40	HASL 300	8.70 +/- 1.18	pCi/g	2.16		9/20/2001	SD
Tl-208	HASL 300	BDL	pCi/g	0.296		9/20/2001	SD
Bi-212	HASL 300	BDL	pCi/g	0.812		9/20/2001	SD
Pb-212	HASL 300	BDL	pCi/g	1.24		9/20/2001	SD
[illegible]4	HASL 300	BDL	pCi/g	1.09		9/20/2001	SD
[illegible]4	HASL 300	BDL	pCi/g	1.75		9/20/2001	SD

BDL = Below Detection Limit

each
Laboratory
North Aspen
en Arrow, OK 74012
251-2515
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PRELIMINARY REPORT

Client:	U S Ecology Inc.
Client Project:	GNI-Webster FS-01-10
Lab Number:	20010819
Date Reported:	9/28/2001
Date Received:	9/10/01
Page Number:	10 of 14

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
Ac-228	HASL 300	BDL	pCi/g	2.48		9/20/2001	SD
Th-234	HASL 300	BDL	pCi/g	9.71		9/20/2001	SD
U-235	HASL 300	BDL	pCi/g	3.51		9/20/2001	SD
Co-60	HASL 300	8 93 +/- 0.203	pCi/g	0.278		9/20/2001	SD
Pa-234	HASL 300	BDL	pCi/g	1.87		9/20/2001	SD
Am-241	HASL 300	2710 +/- 84.2	pCi/g	2.22		9/20/2001	SD
Cs-137	HASL 300	246 +/- 7.38	pCi/g	0.766		9/20/2001	SD

Lab ID: 20010819-18
Client ID: 090701-21
Date Sampled: 9/7/2001 2:30:00 PM
Matrix: Other

Radiochemical Analyses

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
K-	HASL 300	2.74 +/- 0.545	pCi/g	1.51		9/21/2001	SD
Tl-208	HASL 300	BDL	pCi/g	0.349		9/21/2001	SD
Bi-212	HASL 300	BDL	pCi/g	1.31		9/21/2001	SD
Pb-212	HASL 300	BDL	pCi/g	0.432		9/21/2001	SD
Bi-214	HASL 300	BDL	pCi/g	0.477		9/21/2001	SD
Pb-214	HASL 300	1.33 +/- 0.438	pCi/g	0 578		9/21/2001	SD
Ac-228	HASL 300	BDL	pCi/g	0.603		9/21/2001	SD
Th-234	HASL 300	15 3 +/- 2.44	pCi/g	7.56		9/21/2001	SD
U-235	HASL 300	BDL	pCi/g	1 70		9/21/2001	SD
Co-60	HASL 300	0.579 +/- 0.043	pCi/g	0 121		9/21/2001	SD
Pa-234	HASL 300	BDL	pCi/g	1.03		9/21/2001	SD
Am-241	HASL 300	BDL	pCi/g	35.6		9/21/2001	SD
Cs-137	HASL 300	223 +/- 6.73	pCi/g	0 557		9/21/2001	SD

Lab ID: 20010819-19
Client ID: 090501-06
Date Sampled: 9/5/2001 9:30:00 AM
Matrix: Soil

Radiochemical Analyses

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
K-40	HASL 300	8 03 +/- 0 683	pCi/g	1.35		9/21/2001	SD
Tl-208	HASL 300	0.355 +/- 0 050	pCi/g	0.217		9/21/2001	SD
[illegible]	HASL 300	0 673 +/- 0.321	pCi/g	0 136		9/21/2001	SD
[illegible]	HASL 300	0 951 +/- 0 131	pCi/g	0 659		9/21/2001	SD
Bi-214	HASL 300	BDL	pCi/g	0.635		9/21/2001	SD

BDL = Below Detection Limit

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251-2515
'18) 251-0008

PRELIMINARY REPORT

Client:	U S Ecology Inc.
Client Project:	GNI-Webster FS-01-10
Lab Number:	20010819
Date Reported:	9/28/2001
Date Received:	9/10/01
Page Number:	11 of 14

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
ɔ-214	HASL 300	BDL	pCi/g	0.895		9/21/2001	SD
ꞇ-228	HASL 300	BDL	pCi/g	1.14		9/21/2001	SD
ı-234	HASL 300	BDL	pCi/g	3.71		9/21/2001	SD
-235	HASL 300	BDL	pCi/g	1.28		9/21/2001	SD
ɔ-60	HASL 300	BDL	pCi/g	0.227		9/21/2001	SD
ı-234	HASL 300	BDL	pCi/g	0.642		9/21/2001	SD
m-241	HASL 300	16.5 +/- 0.536	pCi/g	0.330		9/21/2001	SD
s-137	HASL 300	119 +/- 3.63	pCi/g	0.365		9/21/2001	SD

ab ID: **20010819-20**
lient ID: **090501-07 R**
ate Sampled: **9/5/2001 9:00:00 AM**
x: **Other**

Radiochemical Analyses

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
-40	HASL 300	ND	pCi/sample	444		9/27/2001	RE
ı-214	HASL 300	ND	pCi/sample	252		9/27/2001	RE
b-214	HASL 300	ND	pCi/sample	20000		9/27/2001	RE
o-60	HASL 300	BDL	pCi/sample	127		9/27/2001	RE
s-137	HASL 300	543000 +/- 39900	pCi/sample	754		9/27/2001	RE
m-241	HASL 300	4570 +/- 575	pCi/sample	1820		9/27/2001	RE

ab ID: **20010819-21**
lient ID: **090501-22**
Date Sampled: **9/7/2001 2:00:00 PM**
Matrix: **Other**

Radiochemical Analyses

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
-40	HASL 300	237 +/- 58	pCi/sample	172		9/26/2001	E/D
Bi-214	HASL 300	ND	pCi/sample	29.9		9/26/2001	E/D
Pb-214	HASL 300	ND	pCi/sample	49.2		9/26/2001	E/D
Co-60	HASL 300	BDL	pCi/sample	6.6		9/26/2001	E/D
Cs-137	HASL 300	4240 +/- 130	pCi/sample	23.2		9/26/2001	E/D
Am-241	HASL 300	9620 +/- 309	pCi/sample	23.1		9/26/2001	E/D

BDL = Below Detection Limit

[illegible]each
[illegible]oratory
North Aspen
[illegible]en Arrow, OK 74012
[illegible] 251-2515
(918) 251-0008

PRELIMINARY REPORT

Client:	U S Ecology Inc.
Client Project:	GNI-Webster FS-01-10
Lab Number:	20010819
Date Reported:	9/28/2001
Date Received:	9/10/01
Page Number:	12 of 14

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
Lab ID:	**20010819-22**						
Client ID:	**090701-23**						
Date Sampled:	**9/7/2001 1:30:00 PM**						
Matrix:	**Other**						
		Radiochemical Analyses					
K-40	HASL 300	ND	pCi/sample	175		9/26/2001	E/D
Bi-214	HASL 300	ND	pCi/sample	86		9/26/2001	E/D
Pb-214	HASL 300	ND	pCi/sample	58		9/26/2001	E/D
Co-60	HASL 300	ND	pCi/sample	20.6		9/26/2001	E/D
Cs-137	HASL 300	619000 +/- 63800	pCi/sample	431		9/26/2001	E/D
Am-241	HASL 300	ND	pCi/sample	17.7		9/26/2001	E/D
Lab ID:	**20010819-23**						
Client ID:	**090701-24**						
Date Sampled:	**9/7/2001 1:00:00 PM**						
Matrix:	**Water**						
		Radiochemical Analyses					
K-40	HASL 300	ND	pCi/l	530		9/20/2001	E/D
Bi-214	HASL 300	ND	pCi/l	74		9/20/2001	E/D
Pb-214	HASL 300	ND	pCi/l	79		9/20/2001	E/D
Co-60	HASL 300	ND	pCi/l	37.4		9/20/2001	E/D
Cs-137	HASL 300	BDL	pCi/l	27		9/20/2001	E/D
Am-241	HASL 300	ND	pCi/l	19.7		9/20/2001	E/D
H-3	EPA 906	70.1 +/- 0.16	uCi/L	0.004	9/20/2001	9/28/2001	M/E
Lab ID:	**20010819-24**						
Client ID:	**090701-25**						
Date Sampled:	**9/7/2001 11:00:00 AM**						
Matrix:	**Other**						
		Radiochemical Analyses					
K-40	HASL 300	220 +/- 72	pCi/sample	184		9/26/2001	E/D
Bi-214	HASL 300	ND	pCi/sample	52		9/26/2001	E/D
Pb-214	HASL 300	ND	pCi/sample	74		9/26/2001	E/D
[illegible]	HASL 300	ND	pCi/sample	25		9/26/2001	E/D
[illegible]	HASL 300	1220 +/- 49	pCi/sample	33		9/26/2001	E/D

BDL - Below Detection Limit

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aboratory
North Aspen
en Arrow, OK 74012
3) 251-2515
(918) 251-0008

PRELIMINARY REPORT

Client:	U S Ecology Inc.
Client Project:	GNI-Webster FS-01-10
Lab Number:	20010819
Date Reported:	9/28/2001
Date Received:	9/10/01
Page Number:	13 of 14

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
Am-241	HASL 300	879000 +/- 27600	pCi/sample	364		9/26/2001	E/D

Lab ID: **20010819-25**
Client ID: **090701-26**
Date Sampled: **9/7/2001 10:30:00 AM**
Matrix: **Other**

Radiochemical Analyses

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
K-40	HASL 300	ND	pCi/sample	262		9/26/2001	E/D
Bi-214	HASL 300	ND	pCi/sample	55		9/26/2001	E/D
Pb-214	HASL 300	ND	pCi/sample	131		9/26/2001	E/D
Co-60	HASL 300	ND	pCi/sample	24		9/26/2001	E/D
(7	HASL 300	19300 +/- 567	pCi/sample	57		9/26/2001	E/D
A 41	HASL 300	119000 +/- 3980	pCi/sample	104		9/26/2001	E/D

Lab ID: **20010819-26**
Client ID: **090701-27**
Date Sampled: **9/7/2001 10:00:00 AM**
Matrix: **Other**

Radiochemical Analyses

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
K-40	HASL 300	ND	pCi/sample	68		9/26/2001	E/D
Bi-214	HASL 300	ND	pCi/sample	14		9/26/2001	E/D
Pb-214	HASL 300	ND	pCi/sample	22		9/26/2001	E/D
Co-60	HASL 300	36 +/- 3.1	pCi/sample	4.6		9/26/2001	E/D
Cs-137	HASL 300	4630 +/- 387	pCi/sample	16		9/26/2001	E/D
Am-241	HASL 300	ND	pCi/sample	94		9/26/2001	E/D

Lab ID: **20010819-27**
Client ID: **090801-019**
Date Sampled: **9/7/2001 3:30:00 PM**
Matrix: **Other**

Radiochemical Analyses

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
K-40	HASL 300	1.69 +/- 0.270	pCi/ml	0.635		9/24/2001	SD
T 08	HASL 300	0.091 +/- 0.022	pCi/ml	0.067		9/24/2001	SD
[illegible]	HASL 300	BDL	pCi/ml	0.448		9/24/2001	SD
Pb-212	HASL 300	BDL	pCi/ml	0.160		9/24/2001	SD

BDL - Below Detection Limit

Outreach Laboratory
North Aspen
Broken Arrow, OK 740
(918) 251-2515
(918) 251-0008

PRELIMINARY REPORT

Client:	U S Ecology Inc.
Client Project:	GNI-Webster FS-01-10
Lab Number:	20010819
Date Reported:	9/28/2001
Date Received:	9/10/01
Page Number:	14 of 14

Analytical Report

	Method	Result	Units	DL	Prep Date	Analysis Date	Analyst
Bi-214	HASL 300	BDL	pCi/ml	0.111		9/24/2001	SD
Pb-214	HASL 300	BDL	pCi/ml	0.957		9/24/2001	SD
Ac-228	HASL 300	BDL	pCi/ml	0.311		9/24/2001	SD
Th-234	HASL 300	BDL	pCi/ml	1.25		9/24/2001	SD
U-235	HASL 300	BDL	pCi/ml	0.631		9/24/2001	SD
Co-60	HASL 300	BDL	pCi/ml	0.089		9/24/2001	SD
Cs-137	HASL 300	0.471 +/- 0.036	pCi/ml	0.075		9/24/2001	SD
Am-241	HASL 300	1230 +/- 39.6	pCi/ml	3.41		9/24/2001	SD

QC Report

Parameter	Blank	LCS %REC	LCSD %REC	LCSD RPD	DUP RPD	MS %REC	MSD %REC	MSD RPD	Date
Ac-228	BDL				4.1				9/26/2001
Co-57		76.2							9/26/2001
Co-60		94.5							9/26/2001
Co-60		99.0							9/27/2001
Cs-137	BDL	88.3			0.0				9/26/2001
Cs-137	BDL	96.3			17.1				9/27/2001
H-3	BDL	115.0			NC	105.0			9/27/2001
K-40									9/25/2001
K-40	BDL	116.0			19.2				9/26/2001
Mn-54		111.0							9/26/2001
Mn-54		103.0							9/27/2001
Pb-212	BDL				18.7				9/26/2001
Pb-214	BDL				35.6				9/26/2001
TCLP-Lead	BDL	97.0				DO	DO		9/21/2001
TCLP-Lead	BDL	121.0				129.0	136.0	5.1	9/13/2001

Reviewed By:

Lab Approval:

BDL = Below Detection Limit

MICROTEC SERVICES, INC.
110 Charles Street • Pasadena, TX 77506
Tel (713) 475-2274 Fax (713) 475-2362

LEAK TESTING
CALIBRATIONS
REPAIR
NEW INSTRUMENTS

August 3. 2001

Elick Acre
The GNI Group. Inc.
P.O. Box 220
Deer Park. Tx. 77536

REF: Soil sample analysis

The following are analysis results of the 66 soil samples we received on August 2, 2001.

Description of Analysis:

In order to get a representative sample for counting, a portion of each sample was divided into 3 test tubes measuring 12mm X 75mm an weighed (approximately 6 grams in each test tube). These were counted for 1 minute each using a Packard Instruments model 5003 Cobra Automatic Gamma Counter with a 3"x3" NaI well detector and MCA. Since Cs-137 was the only isotope of interest, a NIST traceable Cs-137 rod standard (0.0911 uCi. on 8-2-2001) was counted for 15 minutes to calculate counting efficiency for the 662 keV photopeak. Background was counted for 60 minutes to establish minimum detection limits. Counts and weights from the 3 test tubes for each sample were averaged. Results of the analysis are attached.

If you have any questions cocerning this report, please call me at 713-475-2274. Thank you.

Regards,

Quintin A. Stokley
President
Microtec Services, Inc.

MICROTEC SERVICES, INC.

110 Charles Street • Pasadena, TX 77506
Tel (713) 475-2274 Fax (713) 475-2362

LEAK TESTING
CALIBRATIONS
REPAIR
NEW INSTRUMENTS

*** SOIL SAMPLE ANALYSIS FOR Cs-137 ***

DATE: August 3. 2001 PAGE 1 OF 7

ELICK ACREE
THE GNI GROUP. INC.
P.O. BOX 220
DEER PARK. TX. 77536

COUNTING EFF = 25.69%
AVERAGE BKG (CPM) = 15.8
MDA (pCi/g) = 0.7897 pCi/g +/- 0.2117 pCi/g
(ERRORS QUOTED AT 2 SIGMA)

SAMPLE NUMBER	SAMPLE DESCRIPTION	NET ACTIVITY (pCi/g)	ERROR +/- (pCi/g)
1	B-1-1	408.8	22.5
2	B-1-2	173.3	14.6
3	B-2-1	56.5	10.2
4	B-2-2	77.4	12.3
5	B-3-1	395.9	22.2
6	B-3-2	428.2	23.3
7	B-4-1	28.0	7.0
8	B-4-2	57.1	10.2
9	B-5-1	5.9	4.2
10	B-5-2	5.5	4.3

NOTE: * INDICATES LESS THAN MINIMUM DETECTABLE ACTIVITY

8-3-01

SIGNATURE DATE

MICROTEC SERVICES, INC.
110 Charles Street • Pasadena, TX 77506
Tel (713) 475-2274 Fax (713) 475-2362

LEAK TESTING
CALIBRATIONS
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NEW INSTRUMENTS

*** SOIL SAMPLE ANALYSIS FOR Cs-137 ***

DATE: August 3. 2001

ELICK ACREE
THE GNI GROUP. INC.
P.O. BOX 220
DEER PARK. TX. 77536

COUNTING EFF = 25.69%
AVERAGE BKG (CPM) = 15.8
MDA (pCi/g) = 0.7897 pCi/g +/- 0.2117 pCi/g
(ERRORS QUOTED AT 2 SIGMA)

SAMPLE NUMBER	SAMPLE DESCRIPTION	NET ACTIVITY (pCi/g)	ERROR +/- (pCi/g)
11	B-6-1	222.9	19.0
12	B-6-2	115.9	14.5
13	B-7-1	46.7	8.9
14	B-7-2	209.4	17.0
15	B-8-1	62.2	10.6
16	B-8-2	28.2	7.6
17	B-9-1	35.7	7.8
18	B-9-2	182.2	15.8
19	B-10-1	58.1	9.3
20	B-10-2	19.6	6.3

NOTE: * INDICATES LESS THAN MINIMUM DETECTABLE ACTIVITY

SIGNATURE

8-3-01
DATE

MICROTEC SERVICES, INC.

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Tel (713) 475-2274 Fax (713) 475-2362

LEAK TESTING
CALIBRATIONS
REPAIR
NEW INSTRUMENTS

*** SOIL SAMPLE ANALYSIS FOR Cs-137 ***

DATE: August 3. 2001

ELICK ACREE
THE GNI GROUP. INC.
P.O. BOX 220
DEER PARK. TX. 77536

COUNTING EFF = 25.69%
AVERAGE BKG (CPM) = 15.8
MDA (pCi/g) = 0.7897 pCi/g +/- 0.2117 pCi/g
ERRORS QUOTED AT 2 SIGMA)

SAMPLE NUMBER	SAMPLE DESCRIPTION	NET ACTIVITY (pCi/g)	ERROR +/- (pCi/g)
21	B-11-1	343.1	20.8
22	B-11-2	529.3	26.5
23	B-12-1	114.1	14.4
24	B-12-2	187.7	18.6
25	B-13-1	735.0	32.1
26	B-13-2	341.9	21.6
27	B-14-1	22.5	6.1
28	B-14-2	5304.1	83.3
29	B-15-1	120.0	15.2
30	B-15-2	3.6	3.7

NOTE: * INDICATES LESS THAN MINIMUM DETECTABLE ACTIVITY

SIGNATURE

8-3-01
DATE

MICROTEC SERVICES, INC.
110 Charles Street • Pasadena, TX 77506
Tel (713) 475-2274 Fax (713) 475-2362

LEAK TESTING
CALIBRATIONS
REPAIR
NEW INSTRUMENTS

*** SOIL SAMPLE ANALYSIS FOR Cs-137 ***

DATE: August 3. 2001

ELICK ACREE
THE GNI GROUP. INC.
P.O. BOX 220
DEER PARK. TX. 77536

COUNTING EFF = 25.69%
AVERAGE BKG (CPM) = 15.8
MDA (pCi/g) = 0.7897 pCi/g +/- 0.2117 pCi/g
ERRORS QUOTED AT 2 SIGMA)

SAMPLE NUMBER	SAMPLE DESCRIPTION	NET ACTIVITY (pCi/g)	ERROR +/- (pCi/g)
31	B-16-1	17.4	6.4
32	B-16-2	31.4	7.7
33	B-17-1	6.5	4.7
34	B-17-2	5.0	4.4
35	B-18-1	97.8	11.9
36	B-18-2	92.9	12.2
37	B-19-1	197.8	18.0
38	B-19-2	1267.9	43.6
39	B-20-1	29.1	7.8
40	B-20-2	140.6	15.3

NOTE: * INDICATES LESS THAN MINIMUM DETECTABLE ACTIVITY

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ERRORS QUOTED AT 2 SIGMA)

SAMPLE NUMBER	SAMPLE DESCRIPTION	NET ACTIVITY (pCi/g)	ERROR +/- (pCi/g)
41	B-21-1	16.8	6.6
42	B-21-2	5.3	4.6
43	B-22-1	351.7	24.9
44	B-22-2	168.2	16.4
45	B-23-1	15.8	6.0
46	B-23-2	21.2	7.1
47	B-24-1	45.8	8.7
48	B-24-2	43.7	9.1
49	B-25-1	287.8	20.3
50	B-25-2	1115.8	40.0

NOTE: * INDICATES LESS THAN MINIMUM DETECTABLE ACTIVITY

SIGNATURE

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:RRORS QUOTED AT 2 SIGMA)

SAMPLE NUMBER	SAMPLE DESCRIPTION	NET ACTIVITY (pCi/g)	ERROR +/- (pCi/g)
51	B-26-1	167.3	13.4
52	B-26-2	201.1	16.6
53	B-27-1	398.8	24.6
54	B-27-2	214.5	17.6
55	B-28-1	23.5	6.3
56	B-28-2	3.1	3.4
57	B-29-1	20.1	6.3
58	B-29-2	13.1	5.5
59	B-30-1	15.6	5.5
60	B-30-2	14.6	5.2

NOTE: * INDICATES LESS THAN MINIMUM DETECTABLE ACTIVITY

GNATURE

8-3-01
DATE

MICROTEC SERVICES, INC.

110 Charles Street • Pasadena, TX 77506
Tel (713) 475-2274 Fax (713) 475-2362

LEAK TESTING
CALIBRATIONS
REPAIR
NEW INSTRUMENTS

*** SOIL SAMPLE ANALYSIS FOR Cs-137 ***

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ELICK ACREE
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COUNTING EFF = 25.69%
AVERAGE BKG (CPM) = 15.8
MDA (pCi/g) = 0.7897 pCi/g +/- 0.2117 pCi/g
(ERRORS QUOTED AT 2 SIGMA)

SAMPLE NUMBER	SAMPLE DESCRIPTION	NET ACTIVITY (pCi/g)	ERROR +/- (pCi/g)
61	B-31-1	[illegible]	[illegible]
62	B-[illegible]	[illegible].4	[illegible]
[illegible]	[illegible]-1	5[illegible]	11.7
[illegible]	B-32-[illegible]	19.[illegible]	6.[illegible]
65	B-33-1	4[illegible].7	[illegible]
66	B-33-2	4[illegible].7	[illegible]

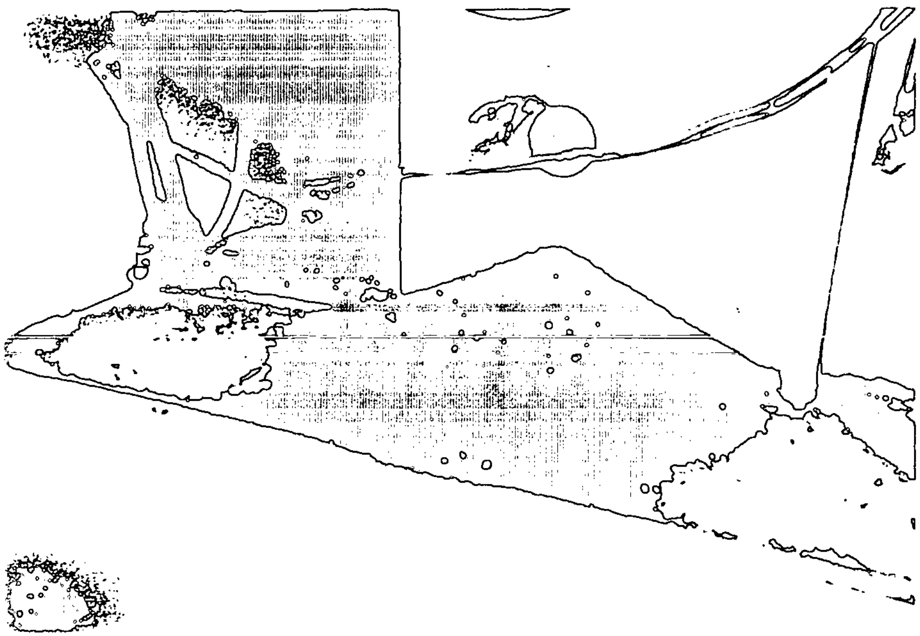
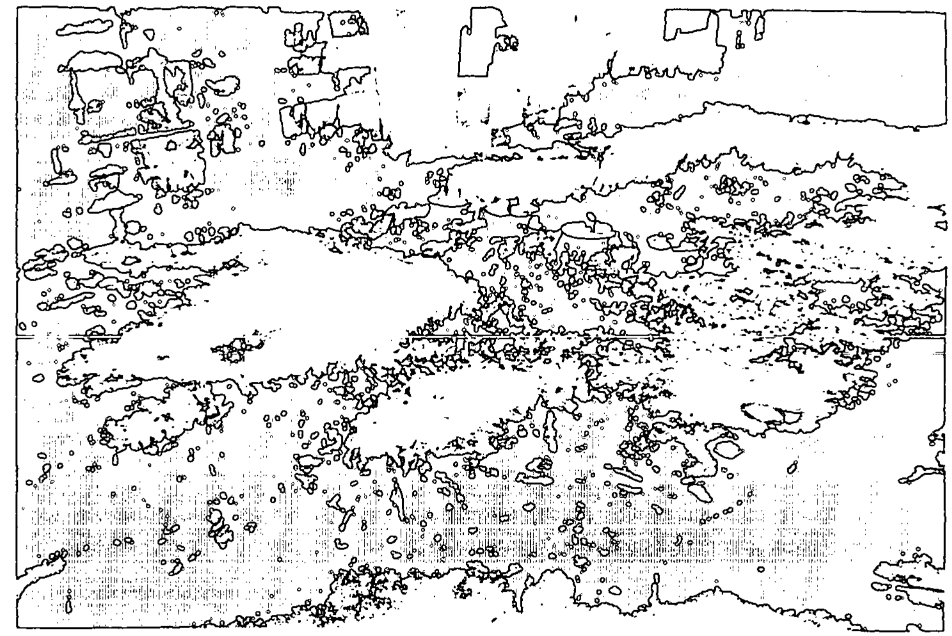
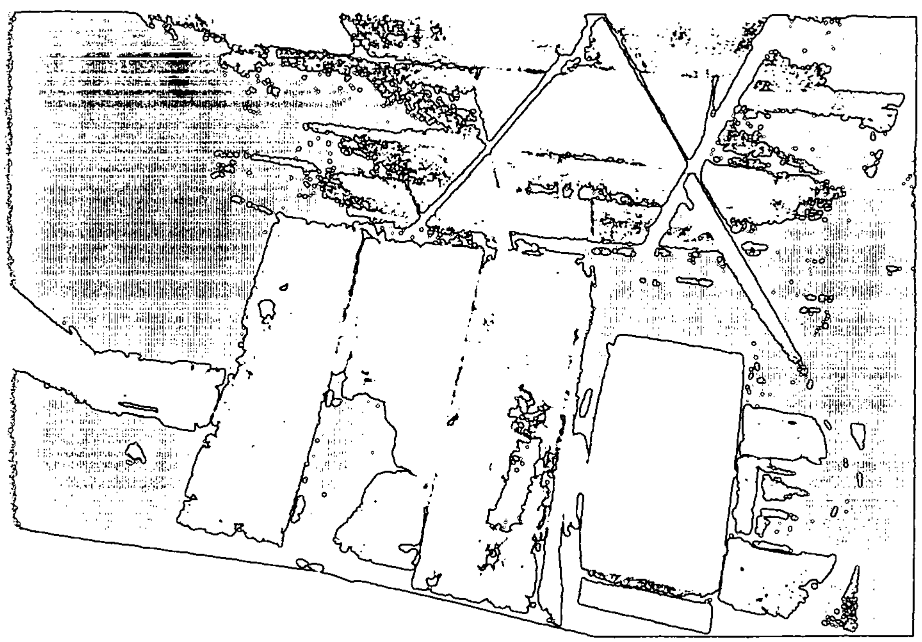
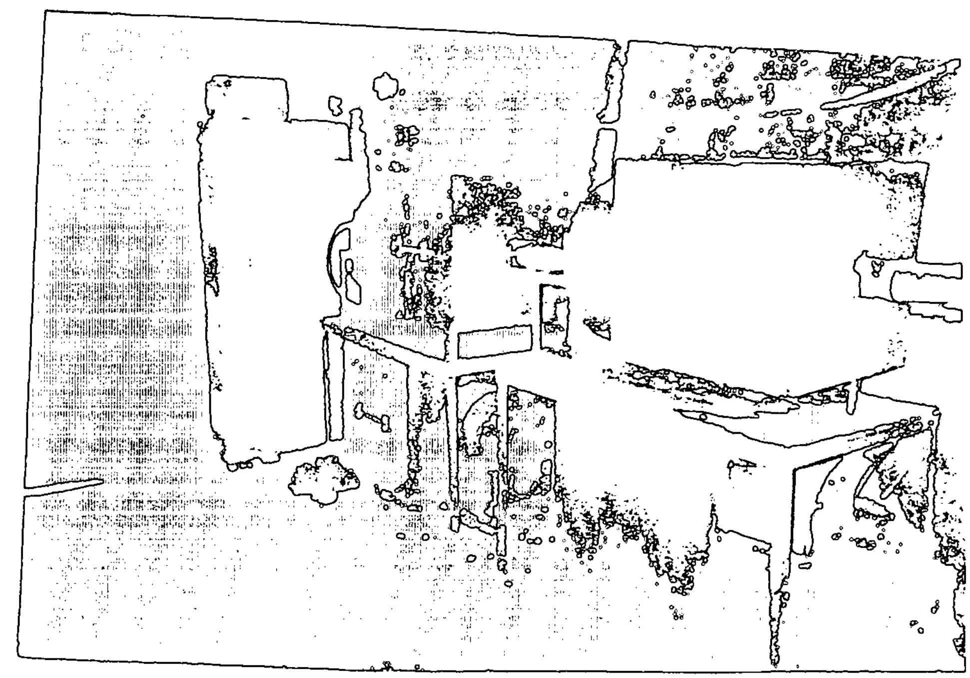
NOTE: * INDICATES LESS THAN MINIMUM DETECTABLE ACTIVITY

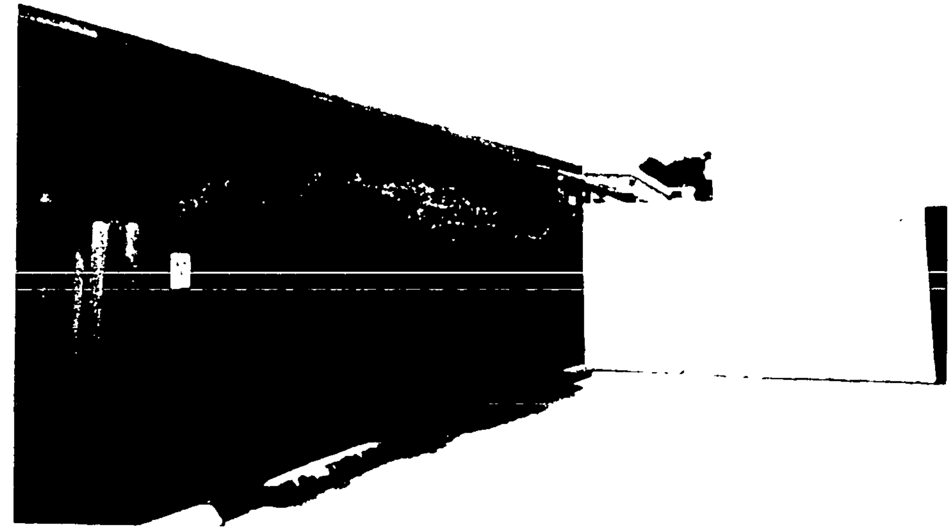
SIGNATURE

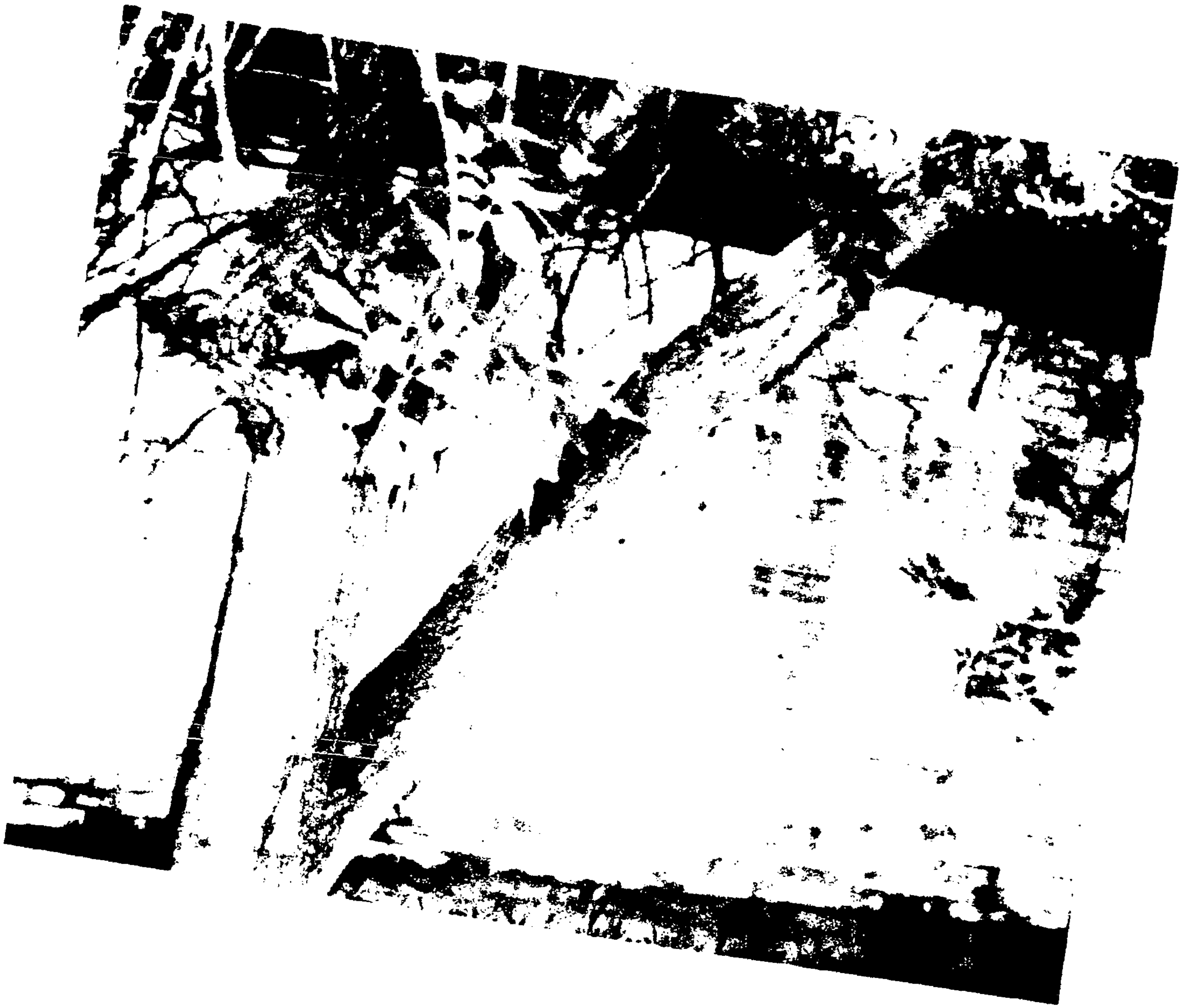
8-3-01
DATE

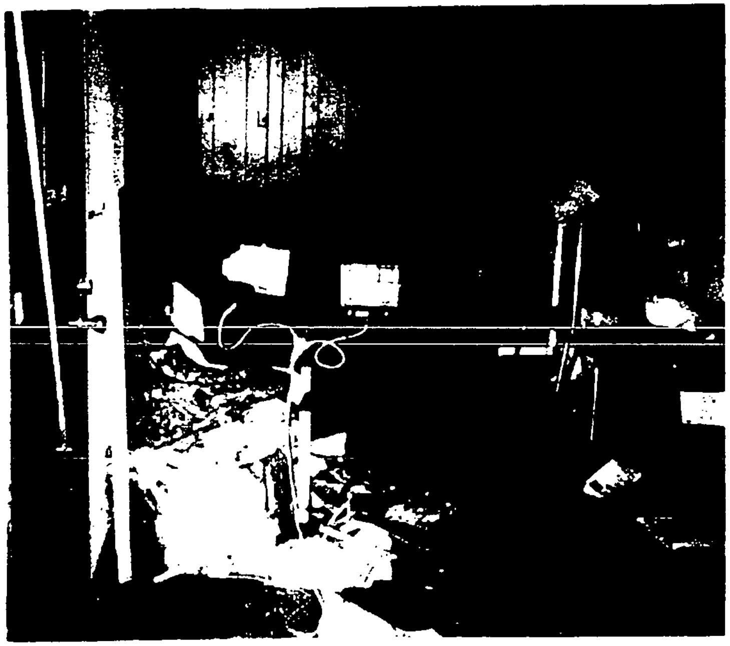
Attachment B

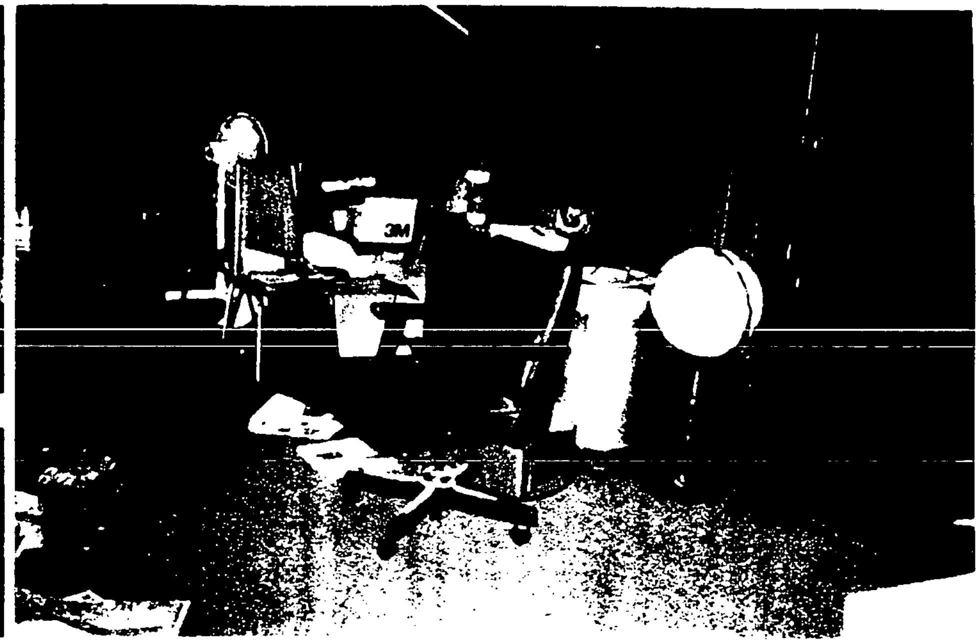
Photographs



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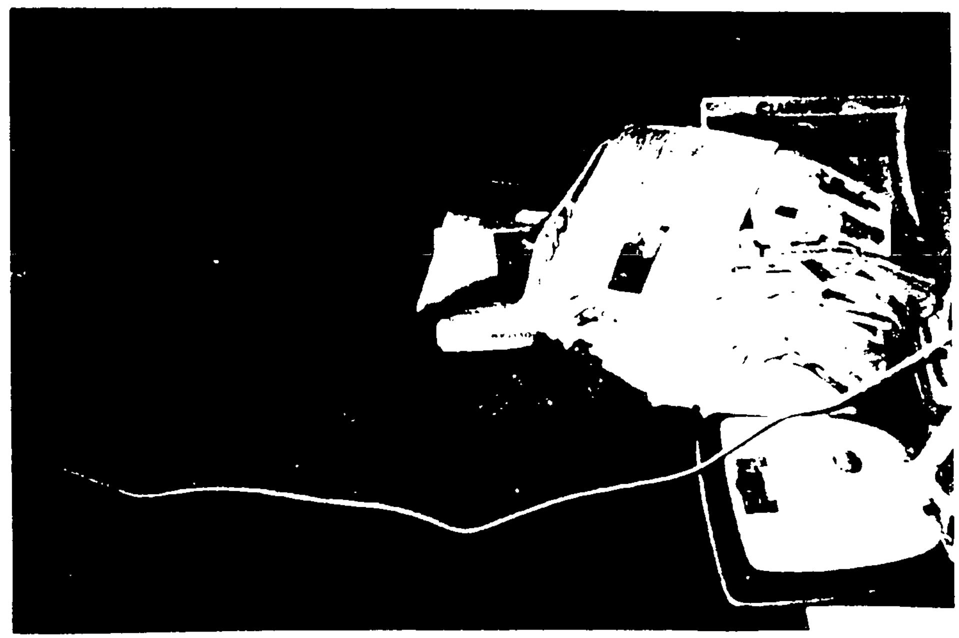

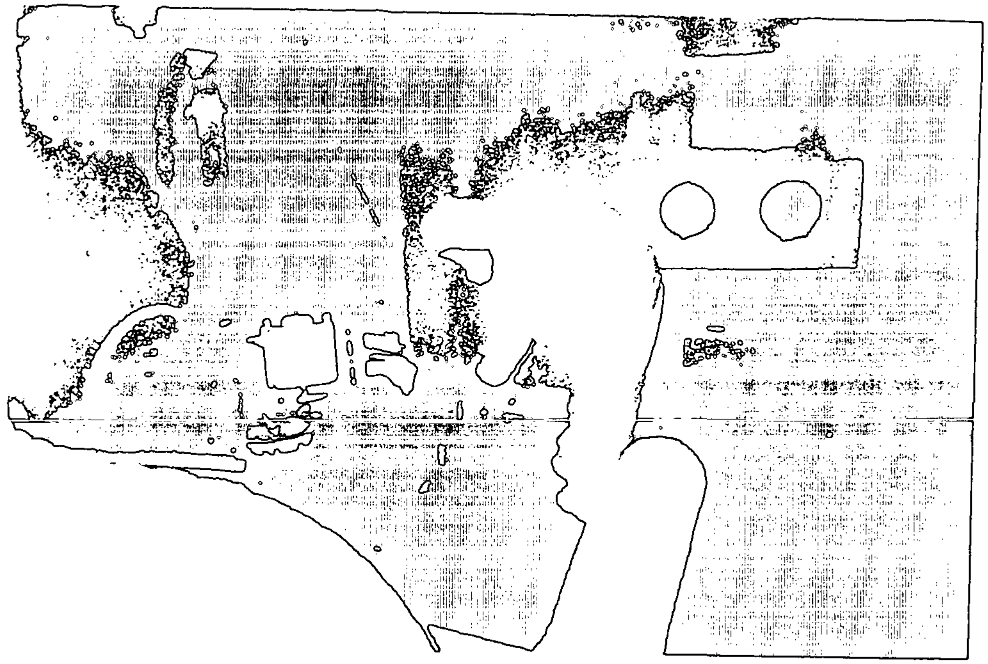

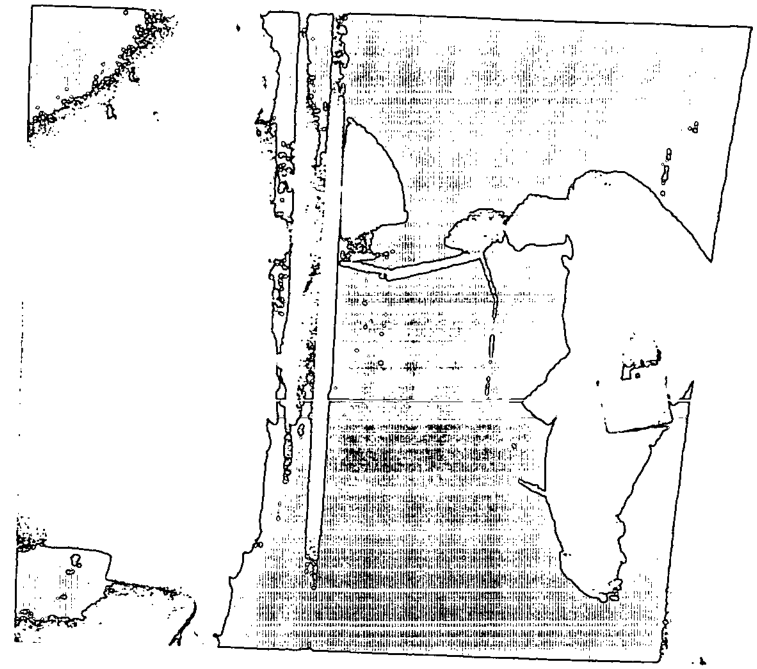

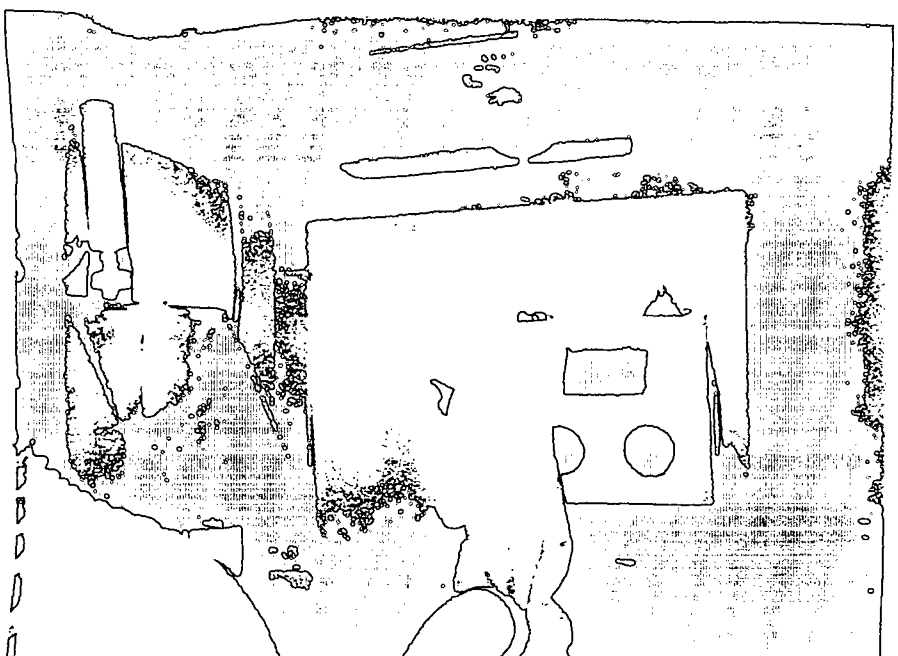

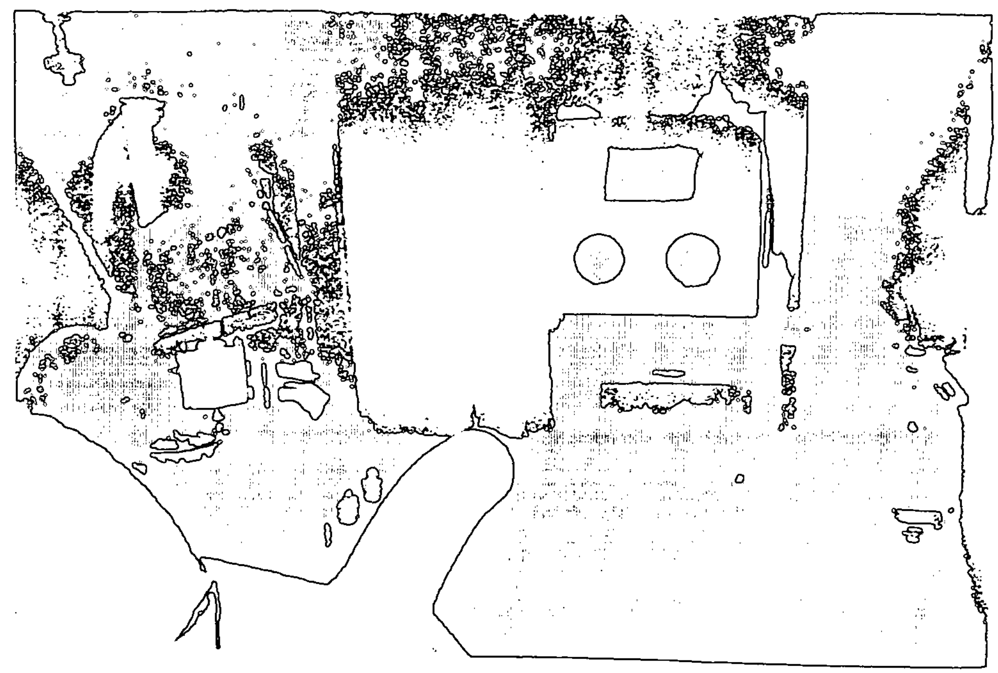

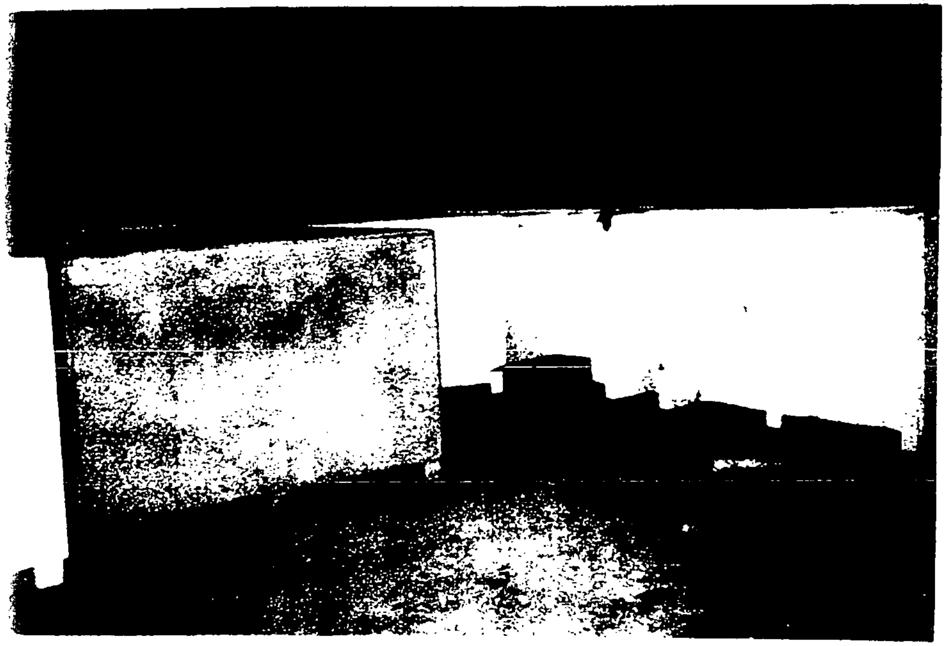

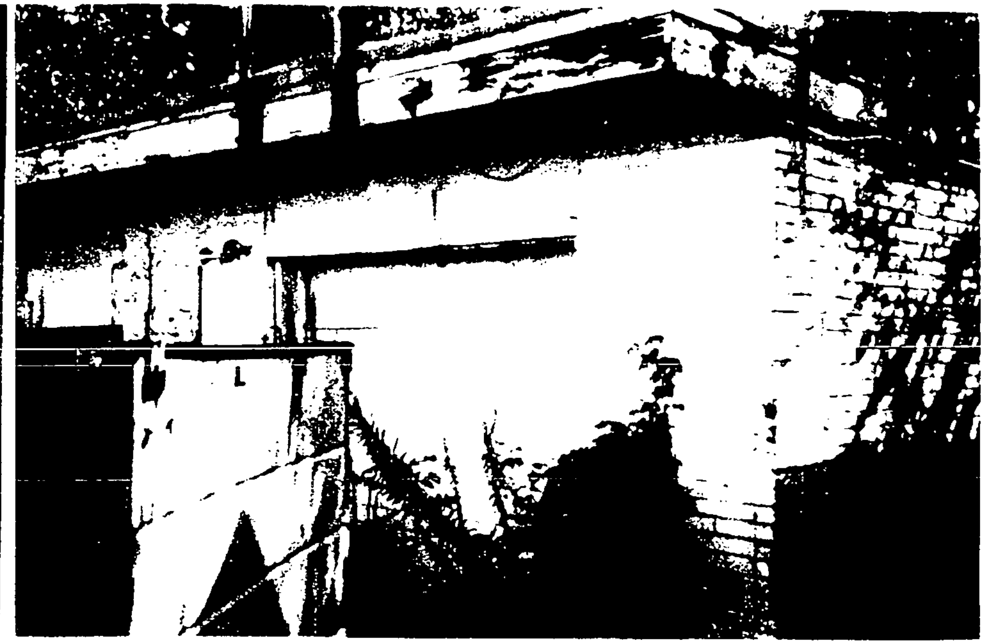

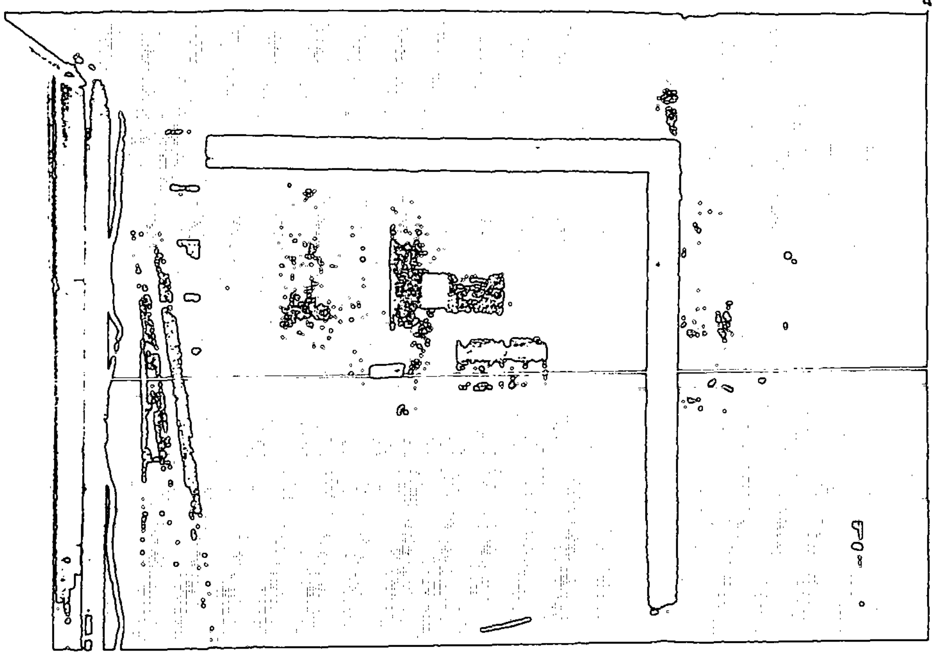
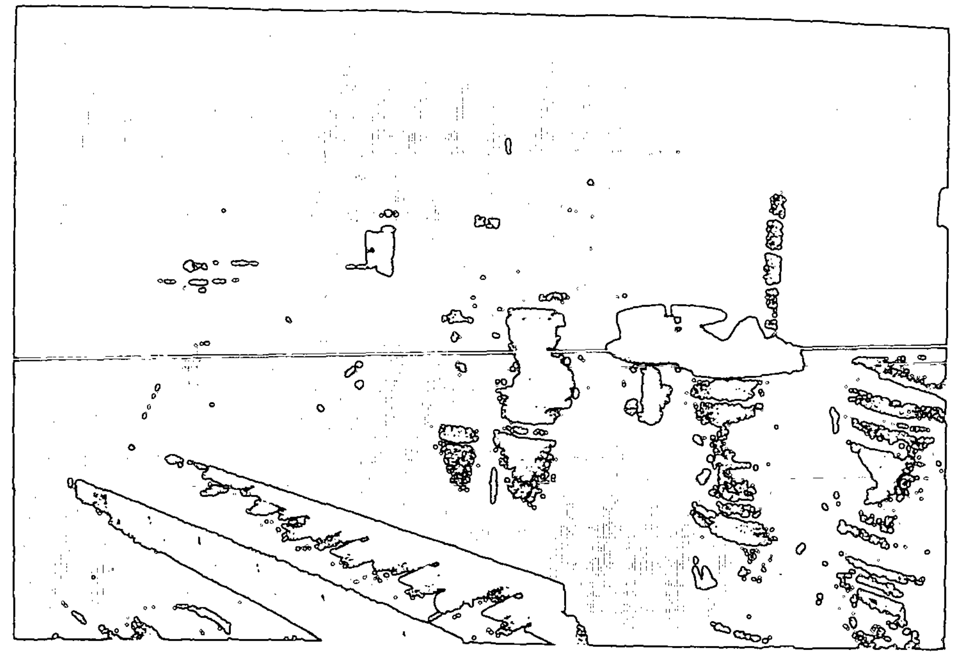
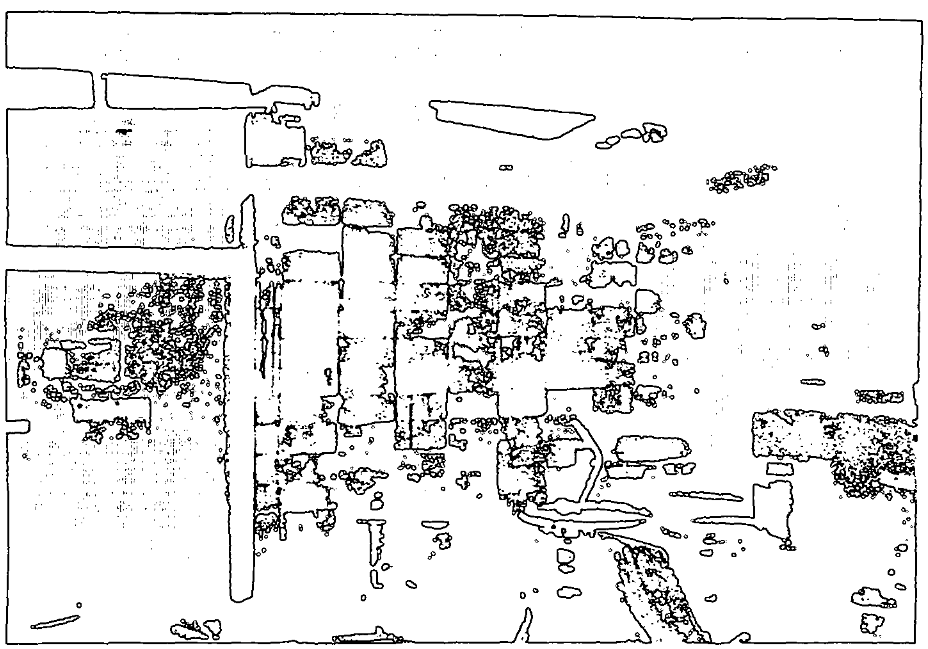
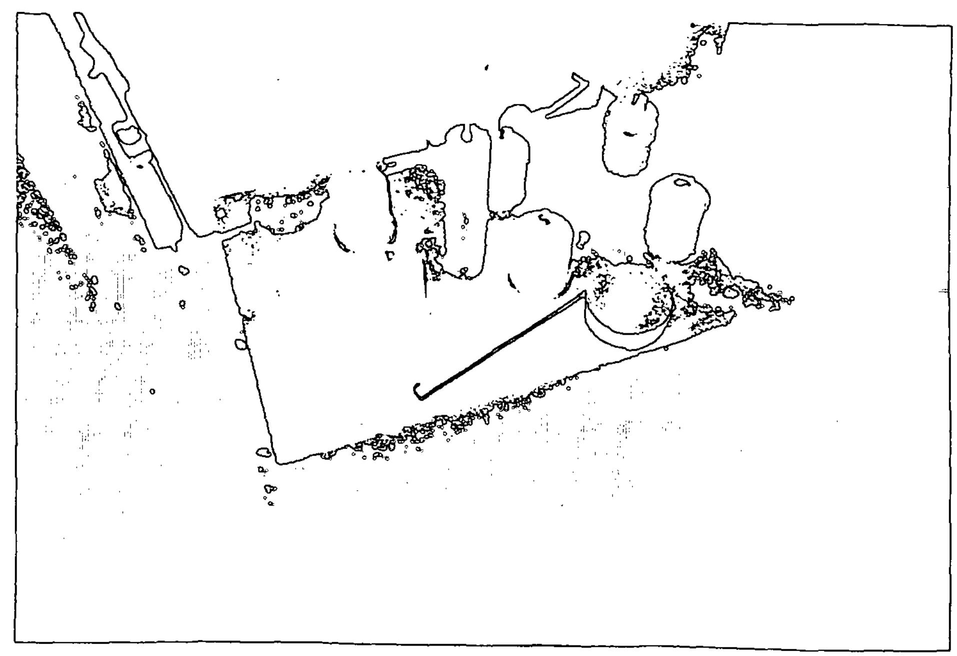

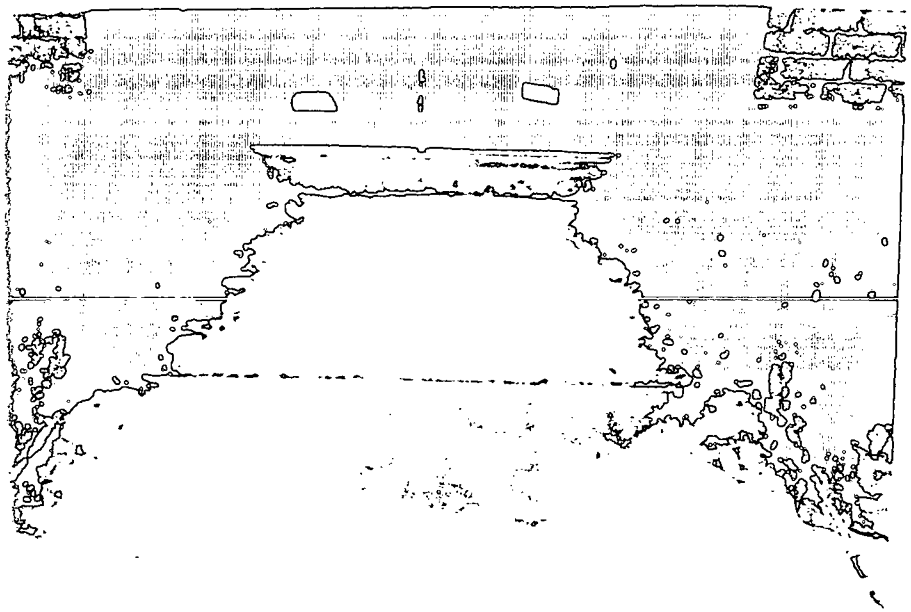
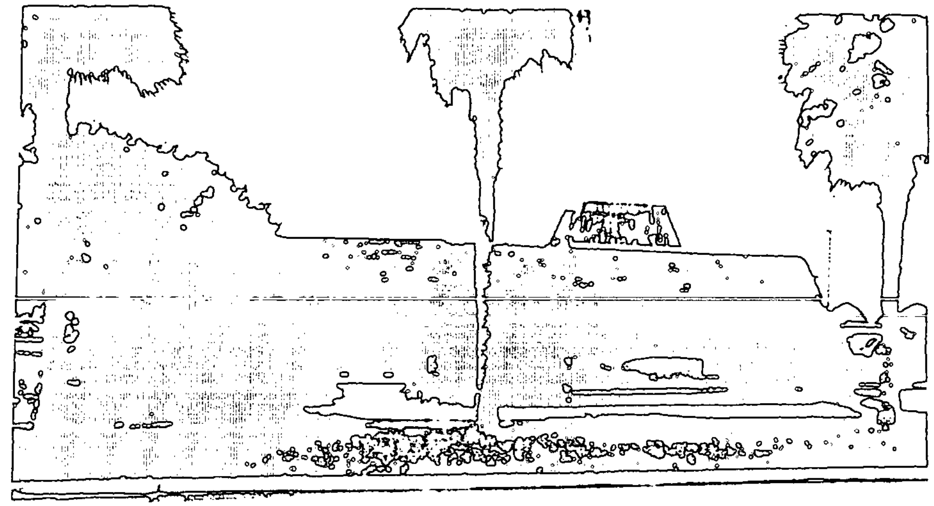
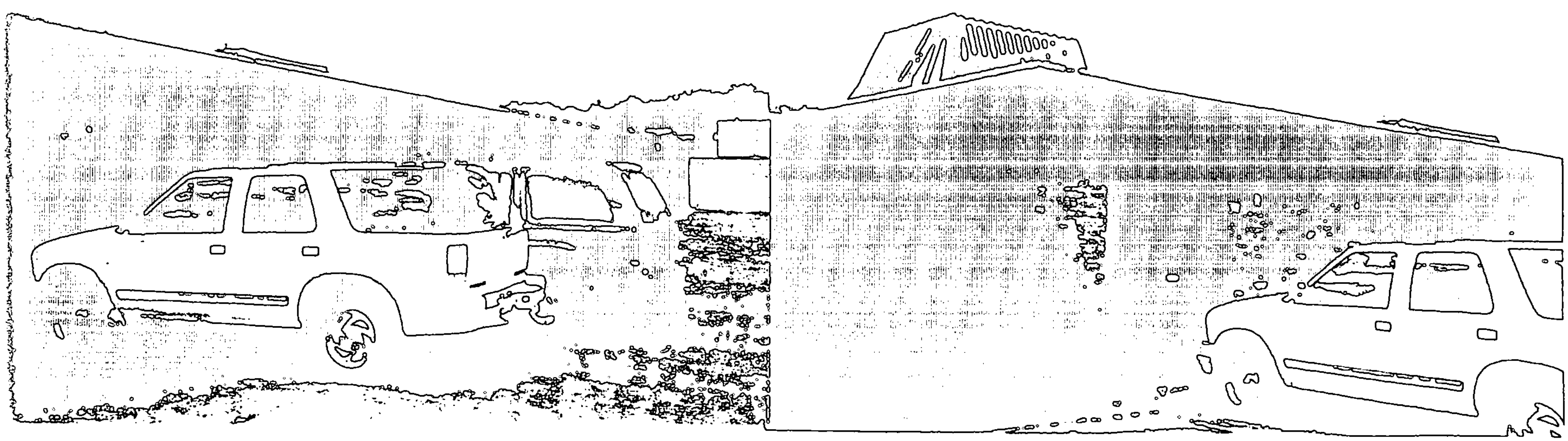

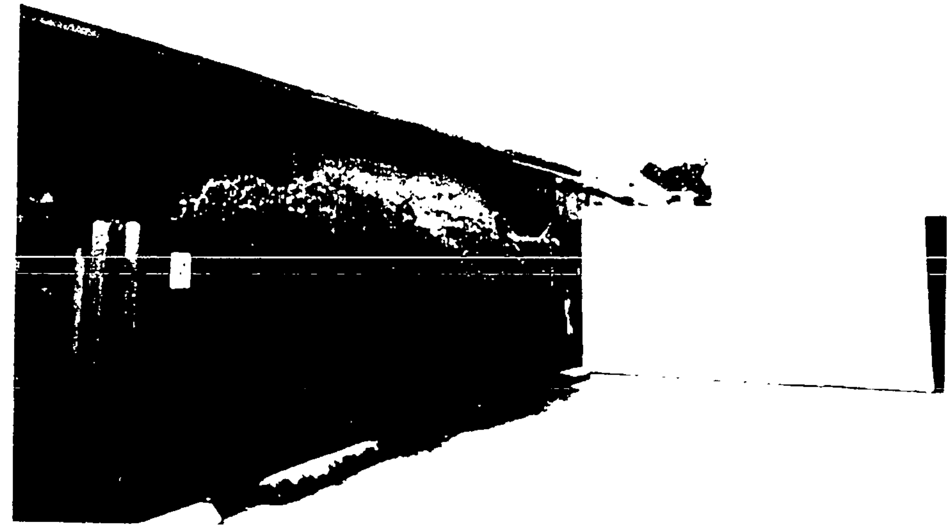

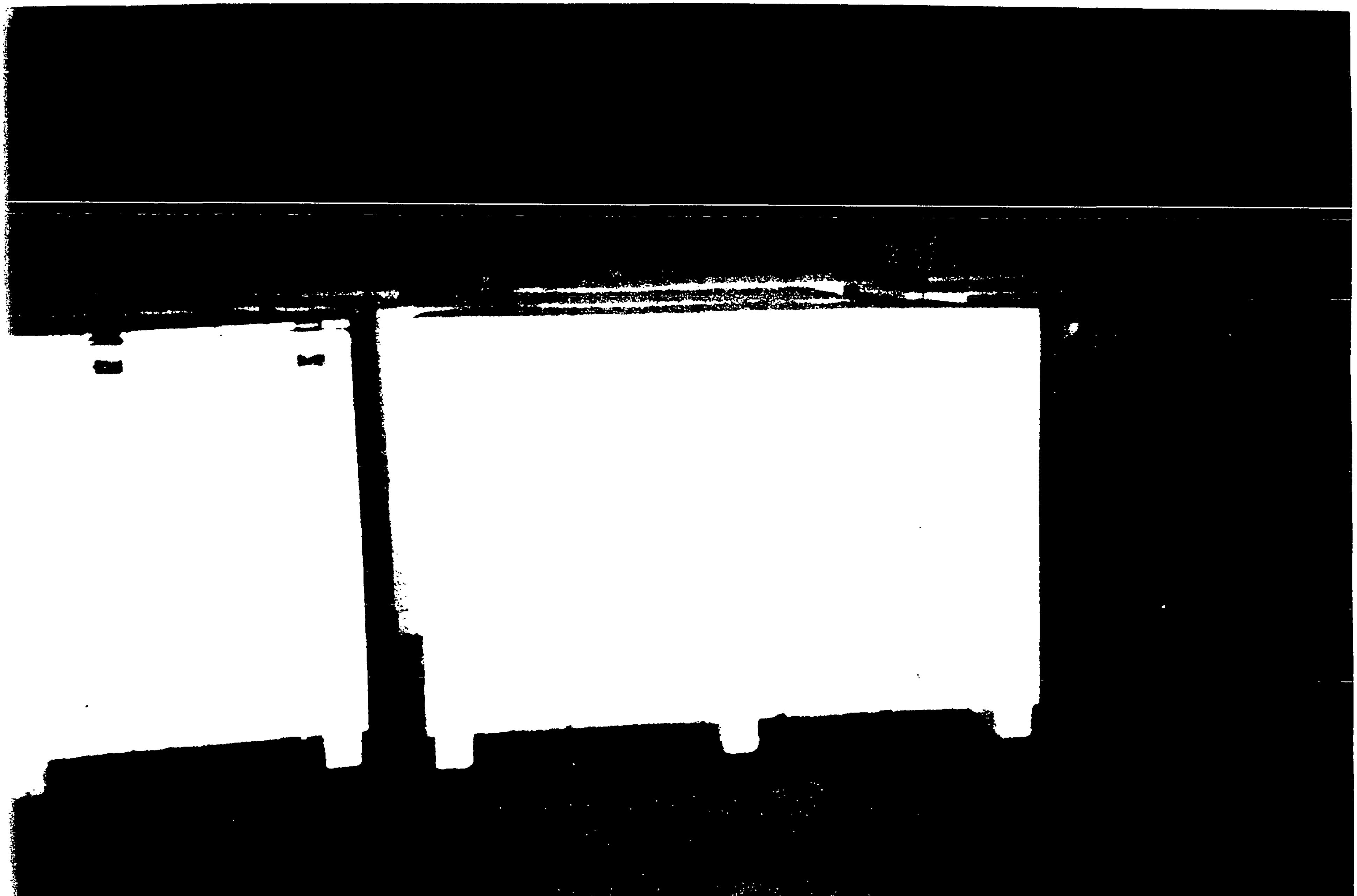

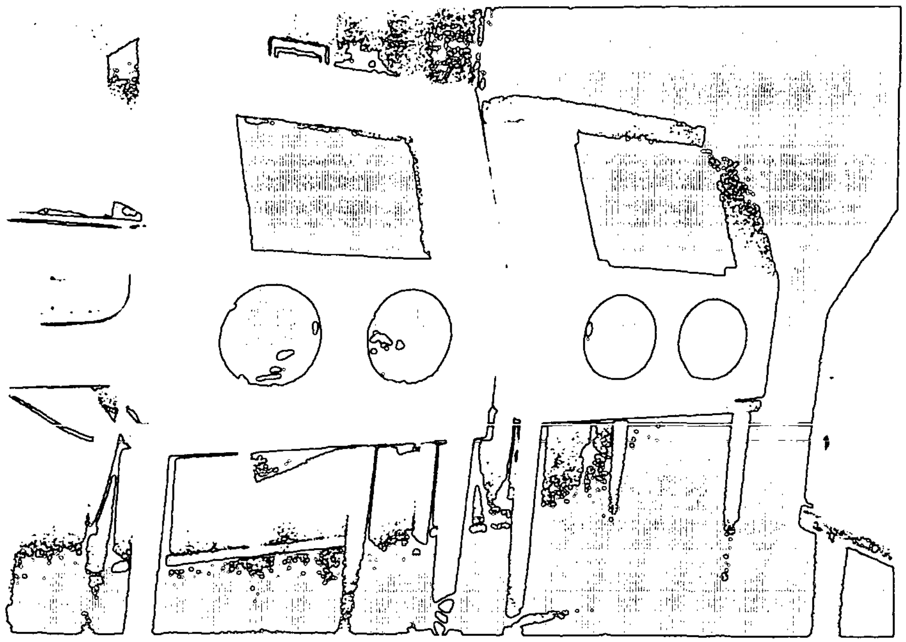

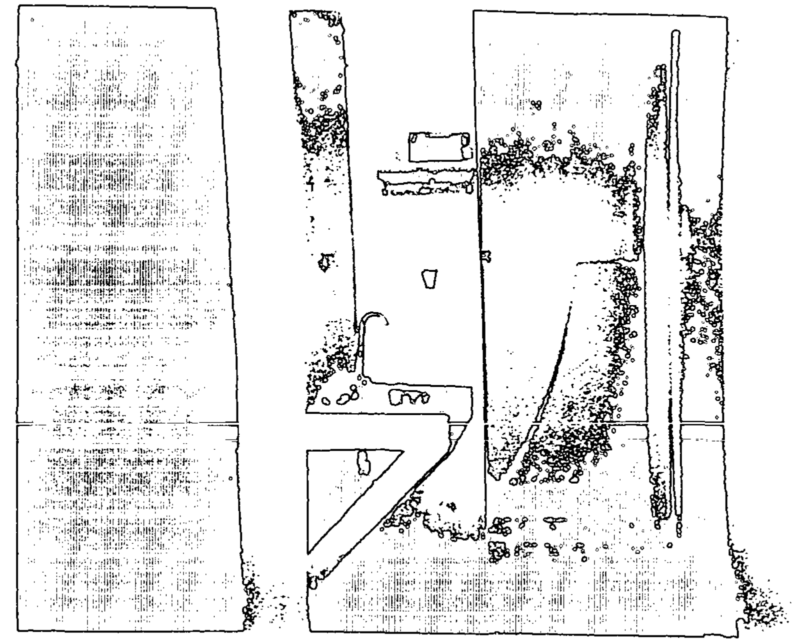

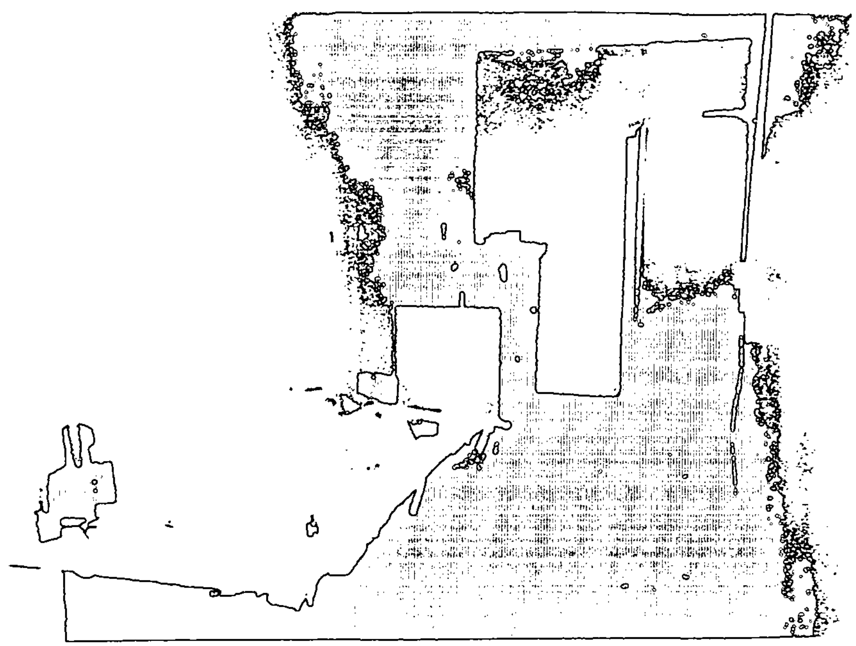

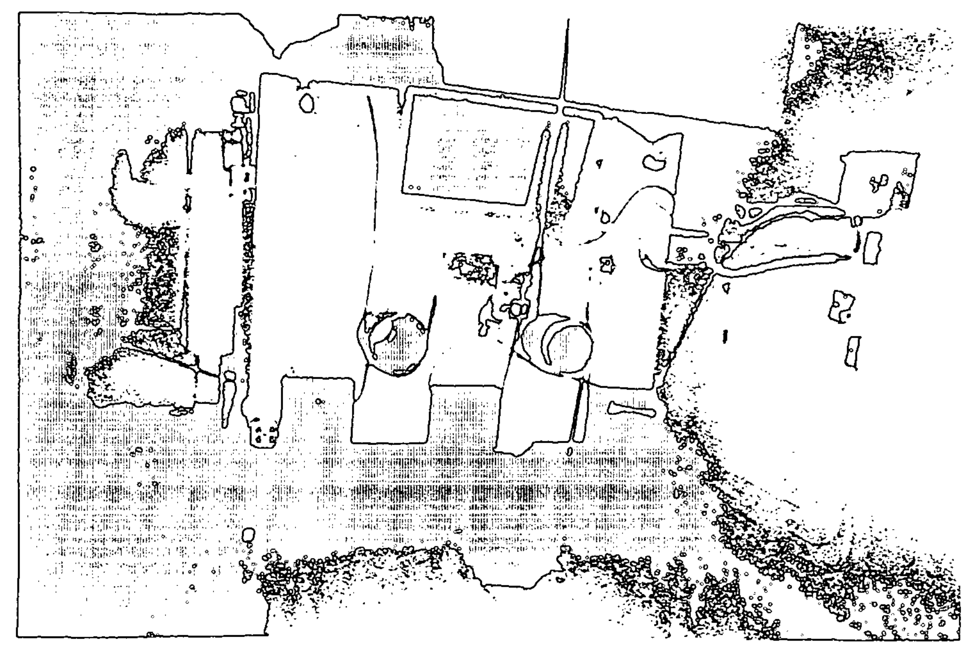

Attachment C

25 Texas Administrative Code 289.202

25 TEXAS ADMINISTRATIVE CODE

§289.202

Standards for Protection Against Radiation from Radioactive Material

Texas Regulations for Control of Radiation

(effective June 1, 1996)

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TEXAS REGISTER FORMAT EXPLANATION

The following example is the outline format used for all agency rules. This explanation will help you locate the different references stated throughout the rule:

§289.xxx = sections are the titles	289.252 Licensing of Radioactive Material.
(a) = subsections are the lowercase letters in parenthesis	(a) Appendices.
(1) = paragraphs are the numbers in parenthesis	(1) Criteria relating to use of financial tests and parent company...
(A) = subparagraphs are the UPPERCASE letters in parenthesis	(A) Financial test.
(*i*) = clauses are the *italicized* lowercase roman numerals in parenthesis	(*i*) To pass the financial test, the parent company...
(*I*) = subclauses are the *italicized* UPPERCASE roman numerals in parenthesis	(*I*) The parent company shall have:
(-a-) = items are the lowercase letters with hyphens in parenthesis	(-a-) two of the following...:
(-1-) = subitems are the numbers with hyphens in parenthesis	(-1-) a ratio of total liabilities to...;

FOR EXAMPLE:

When the rule states "paragraph (1) of this subsection", the rule is referring to paragraph "(1)" within subsection "(a)."
When the rule states "subsection (d) of this section", the rule is referring to subsection "(d)" within the section, for example, §289.252.

(October 2000)

WHERE CAN THE FORMS REFERENCED WITHIN THE RULE BE FOUND?

Forms that are referenced in this rule can be downloaded from the Bureau of Radiation Control web site at:

www.tdh.state.tx.us/ech/rad/pages/brc.htm

Or call (512) 834-6688 to request a copy of the forms

(October 2000)

§289.202 Standards for Protection Against Radiation from Radioactive Material.

(a) Purpose.

(1) This section establishes standards for protection against ionizing radiation resulting from activities conducted in accordance with licenses issued by the agency.

(2) The requirements in this section are designed to control the receipt, possession, use, and transfer of sources of radiation by any licensee so the total dose to an individual, including doses resulting from all sources of radiation other than background radiation, does not exceed the standards for protection against radiation prescribed in this section. However, nothing in this section shall be construed as limiting actions that may be necessary to protect health and safety in an emergency.

(b) Scope.

(1) Except as specifically provided in other sections of this chapter, this section applies to persons who receive, possess, use, or transfer sources of radiation, unless otherwise exempted. No person may use, manufacture, produce, transport, transfer, receive, acquire, own, possess, process, or dispose of sources of radiation unless that person has a license or exemption from the agency. The dose limits in this section do not apply to doses due to background radiation, to exposure of patients to radiation for the purpose of medical diagnosis or therapy, to exposure from individuals administered radioactive material and released in accordance with this chapter, or to voluntary participation in medical research programs. However, no radiation may be deliberately applied to human beings except by or under the supervision of an individual authorized by and licensed in accordance with Texas' statutes to engage in the healing arts.

(2) Licensees who are also registered by the agency to receive, possess, use, and transfer radiation machines must also comply with the requirements of §289.231 of this title (relating to General Provisions and Standards for Protection Against Machine-Produced Radiation).

(c) Definitions. The following words and terms when used in this section shall have the following meaning, unless the context clearly indicates otherwise.

(1) Annual limit on intake (ALI) - The derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year by Reference Man that would result in a committed effective dose equivalent of 5 rems (0.05 sievert (Sv)) or a committed dose equivalent of 50 rems (0.5 Sv) to any individual organ or tissue. ALI values for intake by ingestion and by inhalation of selected radionuclides are given in Columns 1 and 2 of Table I of subsection (ggg)(2) of this section.

(2) Class - A classification scheme for inhaled material according to its rate of clearance from the pulmonary region of the lung. Materials are classified as D, W, or Y, which apply to a range of clearance half-times: for Class D, Days, of less than 10 days; for Class W, Weeks, from 10 to 100 days, and for Class Y, Years, of greater than 100 days. For purposes of this section, lung class and inhalation class are equivalent terms.

(3) Declared pregnant woman - A woman who has voluntarily informed the licensee, in writing, of her pregnancy and the estimated date of conception. The declaration remains in effect until the declared pregnant woman voluntarily withdraws the declaration in writing or is no longer pregnant.

(4) Derived air concentration (DAC) - The concentration of a given radionuclide in air that, if breathed by Reference Man for a working year of 2,000 hours under conditions of light work, results in an intake of 1 ALI. For purposes of this section, the condition of light work is an inhalation rate of 1.2 cubic meters of air per hour for 2,000 hours in a year. DAC values are given in Column 3 of Table I of subsection (ggg)(2) of this section.

(5) Derived air concentration-hour (DAC-hour) - The product of the concentration of radioactive material in air, expressed as a fraction or multiple of the derived air concentration for each radionuclide, and the time of exposure to that radionuclide, in hours. A licensee may take 2,000 DAC-hours to represent ALI, equivalent to a committed effective dose equivalent of 5 rems (0.05 Sv).

(6) Dosimetry processor - A registrant that processes and evaluates personnel monitoring devices in order to determine the radiation dose delivered to the monitoring devices.

(7) Inhalation class (see definition for Class).

(8) Lung class (see definition for Class).

(9) Nonstochastic effect - A health effect, the severity of which varies with the dose and for which a threshold is believed to exist. Radiation-induced cataract formation is an example of a nonstochastic effect. For purposes of this section, deterministic effect is an equivalent term.

(10) Planned special exposure - An infrequent exposure to radiation, separate from and in addition to the annual occupational dose limits.

(11) Quarter - A period of time equal to one-fourth of the year observed by the licensee, approximately 13 consecutive weeks, providing that the beginning of the first quarter in a year coincides with the starting date of the year and that no day is omitted or duplicated in consecutive quarters.

(12) Reference man - A hypothetical aggregation of human physical and physiological characteristics determined by international consensus. These characteristics may be used by researchers and public health employees to standardize results of experiments and to relate biological insult to a common base. A description of Reference Man is contained in the International Commission on Radiological Protection report, ICRP Publication 23, "Report of the Task Group on Reference Man."

(13) Respiratory protective equipment - An apparatus, such as a respirator, used to reduce an individual's intake of airborne radioactive materials.

(14) Sanitary sewerage - A system of public sewers for carrying off waste water and refuse, but excluding sewage treatment facilities, septic tanks, and leach fields owned or operated by the licensee or registrant.

(15) Stochastic effect - A health effect that occurs randomly and for which the probability of the effect occurring, rather than its severity, is assumed to be a linear function of dose without threshold. Hereditary effects and cancer incidence are examples of stochastic effects. For purposes of this section probabilistic effect is an equivalent term.

(16) Weighting factor w_T for an organ or tissue (T) - The proportion of the risk of stochastic effects resulting from irradiation of that organ or tissue to the total risk of stochastic effects when the whole body is irradiated uniformly. For calculating the effective dose equivalent, the values of w_T are:

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ORGAN DOSE WEIGHTING FACTORS

Organ or Tissue	w_T
Gonads	0.25
Breast	0.15
Red bone marrow	0.12
Lung	0.12
Thyroid	0.03
Bone surfaces	0.03
Remainder	0.30*
Whole Body	1.00**

* 0.30 results from 0.06 for each of five "remainder" organs, excluding the skin and the lens of the eye, that receive the highest doses.

** For the purpose of weighting the external whole body dose, for adding it to the internal dose, a single weighting factor, $w_T = 1.0$, has been specified. The use of other weighting factors for external exposure will be approved on a case-by-case basis until such time as specific guidance is issued.

(d) Implementation.

(1) Any existing license condition that is more restrictive than this section remains in force until there is an amendment or renewal of the license that modifies or removes this condition.

(2) If a license condition exempts a licensee from a provision of this section in effect on or before January 1, 1994, it also exempts the licensee from the corresponding provision of this section.

(3) If a license condition cites provisions of this section in effect prior to January 1, 1994, that do not correspond to any provisions of this section, the license condition remains in force until there is an amendment or renewal of the license that modifies or removes this condition.

(e) Radiation protection programs.

(1) Each licensee shall develop, document, and implement a radiation protection program sufficient to ensure compliance with the provisions of this section. See subsection (mm) of this section for recordkeeping requirements relating to these programs. Documentation of the radiation protection program may be incorporated in the licensee's operating, safety, and emergency procedures.

(2) The licensee shall use, to the extent practicable, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and public doses that are as low as is reasonably achievable (ALARA).

(3) The licensee shall, at intervals not to exceed 12 months, ensure the radiation protection program content and implementation is reviewed.

(4) To implement the ALARA requirement in paragraph (2) of this subsection and notwithstanding the requirements in subsection (n) of this section, a constraint on air emissions of radioactive material to the environment, excluding radon-222 and its daughters, shall be established by licensees such that the individual member of the public likely to receive the highest dose will not be expected to receive a total effective dose equivalent in excess of 10 millirems (mrem) (0.1 mSv) per year from these emissions. If a licensee subject to this requirement exceeds this dose constraint, the licensee shall report the exceedance as required in subsection (yy) of this section and promptly take appropriate corrective action.

(f) Occupational dose limits for adults.

(1) The licensee shall control the occupational dose to individuals, except for planned special exposures in accordance with subsection (k) of this section, to the following dose limits.

(A) An annual limit shall be the more limiting of:

(*i*) the total effective dose equivalent being equal to 5 rems (0.05 Sv); or

(*ii*) the sum of the deep dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye being equal to 50 rems (0.5 Sv).

(B) The annual limits to the lens of the eye, to the skin, and to the extremities shall be:

(*i*) a lens dose equivalent of 15 rems (0.15 Sv); and

(*ii*) a shallow dose equivalent of 50 rems (0.5 Sv) to the skin or to any extremity.

(2) Doses received in excess of the annual limits, including doses received during accidents, emergencies, and planned special exposures, shall be subtracted from the limits for planned special exposures that the individual may receive during the current year and during the individual's lifetime. See subsection (k)(6)(A) and (B) of this section.

(3) The assigned deep dose equivalent and shallow dose equivalent shall be for the portion of the body receiving the highest exposure.

(4) The deep dose equivalent, lens dose equivalent and shallow dose equivalent may be assessed from surveys, calculations, or radiation measurements for the purpose of demonstrating compliance with the occupational dose limits, if the individual monitoring device was not in the region of highest potential exposure, or the results of individual monitoring are unavailable.

(5) Derived air concentration (DAC) and annual limit on intake (ALI) values are specified in Table I of subsection (ggg)(2) of this section and may be used to determine the individual's dose and to demonstrate compliance with the occupational dose limits. See subsection (rr) of this section.

(6) Notwithstanding the annual dose limits, the licensee shall limit the soluble uranium intake by an individual to 10 milligrams (mg) in a week in consideration of chemical toxicity. See footnote 3 of subsection (ggg)(2) of this section.

(7) The licensee shall reduce the dose that an individual may be allowed to receive in the current year by the amount of occupational dose received while employed by any other person. See subsection (j)(4) of this section.

(g) Compliance with requirements for summation of external and internal doses.

(1) If the licensee is required to monitor in accordance with both subsection (q)(1) and (3) of this section, the licensee shall demonstrate compliance with the dose limits by summing external and internal doses. If the licensee is required to monitor only in accordance with subsection (q)(1) of this section or only in accordance with subsection (q)(3) of this section, then summation is not required to demonstrate compliance with the dose limits. The licensee may demonstrate compliance with the requirements for summation of external and internal doses in accordance with paragraphs (2)-(4) of this subsection. The dose equivalents for the lens of the eye, the skin, and the extremities are not included in the summation, but are subject to separate limits.

(2) If the only intake of radionuclides is by inhalation, the total effective dose equivalent limit is not exceeded if the sum of the deep dose equivalent divided by the total effective dose equivalent limit, and one of the following, does not exceed unity:

(A) the sum of the fractions of the inhalation ALI for each radionuclide; or

(B) the total number of derived air concentration-hours (DAC-hours) for all radionuclides divided by 2,000; or

(C) the sum of the calculated committed effective dose equivalents to all significantly irradiated organs or tissues (T) calculated from bioassay data using appropriate biological models and expressed as a fraction of the annual limit. For purposes of this requirement, an organ or tissue is deemed to be significantly irradiated if, for that organ or tissue, the product of the weighting factors, w_T, and the committed dose equivalent, $H_{T,50}$, per unit intake is greater than 10% of the maximum weighted value of $H_{T,50}$, that is, $w_T H_{T,50}$, per unit intake for any organ or tissue.

(3) If the occupationally exposed individual receives an intake of radionuclides by oral ingestion greater than 10% of the applicable oral ALI, the licensee shall account for this intake and include it in demonstrating compliance with the limits.

(4) The licensee shall evaluate and, to the extent practical, account for intakes through wounds or skin absorption. The intake through intact skin has been included in the calculation of DAC for hydrogen-3 and does not need to be evaluated or accounted for in accordance with this paragraph.

(h) Determination of external dose from airborne radioactive material.

(1) Licensees shall, when determining the dose from airborne radioactive material, include the contribution to the deep dose equivalent, eye dose equivalent, and shallow dose equivalent from external exposure to the radioactive cloud. See footnotes 1 and 2 of subsection (ggg)(2) of this section.

(2) Airborne radioactivity measurements and DAC values shall not be used as the primary means to assess the deep dose equivalent when the airborne radioactive material includes radionuclides other than noble gases or if the cloud of airborne radioactive material is not relatively uniform. The determination of the deep dose equivalent to an individual shall be based upon measurements using instruments or individual monitoring devices.

(i) Determination of internal exposure.

(1) For purposes of assessing dose used to determine compliance with occupational dose equivalent limits, the licensee shall, when required in accordance with subsection (q) of this section, take suitable and timely measurements of:

(A) concentrations of radioactive materials in air in work areas;

(B) quantities of radionuclides in the body;

(C) quantities of radionuclides excreted from the body; or

(D) combinations of these measurements.

(2) Unless respiratory protective equipment is used, as provided in subsection (x) of this section, or the assessment of intake is based on bioassays, the licensee shall assume that an individual inhales radioactive material at the airborne concentration in which the individual is present.

(3) When specific information on the physical and biochemical properties of the radionuclides taken into the body or the behavior of the material in an individual is known, the licensee may:

(A) use that information to calculate the committed effective dose equivalent, and, if used, the licensee shall document that information in the individual's record;

(B) upon prior approval of the agency, adjust the DAC or ALI values to reflect the actual physical and chemical characteristics of airborne radioactive material, for example, aerosol size distribution or density; and

(C) separately assess the contribution of fractional intakes of Class D, W, or Y compounds of a given radionuclide to the committed effective dose equivalent. See subsection (ggg)(2) of this section.

(4) If the licensee chooses to assess intakes of Class Y material using the measurements given in paragraph (1)(A) or (B) of this subsection, the licensee may delay the recording and reporting of the assessments for periods up to seven months, unless otherwise required by subsections (xx) or (yy) of this section. This delay permits the licensee to make additional measurements basic to the assessments.

(5) If the identity and concentration of each radionuclide in a mixture are known, the fraction of the DAC applicable to the mixture for use in calculating DAC-hours shall be either:

(A) the sum of the ratios of the concentration to the appropriate DAC value, that is, D, W, or Y, from subsection (ggg)(2) of this section for each radionuclide in the mixture; or

(B) the ratio of the total concentration for all radionuclides in the mixture to the most restrictive DAC value for any radionuclide in the mixture.

(6) If the identity of each radionuclide in a mixture is known, but the concentration of one or more of the radionuclides in the mixture is not known, the DAC for the mixture shall be the most restrictive DAC of any radionuclide in the mixture.

(7) When a mixture of radionuclides in air exists, a licensee may disregard certain radionuclides in the mixture if:

(A) the licensee uses the total activity of the mixture in demonstrating compliance with the dose limits in subsection (f) of this section and in complying with the monitoring requirements in subsection (q)(3) of this section;

(B) the concentration of any radionuclide disregarded is less than 10% of its DAC; and

(C) the sum of these percentages for all of the radionuclides disregarded in the mixture does not exceed 30%.

(8) When determining the committed effective dose equivalent, the following information may be considered.

(A) In order to calculate the committed effective dose equivalent, the licensee may assume that the inhalation of 1 ALI, or an exposure of 2,000 DAC-hours, results in a committed effective dose equivalent of 5 rems (0.05 Sv) for radionuclides that have their ALIs or DACs based on the committed effective dose equivalent.

(B) For an ALI and the associated DAC determined by the nonstochastic organ dose limit of 50 rems (0.5 Sv), the intake of radionuclides that would result in a committed effective dose equivalent of 5 rems (0.05 Sv), that is, the stochastic ALI, is listed in parentheses in Table I of subsection (ggg)(2) of this section. The licensee may, as a simplifying assumption, use the stochastic ALI to determine committed effective dose equivalent. However, if the licensee uses the stochastic ALI, the licensee shall also demonstrate that the limit in subsection (f)(1)(A)(*ii*) of this section is met.

(j) Determination of occupational dose for the current year.

(1) For each individual who is likely to receive, in a year, an occupational dose requiring monitoring in accordance with subsection (q) of this section, the licensee shall determine the occupational radiation dose received during the current year.

(2) In complying with the requirements of paragraph (1) of this subsection, a licensee may:

(A) accept, as a record of the occupational dose that the individual received during the current year, BRC Form 202-2 from prior or other current employers, or other clear and legible record, of all information required on that form and indicating any periods of time for which data are not available; or

(B) accept, as a record of the occupational dose that the individual received during the current year, a written signed statement from the individual, or from the individual's prior or other current employer(s) for work involving radiation exposure, that discloses the nature and the amount of any occupational dose that the individual received during the current year; or

(C) obtain reports of the individual's dose equivalent from prior or other current employer(s) for work involving radiation exposure, or the individual's current employer, if the individual is not employed by the licensee, by telephone, telegram, facsimile, or letter. The licensee shall request a written verification of the dose data if the authenticity of the transmitted report cannot be established.

(3) The licensee shall record the exposure data for the current year, as required by paragraph (1) of this subsection, on BRC Form 202-3, or other clear and legible record, of all the information required on that form.

(4) If the licensee is unable to obtain a complete record of an individual's current occupational dose while employed by any other licensee, the licensee shall assume in establishing administrative controls in accordance with subsection (f)(8) of this section for the current year, that the allowable dose limit for the individual is reduced by 1.25 rems (12.5 millisieverts (mSv)) for each quarter; or 416 mrem (4.16 mSv) for each month for which records were unavailable and the individual was engaged in activities that could have resulted in occupational radiation exposure.

(5) If an individual has incomplete (e.g., a lost or damaged personnel monitoring device) current occupational dose data for the current year and that individual is employed solely by the licensee during the current year, the licensee shall:

(A) assume that the allowable dose limit for the individual is reduced by 1.25 rems (12.5 mSv) for each quarter;

(B) assume that the allowable dose limit for the individual is reduced by 416 mrem (4.16 mSv) for each month; or

(C) assess an occupational dose for the individual during the period of missing data using surveys, radiation measurements, or other comparable data for the purpose of demonstrating compliance with the occupational dose limits.

(6) Administrative controls established in accordance with paragraph (4) of this subsection shall be documented and maintained for inspection by the agency. Occupational dose assessments made in accordance with paragraph (5) of this subsection and records of data used to make the assessment shall be maintained for inspection by the agency. The licensee shall retain the records in accordance with subsection (rr) of this section.

(k) Planned special exposures. A licensee may authorize an adult worker to receive doses in addition to and accounted for separately from the doses received under the limits specified in subsection (f) of this section provided that each of the following conditions is satisfied.

(1) The licensee authorizes a planned special exposure only in an exceptional situation when alternatives that might avoid the doses estimated to result from the planned special exposure are unavailable or impractical.

(2) The licensee and employer, if the employer is not the licensee, specifically authorizes the planned special exposure, in writing, before the exposure occurs.

(3) Before a planned special exposure, the licensee ensures that each individual involved is:

(A) informed of the purpose of the planned operation;

(B) informed of the estimated doses and associated potential risks and specific radiation levels or other conditions that might be involved in performing the task; and

(C) instructed in the measures to be taken to keep the dose ALARA considering other risks that may be present.

(4) Prior to permitting an individual to participate in a planned special exposure, the licensee shall determine:

(A) the internal and external doses from all previous planned special exposures;

(B) all doses in excess of the limits, including doses received during accidents and emergencies, received during the lifetime of the individual; and

(C) all lifetime cumulative occupational radiation doses.

(5) In complying with the requirements of paragraph (4)(C) of this subsection, a licensee may:

(A) accept, as the record of lifetime cumulative radiation dose, an up-to-date BRC Form 202-2 or equivalent, signed by the individual and countersigned by an appropriate official of the most recent employer for work involving radiation exposure, or the individual's current employer, if the individual is not employed by the licensee; and

(B) obtain reports of the individual's dose equivalent from prior employer(s) for work involving radiation exposure, or the individual's current employer, if the individual is not employed by the licensee, by telephone, telegram, facsimile, or letter. The licensee shall request a written verification of the dose data if the authenticity of the transmitted report cannot be established.

(6) Subject to subsection (f)(2) of this section, the licensee shall not authorize a planned special exposure that would cause an individual to receive a dose from all planned special exposures and all doses in excess of the limits to exceed:

(A) the numerical values of any of the dose limits in subsection (f)(1) of this section in any year; and

(B) five times the annual dose limits in subsection (f)(1) of this section during the individual's lifetime.

(7) The licensee maintains records of the conduct of a planned special exposure in accordance with subsection (qq) of this section and submits a written report to the agency in accordance with subsection (zz) of this section.

(8) The licensee records the best estimate of the dose resulting from the planned special exposure in the individual's record and informs the individual, in writing, of the dose within 30 days from the date of the planned special exposure. The dose from planned special exposures shall not be considered in controlling future occupational dose of the individual in accordance with subsection (f)(1) of this section but shall be included in evaluations required by paragraphs (4) and (6) of this subsection.

(9) The licensee shall record the exposure history, as required by paragraph (4) of this subsection, on BRC Form 202-2, or other clear and legible record, of all the information required on that form. The form or record shall show each period in which the individual received occupational exposure to radiation or radioactive material and shall be signed by the individual who received the exposure. For each period for which the licensee obtains reports, the licensee shall use the dose shown in the report in preparing BRC Form 202-2 or equivalent.

(l) Occupational dose limits for minors. The annual occupational dose limits for minors are 10% of the annual occupational dose limits specified for adult workers in subsection (f) of this section.

(m) Dose equivalent to an embryo/fetus.

(1) If a woman declares her pregnancy, the licensee shall ensure that the dose equivalent to an embryo/fetus during the entire pregnancy, due to occupational exposure of a declared pregnant woman, does not exceed 0.5 rem (5 mSv). If a woman chooses not to declare pregnancy, the occupational dose limits specified in subsection (f)(1) of this section are applicable to the woman. See subsection (rr) of this section for recordkeeping requirements.

(2) The licensee shall make efforts to avoid substantial variation above a uniform monthly exposure rate to a declared pregnant woman so as to satisfy the limit in paragraph (1) of this subsection. The National Council on Radiation Protection and Measurements recommended in NCRP Report No. 91 "Recommendations on Limits for Exposure to Ionizing Radiation" (June 1, 1987) that no more than 0.05 rem (0.5 mSv) to the embryo/fetus be received in any one month.

(3) The dose equivalent to an embryo/fetus shall be taken as:

(A) the dose equivalent to the embryo/fetus from radionuclides in the embryo/fetus and radionuclides in the declared pregnant woman; and

(B) the dose equivalent that is most representative of the dose equivalent to the embryo/fetus from external radiation, that is, in the mother's lower torso region.

(*i*) If multiple measurements have not been made, assignment of the highest deep dose equivalent for the declared pregnant woman shall be the dose equivalent to the embryo/fetus.

(*ii*) If multiple measurements have been made, assignment of the deep dose equivalent for the declared pregnant woman from the individual monitoring device that is most representative of the dose equivalent to the embryo/fetus shall be the dose equivalent to the embryo/fetus. Assignment of the highest deep dose equivalent for the declared pregnant woman to the embryo/fetus is not required unless that dose equivalent is also the most representative deep dose equivalent for the region of the embryo/fetus.

(4) If by the time the woman declares pregnancy to the licensee, the dose equivalent to the embryo/fetus has exceeded 0.45 rem (4.5 mSv), the licensee shall be deemed to be in compliance with paragraph (1) of this subsection, if the additional dose equivalent to the embryo/fetus does not exceed 0.05 rem (0.5 mSv) during the remainder of the pregnancy.

(n) Dose limits for individual members of the public.

(1) Each licensee shall conduct operations so that:

(A) except as provided in subparagraph (B) of this paragraph, the total effective dose equivalent to individual members of the public from the licensed and/or registered operation does not exceed 0.1 rem (1 mSv) in a year, exclusive of the dose contribution from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with this chapter, from voluntary participation in medical research programs, and from the licensee's disposal of radioactive material into sanitary sewerage in accordance with subsection (gg) of this section; and

(B) the dose in any unrestricted area from licensed and/or registered external sources, exclusive of the dose contributions from patients administered radioactive material and released in accordance with this chapter, does not exceed 0.002 rem (0.02 mSv) in any one hour.

(2) If the licensee permits members of the public to have access to restricted areas, the limits for members of the public continue to apply to those individuals.

(3) A licensee or an applicant for a license may apply for prior agency authorization to operate up to an annual dose limit for an individual member of the public of 0.5 rem (5 mSv). This application shall include the following information:

(A) demonstration of the need for and the expected duration of operations in excess of the limit in paragraph (1) of this subsection;

(B) the licensee's program to assess and control dose within the 0.5 rem (5 mSv) annual limit; and

(C) the procedures to be followed to maintain the dose ALARA.

(4) In addition to the requirements of this section, a licensee subject to the provisions of the United States Environmental Protection Agency's (EPA) generally applicable environmental radiation standards in 40 Code of Federal Regulations (CFR), §190 shall comply with those requirements.

(5) The agency may impose additional restrictions on radiation levels in unrestricted areas and on the total quantity of radionuclides that a licensee may release in effluents in order to restrict the collective dose.

(o) Compliance with dose limits for individual members of the public.

(1) The licensee shall make or cause to be made surveys of radiation levels in unrestricted areas and radioactive materials in effluents released to unrestricted areas to demonstrate compliance with the dose limits for individual members of the public as required in subsection (n) of this section.

(2) A licensee shall show compliance with the annual dose limit in subsection (n) of this section by:

(A) demonstrating by measurement or calculation that the total effective dose equivalent to the individual likely to receive the highest dose from the licensed or registered operation does not exceed the annual dose limit; or

(B) demonstrating that:

(*i*) the annual average concentrations of radioactive material released in gaseous and liquid effluents at the boundary of the unrestricted area do not exceed the values specified in Table II of subsection (ggg)(2) of this section; and

(*ii*) if an individual were continuously present in an unrestricted area, the dose from external sources of radiation would not exceed 0.002 rem (0.02 mSv) in an hour and 0.05 rem (0.5 mSv) in a year.

(3) Upon approval from the agency, the licensee may adjust the effluent concentration values in Table II, of subsection (ggg)(2) of this section, for members of the public, to take into account the actual physical and chemical characteristics of the effluents, such as, aerosol size distribution, solubility, density, radioactive decay equilibrium, and chemical form.

(p) General surveys and monitoring.

(1) Each licensee shall make, or cause to be made, surveys that:

(A) are necessary for the licensee to comply with this section; and

(B) are necessary under the circumstances to evaluate:

(*i*) the magnitude and extent of radiation levels;

(*ii*) concentrations or quantities of radioactive material; and

(*iii*) the potential radiological hazards.

(2) The licensee shall ensure that instruments and equipment used for quantitative radiation measurements, for example, dose rate and effluent monitoring, are operable and calibrated:

(A) by a person licensed or registered by the agency, another agreement state, a licensing state, or the United States Nuclear Regulatory Commission (NRC) to perform such service;

(B) at intervals not to exceed 12 months unless a different time interval is specified in another section of this chapter;

(C) after each instrument or equipment repair;

(D) for the types of radiation used and at energies appropriate for use; and

(E) at an accuracy within 20% of the true radiation level.

(3) All individual monitoring devices, except for direct and indirect reading pocket dosimeters, electronic personal dosimeters, and those individual monitoring devices used to measure the dose to any extremity, that require processing to determine the radiation dose and that are used by licensees to comply with subsection (f) of this section, with other applicable provisions of this chapter, or with conditions specified in a license, shall be processed and evaluated by a dosimetry processor:

(A) holding current personnel dosimetry accreditation from the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute of Standards and Technology;

(B) approved in this accreditation process for the type of radiation or radiations included in the NVLAP program that most closely approximates the type of radiation or radiations for which the individual wearing the dosimeter is monitored; and

(C) holding a current certificate of registration from the agency authorizing dosimetry processing.

(q) Conditions requiring individual monitoring of external and internal occupational dose. Each licensee shall monitor exposures from sources of radiation at levels sufficient to demonstrate compliance with the occupational dose limits of this section. As a minimum:

(1) each licensee shall monitor occupational exposure to radiation and shall supply and require the use of individual monitoring devices by:

(A) adults likely to receive, in one year from sources external to the body, a dose in excess of 10% of the limits in subsection (f)(1) of this section;

(B) minors likely to receive, in one year from sources of radiation external to the body, a deep dose equivalent in excess of 0.1 rem (1 mSv), a lens dose equivalent in excess of 0.15 rem (1.5 mSv), or a shallow dose equivalent to the skin or to the extremities in excess of 0.5 rem (5 mSv);

(C) declared pregnant women likely to receive during the entire pregnancy, from sources of radiation external to the body, a deep dose equivalent in excess of 0.1 rem (1 mSv); and

(D) individuals entering a high or very high radiation area;

(2) notwithstanding paragraph (1)(C) of this subsection, a licensee is exempt from supplying individual monitoring devices to healthcare personnel who may enter a high radiation area while providing patient care if:

(A) the personnel are not likely to receive, in one year from sources external to the body, a dose in excess of 10% of the limits in subsection (f)(1) of this section; and

(B) the licensee complies with the requirements of subsection (e)(2) of this section; and

(3) each licensee shall monitor, to determine compliance with subsection (i) of this section, the occupational intake of radioactive material by and assess the committed effective dose equivalent to:

(A) adults likely to receive, in one year, an intake in excess of 10% of the applicable ALI in Columns 1 and 2 of Table I of subsection (ggg)(2) of this section;

(B) minors likely to receive, in one year, a committed effective dose equivalent in excess of 0.1 rem (1 mSv); and

(C) declared pregnant women likely to receive, during the entire pregnancy, a committed effective dose equivalent in excess of 0.1 rem (1 mSv).

(r) Location and use of individual monitoring devices.

(1) Each licensee shall ensure that individuals who are required to monitor occupational doses in accordance with subsection (q)(1) of this section wear and use individual monitoring devices as follows.

(A) An individual monitoring device used for monitoring the dose to the whole body shall be worn at the unshielded location of the whole body likely to receive the highest exposure. When a protective apron is worn, the location of the individual monitoring device is typically at the neck (collar).

(B) If an additional individual monitoring device is used for monitoring the dose to an embryo/fetus of a declared pregnant woman, in accordance with subsection (m)(1) of this section, it shall be located at the waist under any protective apron being worn by the woman.

(C) An individual monitoring device used for monitoring the lens dose equivalent, to demonstrate compliance with subsection (f)(1)(B)(*i*) of this section, shall be located at the neck (collar) or at a location closer to the eye, outside any protective apron being worn by the monitored individual.

(D) An individual monitoring device used for monitoring the dose to the extremities, to demonstrate compliance with subsection (f)(1)(B)(*ii*) of this section, shall be worn on the extremity likely to receive the highest exposure. Each individual monitoring device, to the extent practicable, shall be oriented to measure the highest dose to the extremity being monitored.

(E) An individual monitoring device shall be assigned to and worn by only one individual.

(F) An individual monitoring device shall be worn for the period of time authorized by the dosimetry processor's certificate of registration or for no longer than three months, whichever is more restrictive.

(2) Each licensee shall ensure that individual monitoring devices are returned to the dosimetry processor for proper processing.

(3) Each licensee shall ensure that adequate precautions are taken to prevent a deceptive exposure of an individual monitoring device.

(s) Control of access to high radiation areas.

(1) The licensee shall ensure that each entrance or access point to a high radiation area has one or more of the following features:

(A) a control device that, upon entry into the area, causes the level of radiation to be reduced below that level at which an individual might receive a deep dose equivalent of 0.1 rem (1 mSv) in one hour at 30 centimeters (cm) from the source of radiation from any surface that the radiation penetrates;

(B) a control device that energizes a conspicuous visible or audible alarm signal so that the individual entering the high radiation area and the supervisor of the activity are made aware of the entry; or

(C) entryways that are locked, except during periods when access to the areas is required, with positive control over each individual entry.

(2) In place of the controls required by paragraph (1) of this subsection for a high radiation area, the licensee may substitute continuous direct or electronic surveillance that is capable of preventing unauthorized entry.

(3) The licensee may apply to the agency for approval of alternative methods for controlling access to high radiation areas.

(4) The licensee shall establish the controls required by paragraphs (1) and (3) of this subsection in a way that does not prevent individuals from leaving a high radiation area.

(5) The licensee is not required to control each entrance or access point to a room or other area that is a high radiation area solely because of the presence of radioactive materials prepared for transport and packaged and labeled in accordance with the regulations of the United States Department of Transportation (DOT) provided that:

(A) the packages do not remain in the area longer than three days; and

(B) the dose rate at 1 meter from the external surface of any package does not exceed 0.01 rem (0.1 millisievert) per hour.

(6) The licensee is not required to control entrance or access to rooms or other areas in hospitals solely because of the presence of patients containing radioactive material, provided that there are personnel in attendance who are taking the necessary precautions to prevent the exposure of individuals to sources of radiation in excess of the established limits in this section and to operate within the ALARA provisions of the licensee's radiation protection program.

(t) Control of access to very high radiation areas. In addition to the requirements in subsection (s) of this section, the licensee shall institute measures to ensure that an individual is not able to gain unauthorized or inadvertent access to areas in which radiation levels could be encountered at 500 rads (5 grays) or more in one hour at 1 m from a source of radiation or any surface through which the radiation penetrates at this level.

(u) Control of access to very high radiation areas for irradiators.

(1) This subsection applies to licensees with sources of radiation in non-self-shielded irradiators. This subsection does not apply to sources of radiation that are used in teletherapy, in industrial radiography, or in completely self-shielded irradiators in which the source of radiation is both stored and operated within the same shielding radiation barrier and, in the designed configuration of the irradiator, is always physically inaccessible to any individual and cannot create high levels of radiation in an area that is accessible to any individual.

(2) Each area in which there may exist radiation levels in excess of 500 rads (5 grays) in one hour at 1 m from a source of radiation that is used to irradiate materials shall meet the following requirements.

(A) Each entrance or access point shall be equipped with entry control devices that:

(*i*) function automatically to prevent any individual from inadvertently entering a very high radiation area;

(*ii*) permit deliberate entry into the area only after a control device is actuated that causes the radiation level within the area, from the source of radiation, to be reduced below that at which it would be possible for an individual to receive a deep dose equivalent in excess of 0.1 rem (1 mSv) in one hour; and (*iii*) prevent operation of the source of radiation if it would produce radiation levels in the area that could result in a deep dose equivalent to an individual in excess of 0.1 rem (1 mSv) in one hour.

(B) Additional control devices shall be provided so that, upon failure of the entry control devices to function as required by subparagraph (A) of this paragraph:

(*i*) the radiation level within the area, from the source of radiation, is reduced below that at which it would be possible for an individual to receive a deep dose equivalent in excess of 0.1 rem (1 mSv) in one hour; and

(*ii*) conspicuous visible and audible alarm signals are generated to make an individual attempting to enter the area aware of the hazard and at least one other authorized individual, who is physically present, familiar with the activity, and prepared to render or summon assistance, aware of the failure of the entry control devices.

(C) The licensee shall provide control devices so that, upon failure or removal of physical radiation barriers other than the sealed source's shielded storage container:

(*i*) the radiation level from the source of radiation is reduced below that at which it would be possible for an individual to receive a deep dose equivalent in excess of 0.1 rem (1 mSv) in one hour; and

(*ii*) conspicuous visible and audible alarm signals are generated to make potentially affected individuals aware of the hazard and the licensee or at least one other individual, who is familiar with the activity and prepared to render or summon assistance, aware of the failure or removal of the physical barrier.

(D) When the shield for stored sealed sources is a liquid, the licensee shall provide means to monitor the integrity of the shield and to signal, automatically, loss of adequate shielding.

(E) Physical radiation barriers that comprise permanent structural components, such as walls, that have no credible probability of failure or removal in ordinary circumstances, need not meet the requirements of subparagraphs (C) and (D) of this paragraph.

(F) Each area shall be equipped with devices that will automatically generate conspicuous visible and audible alarm signals to alert personnel in the area before the source of radiation can be put into operation and in time for any individual in the area to operate a clearly identified control device, which must be installed in the area and which can prevent the source of radiation from being put into operation.

(G) Each area shall be controlled by use of such administrative procedures and such devices as are necessary to ensure that the area is cleared of personnel prior to each use of the source of radiation.

(H) Each area shall be checked by a radiation measurement to ensure that, prior to the first individual's entry into the area after any use of the source of radiation, the radiation level from the source of radiation in the area is below that at which it would be possible for an individual to receive a deep dose equivalent in excess of 0.1 rem (1 mSv) in one hour.

(I) The entry control devices required in subparagraph (A) of this paragraph shall be tested for proper functioning. See subsection (uu) of this section for recordkeeping requirements.

(*i*) Testing shall be conducted prior to initial operation with the source of radiation on any day, unless operations were continued uninterrupted from the previous day.

(*ii*) Testing shall be conducted prior to resumption of operation of the source of radiation after any unintentional interruption.

(*iii*) The licensee shall submit and adhere to a schedule for periodic tests of the entry control and warning systems.

(J) The licensee shall not conduct operations, other than those necessary to place the source of radiation in safe condition or to effect repairs on controls, unless control devices are functioning properly.

(K) Entry and exit portals that are used in transporting materials to and from the irradiation area, and that are not intended for use by individuals, shall be controlled by such devices and administrative procedures as are necessary to physically protect and warn against inadvertent entry by any individual through these portals. Exit portals for irradiated materials shall be equipped to detect and signal the presence of any loose radioactive material that is carried toward such an exit and automatically to prevent loose radioactive material from being carried out of the area.

(3) Licensees or applicants for licenses for sources of radiation within the purview of paragraph (2) of this subsection that will be used in a variety of positions or in locations, such as open fields or forests, which make it impracticable to comply with certain requirements of paragraph (2) of this subsection, such as those for the automatic control of radiation levels, may apply to the Agency for approval of alternative safety measures. Alternative safety measures shall provide personnel protection at least equivalent to those specified in paragraph (2) of this subsection. At least one of the alternative measures shall include an entry-preventing interlock control based on a measurement of the radiation that ensures the absence of high radiation levels before an individual can gain access to the area where such sources of radiation are used.

(4) The entry control devices required by paragraphs (2) and (3) of this subsection shall be established in such a way that no individual will be prevented from leaving the area.

(v) Use of process or other engineering controls. The licensee shall use, to the extent practicable, process or other engineering controls, such as containment or ventilation, to control the concentrations of radioactive material in air.

(w) Use of other controls. When it is not practicable to apply process or other engineering controls to control the concentrations of radioactive material in air to values below those that define an airborne radioactivity area, the licensee shall, consistent with maintaining the total effective dose equivalent ALARA, increase monitoring and limit intakes by one or more of the following means:

(1) control of access;

(2) limitation of exposure times;

(3) use of respiratory protection equipment; or

(4) other controls.

(x) Use of individual respiratory protection equipment.

(1) If the licensee uses respiratory protection equipment to limit intakes in accordance with subsection (w) of this section.

(A) Except as provided in subparagraph (B) of this paragraph, the licensee shall use only respiratory protection equipment that is tested and certified or had certification extended by the National Institute for Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA).

(B) If the licensee wishes to use equipment that has not been tested or certified by the NIOSH and the MSHA, or has not had certification extended by the NIOSH and the MSHA, or for which there is no schedule for testing or certification, the licensee shall submit an application for authorized use of that equipment, including a demonstration by testing, or a demonstration on the basis of test information, that the material and performance characteristics of the equipment are capable of providing the proposed degree of protection under anticipated conditions of use.

(C) The licensee shall implement and maintain a respiratory protection program that includes:

(*i*) air sampling sufficient to identify the potential hazard, permit proper equipment selection, and estimate exposures;

(*ii*) surveys and bioassays, as appropriate, to evaluate actual intakes;

(*iii*) testing of respirators for operability immediately prior to each use;

(*iv*) written procedures regarding selection, fitting, issuance, maintenance, and testing of respirators, including testing for operability immediately prior to each use; supervision and training of personnel; monitoring, including air sampling and bioassays; and recordkeeping; and

(*v*) determination by a physician prior to initial fitting of respirators, and either every 12 months thereafter or periodically at a frequency determined by a physician, that the individual user is physically able to use the respiratory protection equipment.

(D) The licensee shall issue a written policy statement on respirator usage covering:

(*i*) the use of process or other engineering controls, instead of respirators;

(*ii*) the routine, nonroutine, and emergency use of respirators; and

(*iii*) the length of periods of respirator use and relief from respirator use.

(E) The licensee shall advise each respirator user that the user may leave the area at any time for relief from respirator use in the event of equipment malfunction, physical or psychological distress, procedural or communication failure, significant deterioration of operating conditions, or any other conditions that might require such relief.

(F) The licensee shall use respiratory protection equipment within the equipment manufacturer's expressed limitations for type and mode of use and shall provide proper visual, communication, and other special capabilities, such as adequate skin protection, when needed.

(2) When estimating exposure of individuals to airborne radioactive materials, the licensee may make allowance for respiratory protection equipment used to limit intakes in accordance with subsection (w) of this section, provided that the following conditions, in addition to those in paragraph (1) of this subsection, are satisfied.

(A) The licensee selects respiratory protection equipment that provides a protection factor, specified in subsection (ggg)(1) of this section, greater than the multiple by which peak concentrations of airborne radioactive materials in the working area are expected to exceed the values specified in Column 3 of Table I of subsection (ggg)(2) of this section. However, if the selection of respiratory protection equipment with a protection factor greater than the peak concentration is inconsistent with the goal specified in subsection (w) of this section of keeping the total effective dose equivalent ALARA, the licensee may select respiratory protection equipment with a lower protection factor provided that such a selection would result in a total effective dose equivalent that is ALARA. The concentration of radioactive material in the air that is inhaled when respirators are worn may be initially estimated by dividing the average concentration in air, during each period of uninterrupted use, by the protection factor. If the exposure is later found to be greater than initially estimated, the corrected value shall be used; if the exposure is later found to be less than initially estimated, the corrected value may be used.

(B) The licensee shall obtain authorization from the agency before assigning respiratory protection factors in excess of those specified in subsection (ggg)(1) of this section. The agency may authorize a licensee to use higher protection factors on receipt of an application that:

(*i*) describes the situation for which a need exists for higher protection factors; and

(*ii*) demonstrates that the respiratory protection equipment provides these higher protection factors under the proposed conditions of use.

(3) In an emergency, the licensee shall use as emergency equipment only respiratory protection equipment that has been specifically certified or had certification extended for emergency use by the NIOSH and the MSHA.

(4) The licensee shall notify the agency in writing at least 30 days before the date that respiratory protection equipment is first used in accordance with either paragraphs (1) or (2) of this subsection.

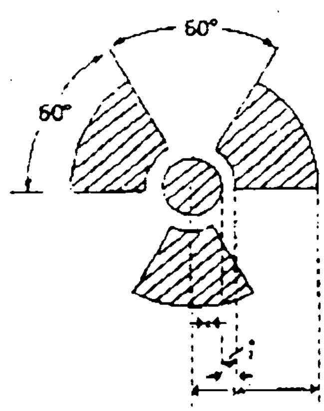
(y) Security and control of licensed sources of radiation.

(1) The licensee shall secure radioactive material from unauthorized removal or access.

(2) The licensee shall maintain constant surveillance, using devices and/or administrative procedures to prevent unauthorized use of radioactive material that is in an unrestricted area and that is not in storage.

(z) Caution signs.

(1) Unless otherwise authorized by the agency, the standard radiation symbol prescribed shall use the colors magenta, or purple, or black on yellow background. The standard radiation symbol prescribed is the three-bladed design as follows:



(A) the cross-hatched area of the symbol is to be magenta, or purple, or black; and

(B) the background of the symbol is to be yellow.

(2) Notwithstanding the requirements of paragraph (1) of this subsection, licensees are authorized to label sources, source holders, or device components containing sources of radiation that are subjected to high temperatures, with conspicuously etched or stamped radiation caution symbols and without a color requirement.

(aa) Posting requirements.

(1) The licensee shall post each radiation area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIATION AREA."

(2) The licensee shall post each high radiation area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, HIGH RADIATION AREA" or "DANGER, HIGH RADIATION AREA."

(3) The licensee shall post each very high radiation area with a conspicuous sign or signs bearing the radiation symbol and words "GRAVE DANGER, VERY HIGH RADIATION AREA." If the very high radiation area involves medical treatment of patients, the licensee may omit the word "GRAVE" from the sign or signs.

(4) The licensee shall post each airborne radioactivity area with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, AIRBORNE RADIOACTIVITY AREA" or "DANGER, AIRBORNE RADIOACTIVITY AREA."

(5) The licensee shall post each area or room in which there is used or stored an amount of licensed material exceeding 10 times the quantity of such material specified in subsection (ggg)(3) of this section with a conspicuous sign or signs bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL(S)" or "DANGER, RADIOACTIVE MATERIAL(S)."

(bb) Exceptions to posting requirements.

(1) A licensee is not required to post caution signs in areas or rooms containing sources of radiation for periods of less than 8 hours, if each of the following conditions is met:

(A) the sources of radiation are constantly attended during these periods by an individual who takes the precautions necessary to prevent the exposure of individuals to sources of radiation in excess of the limits established in this section; and

(B) the area or room is subject to the licensee's control.

(2) Rooms or other areas in hospitals that are occupied by patients are not required to be posted with caution signs in accordance with subsection (aa) of this section provided that the patient could be released from licensee control in accordance with this chapter.

(3) A room or area is not required to be posted with a caution sign because of the presence of a sealed source(s) provided the radiation level at 30 centimeters from the surface of the sealed source container(s) or housing(s) does not exceed 0.005 rem (0.05 mSv) per hour.

(4) Rooms in medical facilities that are used for teletherapy are exempt from the requirement to post caution signs in accordance with subsection (aa) of this section provided the following conditions are met.

(A) Access to the room is controlled in accordance with this chapter; and

(B) Personnel in attendance take necessary precautions to prevent the inadvertent exposure of workers, other patients, and members of the public to radiation in excess of the limits established in this section.

(cc) Labeling containers.

(1) The licensee shall ensure that each container of licensed material bears a durable, clearly visible label bearing the radiation symbol and the words "CAUTION, RADIOACTIVE MATERIAL" or "DANGER, RADIOACTIVE MATERIAL." The label shall also provide information, such as the radionuclides present, an estimate of the quantity of radioactivity, the date for which the activity is estimated, radiation levels, kinds of materials, and mass enrichment, to permit individuals handling or using the containers, or working in the vicinity of the containers, to take precautions to avoid or minimize exposures.

(2) Each licensee shall, prior to removal or disposal of empty uncontaminated containers to unrestricted areas, remove or deface the radioactive material label or otherwise clearly indicate that the container no longer contains radioactive materials.

(dd) Exemptions to labeling requirements. A licensee is not required to label:

(1) containers holding licensed material in quantities less than the quantities listed in subsection (ggg)(3) of this section;

(2) containers holding licensed material in concentrations less than those specified in Table III of subsection (ggg)(2) of this section;

(3) containers attended by an individual who takes the precautions necessary to prevent the exposure of individuals in excess of the limits established by this section;

(4) containers when they are in transport and packaged and labeled in accordance with the rules of the DOT (labeling of packages containing radioactive materials is required by the DOT if the amount and type of radioactive material exceeds the limits for an excepted quantity or article as defined and limited by DOT regulations 49 CFR 173.403(m) and (w) and 173.424);

(5) containers that are accessible only to individuals authorized to handle or use them, or to work in the vicinity of the containers, if the contents are identified to these individuals by a readily available written record. Examples of containers of this type are containers in locations such as water-filled canals, storage vaults, or hot cells. The record shall be retained as long as the containers are in use for the purpose indicated on the record; or

(6) installed manufacturing or process equipment, such as piping and tanks.

(ee) Procedures for receiving and opening packages.

(1) Each licensee who expects to receive a package containing quantities of radioactive material in excess of a Type A quantity, as defined in §289.201(b) of this title and specified in §289.257(s)(1) of this title (relating to Packaging and Transportation of Radioactive Material), shall make arrangements to receive:

(A) the package when the carrier offers it for delivery; or

(B) the notification of the arrival of the package at the carrier's terminal and to take possession of the package expeditiously.

(2) Each licensee shall:

(A) monitor the external surfaces of a labeled package, labeled with a Radioactive White I, Yellow II, or Yellow III label as specified in DOT regulations 49 CFR 172.403 and 172.436-440, for radioactive contamination unless the package contains only radioactive material in the form of gas or in special form as defined in §289.201(b) of this title; and

(B) monitor the external surfaces of a labeled package, labeled with a Radioactive White I, Yellow II, or Yellow III label as specified in DOT regulations 49 CFR 172.403 and 172.436-440, for radiation levels unless the package contains quantities of radioactive material that are less than or equal to the Type A quantity, as defined in §289.201(b) of this title and specified in §289.257(s)(1) of this title; and

(C) monitor all packages known to contain radioactive material for radioactive contamination and radiation levels if there is evidence of degradation of package integrity, such as packages that are crushed, wet, or damaged.

(3) The licensee shall perform the monitoring required by paragraph (2) of this subsection as soon as practicable after receipt of the package, but not later than three hours after the package is received at the licensee's facility if it is received during the licensee's normal working hours. If a package is received after working hours, the package shall be monitored no later than three hours from the beginning of the next working day. If the licensee discovers there is evidence of degradation of package integrity, such as a package that is crushed, wet, or damaged, the package shall be surveyed immediately.

(4) The licensee shall immediately notify the final delivery carrier and, by telephone and telegram, mailgram, or facsimile, the agency when removable radioactive surface contamination or external radiation levels exceed the limits established in subparagraphs (A) and (B) of this paragraph.

(A) Limits for removable radioactive surface contamination levels.

(*i*) The level of removable radioactive contamination on the external surfaces of each package offered for shipment shall be ALARA. The level of removable radioactive contamination may be determined by wiping an area of 300 square centimeters (cm^2) of the surface concerned with an absorbent material, using moderate pressure, and measuring the activity on the wiping material. Sufficient measurements must be taken in the most appropriate locations to yield a representative assessment of the removable contamination levels. Except as provided in clause (*iii*) of this subparagraph, the amount of radioactivity measured on any single wiping material, when averaged over the surface wiped, must not exceed the limits given in clause (*ii*) of this subparagraph at any time during transport. If other methods are used, the detection efficiency of the method used must be taken into account and in no case may the removable contamination on the external surfaces of the package exceed 10 times the limits listed in clause (*ii*) of this subparagraph.

(*ii*) Removable external radioactive contamination wipe limits are as follows.

Contaminant	Maximum Permissible Limits	
	$\mu Ci/cm^2$*	dpm/cm^2
Beta-gamma emitting radionuclides; all radionuclides with half-lives less than 10 days; natural uranium; natural thorium; uranium-235; uranium-238; thorium-232; thorium-228; and thorium-230 when contained in ores or physical concentrates.....	10^{-5}	22
All other alpha emitting radionuclides..........................	10^{-6}	2.2

(*iii*) In the case of packages transported as exclusive use shipments by rail or highway only, the removable radioactive contamination at any time during transport must not exceed 10 times the levels prescribed in clause (*ii*) of this subparagraph. The levels at the beginning of transport must not exceed the levels in clause (*ii*) of this subparagraph.

(B) Limits for external radiation levels.

(*i*) External radiation levels around the package and around the vehicle, if applicable, will not exceed 200 millirems per hour (mrem/hr) (2 millisiverts per hour (mSv/hr)) at any point on the external surface of the package at any time during transportation. The transport index shall not exceed 10.

(*ii*) For a package transported in exclusive use by rail, highway or water, radiation levels external to the package may exceed the limits specified in clause (*i*) of this subparagraph but shall not exceed any of the following:

* To convert microcuries (μCi) to SI units of kilobecquerels, multiply the values by 37.

(*I*) 200 mrem/hr (2 mSv/hr) on the accessible external surface of the package unless the following conditions are met, in which case the limit is 1,000 mrem/hr (10 mSv/hr):

(-a-) the shipment is made in a closed transport vehicle;

(-b-) provisions are made to secure the package so that its position within the vehicle remains fixed during transportation; and

(-c-) there are no loading or unloading operations between the beginning and end of the transportation;

(*II*) 200 mrem/hr (2 mSv/hr) at any point on the outer surface of the vehicle, including the upper and lower surfaces, or, in the case of a flat-bed style vehicle, with a personnel barrier, at any point on the vertical planes projected from the outer edges of the vehicle, on the upper surface of the load (or enclosure, if used), and on the lower external surface of the vehicle (a flat-bed style vehicle with a personnel barrier shall have radiation levels determined at vertical planes. If no personnel barrier, the package cannot exceed 200 mrem/hr (2 mSv/hr) at the surface.);

(*III*) 10 mrem/hr (0.1 mSv/hr) at any point 2 m from the vertical planes represented by the outer lateral surfaces of the vehicle, or, in the case of a flat-bed style vehicle, at any point 2 m from the vertical planes projected from the outer edges of the vehicle; and

(*IV*) 2 mrem/hr (0.02 mSv/hr) in any normally occupied positions of the vehicle, except that this provision does not apply to private motor carriers when persons occupying these positions are provided with special health supervision, personnel radiation exposure monitoring devices, and training in accordance with §289.203(c) of this title (relating to Notices, Instructions, and Reports to Workers; Inspections).

(5) Each licensee shall:

(A) establish, maintain, and retain written procedures for safely opening packages in which radioactive material is received; and

(B) ensure that the procedures are followed and that due consideration is given to special instructions for the type of package being opened.

(6) Licensees transferring special form sources in vehicles owned or operated by the licensee to and from a work site are exempt from the contamination monitoring requirements of paragraph (2) of this subsection, but are not exempt from the monitoring requirement in paragraph (2) of this subsection for measuring radiation levels that ensures that the source is still properly lodged in its shield.

(ff) General requirements for waste management.

(1) Unless otherwise exempted, a licensee shall discharge, treat, or decay licensed material or transfer waste for disposal only:

(A) by transfer to an authorized recipient as provided in subsection (jj) of this section, §289.252 of this title, §289.254 of this title (relating to Licensing of Radioactive Waste Processing and Storage Facilities), §289.257 of this title, §289.259 of this title (relating to Licensing of Naturally Occurring Radioactive Material (NORM)), or to the United States Department of Energy (DOE);

(B) by decay in storage with prior approval from the agency;

(C) by release in effluents within the limits in subsection (n) of this section; or

(D) as authorized in accordance with paragraph (2) of this subsection, and subsections (gg) and (hh) of this section.

(2) Upon agency approval, emission control dust and other material from electric arc furnaces or foundries, such as K061 listed hazardous waste or other listed hazardous waste, contaminated as a result of inadvertent melting of a cesium-137 source may be transferred for disposal to a hazardous waste disposal facility authorized by the Texas Natural Resource Conservation Commission (Commission) or its successor, another state's regulatory agency with jurisdiction to regulate hazardous waste as classified under Subtitle C of the Resource Conservation and Recovery Act (RCRA), or the EPA. The material may be transferred for disposal without regard to its radioactivity if the following conditions are met.

(A) Contaminated material described in paragraph (2) of this subsection, whether packaged or unpackaged (i.e., bulk), must be treated through stabilization to comply with all waste treatment requirements of the appropriate state or federal regulatory agency as listed in this paragraph. The treatment operations must be undertaken by either of the following:

(*i*) the owner/operator of the electric arc furnace or foundry licensed to possess, treat or transfer cesium-137 contaminated incident-related material; or

(*ii*) a service contractor licensed by the agency, NRC, or an agreement state.

(B) The emission control dust and other incident-related materials have been stored (if applicable) and transferred in accordance with operating and emergency procedures approved by the agency.

(C) The total cesium-137 activity contained in emission control dust and other incident-related materials to be transferred to a hazardous waste disposal facility has been specifically approved by NRC or the appropriate agreement state(s) and does not exceed the total activity associated with the inadvertent melting incident.

(D) The hazardous waste disposal facility operator has been notified in writing of the impending transfer of the incident-related materials and has agreed in writing to receive and dispose of the packaged or unpackaged materials. Copies of the notification and agreement shall be submitted to the agency.

(E) The licensee, as listed in subparagraph (A)(*i*) or (*ii*) of this paragraph, notifies the NRC or agreement state(s) in which the transferor and transferee are located, in writing, of the impending transfer, at least 30 days before the transfer.

(F) The packaged stabilized material has been packaged for transportation and disposal in non-bulk steel packaging as defined in DOT regulations at 49 CFR 173.213.

(G) The emission control dust and other incident-related materials that have been stabilized and packaged as described in subparagraph (F) of this paragraph shall contain pretreatment average concentrations of cesium-137 that do not exceed 130 pCi/g of material, above background.

(H) The dose rate at 3.28 feet (1 m) from the surface of any package containing stabilized waste shall not exceed 20 μrem per hour or 0.20 μSv per hour, above background.

(I) The unpackaged stabilized material shall contain pretreatment average concentrations of cesium-137 that do not exceed 100 pCi/g of material, above background.

(3) The licensee transferring the cesium-137 contaminated incident-related material must consult with the agency, the Commission or its successor, another state's regulatory agency with jurisdiction to regulate hazardous waste as classified under RCRA, or the EPA and other authorized parties, including state and local governments, and obtain all necessary approvals, in addition to those of NRC and/or appropriate agreement states, for the transfers described in paragraph (2) of this subsection.

(4) Nothing in this subsection shall be or is intended to be construed as a waiver of any RCRA permit condition or term, of any state or local statute or regulation, or of any federal RCRA regulation.

(5) The total incident-related cesium-137 activity received by a facility over its operating life shall not exceed 1 Ci (37 GBq). The agency will maintain a record of the total incident-related cesium-137 activity shipped by a person licensed by the agency. Upon consultation with the Commission, the agency will determine if the total incident-related cesium-137 activity received by a hazardous waste disposal facility over its operating life has reached 1 Ci (37 GBq). The agency will not approve shipments of cesium-137 contaminated incident-related material that will cause this limit to be exceeded.

(6) A person shall be specifically licensed to receive waste containing licensed material from other persons for:

(A) treatment prior to disposal;

(B) treatment by incineration;

(C) decay in storage;

(D) disposal at an authorized land disposal facility; or

(E) storage until transferred to a storage or disposal facility authorized to receive the waste.

(gg) Discharge by release into sanitary sewerage.

(1) A licensee may discharge licensed material into sanitary sewerage if each of the following conditions is satisfied:

(A) the material is readily soluble, or is readily dispersible biological material, in water;

(B) the quantity of licensed radioactive material that the licensee releases into the sewer in one month divided by the average monthly volume of water released into the sewer by the licensee does not exceed the concentration listed in Table III of subsection (ggg)(2) of this section; and

(C) if more than one radionuclide is released, the following additional conditions must also be satisfied:

(*i*) the fraction of the limit in Table III of subsection (ggg)(2) of this section represented by discharges into sanitary sewerage determined by dividing the actual monthly average concentration of each radionuclide released by the licensee into the sewer by the concentration of that radionuclide listed in Table III of subsection (ggg)(2) of this section; and

(*ii*) the sum of the fractions for each radionuclide required by clause (*i*) of this subparagraph does not exceed unity; and

(D) the total quantity of licensed radioactive material that the licensee releases into the sanitary sewerage in a year does not exceed 5 curies (Ci) (185 gigabecquerels (GBq)) of hydrogen-3, 1 Ci (37 GBq) of carbon-14, and 1 Ci (37 GBq) of all other radioactive materials combined.

(2) Excreta from individuals undergoing medical diagnosis or therapy with radioactive material are not subject to the limitations contained in paragraph (1) of this subsection.

(hh) Treatment by incineration. A licensee may treat licensed material by incineration only in the form and concentration specified in subsection (fff)(1) of this section or as authorized by the agency.

(ii) Discharge by release into septic tanks. No licensee shall discharge radioactive material into a septic tank system except as specifically approved by the agency.

(jj) Transfer for disposal and manifests.

(1) The control of transfers of LLRW intended for disposal at a licensed low-level radioactive waste disposal facility, the establishment of a manifest tracking system, and additional requirements concerning transfers and recordkeeping for those wastes are found in §289.257(s)(5) of this title.

(2) Each person involved in the transfer of waste for disposal including the waste generator, waste collector, and waste processor, shall comply with the requirements specified in §289.257(s)(5) of this title.

(kk) Compliance with environmental and health protection regulations. Nothing in subsections (ff), (gg), (hh), or (jj) of this section relieves the licensee from complying with other applicable federal, state, and local regulations governing any other toxic or hazardous properties of materials that may be disposed of in accordance with subsections (ff), (gg), (hh), or (jj) of this section.

(ll) General provisions for records.

(1) Each licensee shall use the SI units becquerel, gray, sievert, and coulomb per kilogram, or the special units curie, rad, rem, and roentgen, including multiples and subdivisions, and shall clearly indicate the units of all quantities on records required by this section. Disintegrations per minute may be indicated on records of surveys performed to determine compliance with subsection (ggg)(6) of this section. To ensure compatibility with international transportation standards, all limits in this section are given in terms of dual units: The International System of Units (SI) followed or preceded by United States (U.S.) standard or customary units. The U.S. customary units are not exact equivalents, but are rounded to a convenient value, providing a functionally equivalent unit. For the purpose of this section, either unit may be used.

(2) Notwithstanding the requirements of paragraph (1) of this subsection, when recording information on shipment manifests, as required in §289.257 of this title, information must be recorded in SI units or in SI and units as specified in paragraph (1) of this subsection.

(3) The licensee shall make a clear distinction among the quantities entered on the records required by this section, such as, total effective dose equivalent, total organ dose equivalent, shallow dose equivalent, lens dose equivalent, deep dose equivalent, or committed effective dose equivalent.

(4) Records required in accordance with §289.201(d) of this title, and subsections (mm)-(oo), (tt), and (uu) of this section shall include the date and the identification of individual(s) making the record, and, as applicable, a unique identification of survey instrument(s) used, and an exact description of the location of the survey. Records of receipt, transfer, and disposal of sources of radiation shall uniquely identify the source of radiation.

(5) Copies of records required in accordance with §289.201(d) of this title, and subsections (mm)-(uu) of this section, and by license condition that are relevant to operations at an additional authorized use/storage site shall be maintained at that site in addition to the main site specified on a license.

(mm) Records of radiation protection programs.

(1) Each licensee shall maintain records of the radiation protection program, including:

(A) the provisions of the program; and

(B) audits and other reviews of program content and implementation.

(2) The licensee shall retain the records required by paragraph (1)(A) of this subsection until the agency terminates each pertinent license requiring the record. The licensee shall retain the records required by paragraph (1)(B) of this subsection for three years after the record is made.

(nn) Records of surveys.

(1) Each licensee shall maintain records showing the results of surveys and calibrations required by subsections (p) and (ee)(2) of this section. The licensee shall retain these records for three years after the record is made.

(2) The licensee shall retain each of the following records until the agency terminates each pertinent license requiring the record:

(A) the results of surveys to determine the dose from external sources of radiation used, in the absence of or in combination with individual monitoring data, in the assessment of individual dose equivalents; and

(B) results of measurements and calculations used to determine individual intakes of radioactive material and used in the assessment of internal dose; and

(C) results of air sampling, surveys, and bioassays required in accordance with subsection (x)(1)(C)(*i*) and (*ii*) of this section; and

(D) results of measurements and calculations used to evaluate the release of radioactive effluents to the environment.

(oo) Records of tests for leakage or contamination of sealed sources. Records of tests for leakage or contamination of sealed sources required by §289.201(g) of this title shall be kept in units of becquerel or microcurie and retained for inspection by the agency for five years after the records are made.

(pp) Records of lifetime cumulative occupational radiation dose. The licensee shall retain the records of lifetime cumulative occupational radiation dose as specified in subsection (k) of this section on BRC Form 202-2 or equivalent until the agency terminates each pertinent license requiring this record. The licensee shall retain records used in preparing BRC Form 202-2 or equivalent for three years after the record is made.

(qq) Records of planned special exposures.

(1) For each use of the provisions of subsection (k) of this section for planned special exposures, the licensee shall maintain records that describe:

(A) the exceptional circumstances requiring the use of a planned special exposure;

(B) the name of the management official who authorized the planned special exposure and a copy of the signed authorization;

(C) what actions were necessary;

(D) why the actions were necessary;

(E) what precautions were taken to assure that doses were maintained ALARA;

(F) what individual and collective doses were expected to result; and

(G) the doses actually received in the planned special exposure.

(2) The licensee shall retain the records until the agency terminates each pertinent license requiring these records.

(rr) Records of individual monitoring results.

(1) Each licensee shall maintain records of doses received by all individuals for whom monitoring was required in accordance with subsection (q) of this section, and records of doses received during planned special exposures, accidents, and emergency conditions. Assessments of dose equivalent and records made using units in effect before January 1, 1994, need not be changed. These records shall include, when applicable:

(A) the deep dose equivalent to the whole body, lens dose equivalent, shallow dose equivalent to the skin, and shallow dose equivalent to the extremities;

(B) the estimated intake of radionuclides, see subsection (g) of this section;

(C) the committed effective dose equivalent assigned to the intake of radionuclides;

(D) the specific information used to calculate the committed effective dose equivalent in accordance with subsection (i)(1) and (3) of this section and when required by subsection (q)(1) of this section;

(E) the total effective dose equivalent when required by subsection (g) of this section;

(F) the total of the deep dose equivalent and the committed dose to the organ receiving the highest total dose; and

(G) the data used to make occupational dose assessments in accordance with subsection (j)(5) of this section.

(2) The licensee shall make entries of the records specified in paragraph (1) of this subsection at intervals not to exceed 1 year and within 60 days of the end of the year.

(3) The licensee shall maintain the records specified in paragraph (1) of this subsection on BRC Form 202-3, in accordance with the instructions for BRC Form 202-3, or in clear and legible records containing all the information required by BRC Form 202-3.

(4) The licensee shall maintain the records of dose to an embryo/fetus with the records of dose to the declared pregnant woman. The declaration of pregnancy, including the estimated date of conception, shall also be kept on file, but may be maintained separately from the dose records.

(5) The licensee shall retain each required form or record until the agency terminates each pertinent license requiring the record. The licensee shall retain records used in preparing BRC Form 202-3 or equivalent for three years after the record is made.

(ss) Records of dose to individual members of the public.

(1) Each licensee shall maintain records sufficient to demonstrate compliance with the dose limit for individual members of the public. See subsection (n) of this section.

(2) The licensee shall retain the records required by paragraph (1) of this subsection until the agency terminates each pertinent license requiring the record.

(tt) Records of discharge, treatment, or transfer for disposal.

(1) Each licensee shall maintain records of the discharge or treatment of licensed materials made in accordance with subsection (gg) and (hh) of this section and of transfers for disposal made in accordance with subsection (jj) of this section and §289.257 of this title.

(2) The licensee shall retain the records required by paragraph (1) of this subsection until the agency terminates each pertinent license requiring the record.

(uu) Records of testing entry control devices for very high radiation areas.

(1) Each licensee shall maintain records of tests made in accordance with subsection (u)(2)(I) of this section on entry control devices for very high radiation areas. These records must include the date, time, and results of each such test of function.

(2) The licensee shall retain the records required by paragraph (1) of this subsection for three years after the record is made.

(vv) Form of records. Each record required by this chapter shall be legible throughout the specified retention period. The record shall be the original or a reproduced copy or a microform, provided that the copy or microform is authenticated by authorized personnel and that the microform is capable of producing a clear copy throughout the required retention period or the record may also be stored in electronic media with the capability for producing legible, accurate, and complete records during the required retention period. Records, such as letters, drawings, and specifications, shall include all pertinent information, such as stamps, initials, and signatures. The licensee shall maintain adequate safeguards against tampering with and loss of records.

(ww) Reports of stolen, lost, or missing licensed sources of radiation.

(1) Each licensee shall report to the agency by telephone as follows:

(A) immediately after its occurrence becomes known to the licensee, stolen, lost, or missing licensed radioactive material in an aggregate quantity equal to or greater than 1,000 times the quantity specified in subsection (ggg)(3) of this section, under such circumstances that it appears to the licensee that an exposure could result to individuals in unrestricted areas; or

(B) within 30 days after its occurrence becomes known to the licensee, lost, stolen, or missing licensed radioactive material in an aggregate quantity greater than 10 times the quantity specified in subsection (ggg)(3) of this section that is still missing.

(2) Each licensee required to make a report in accordance with paragraph (1) of this subsection shall, within 30 days after making the telephone report, make a written report to the agency setting forth the following information:

(A) a description of the licensed source of radiation involved, including, for radioactive material, the kind, quantity, and chemical and physical form;

(B) a description of the circumstances under which the loss or theft occurred;

(C) a statement of disposition, or probable disposition, of the licensed source of radiation involved;

(D) exposures of individuals to radiation, circumstances under which the exposures occurred, and the possible total effective dose equivalent to persons in unrestricted areas;

(E) actions that have been taken, or will be taken, to recover the source of radiation; and

(F) procedures or measures that have been, or will be, adopted to ensure against a recurrence of the loss or theft of licensed sources of radiation.

(3) Subsequent to filing the written report, the licensee shall also report additional substantive information on the loss or theft within 30 days after the licensee learns of such information.

(4) The licensee shall prepare any report filed with the agency in accordance with this subsection so that names of individuals who may have received exposure to radiation are stated in a separate and detachable portion of the report.

(xx) Notification of incidents.

(1) Notwithstanding other requirements for notification, each licensee shall immediately report each event involving a source of radiation possessed by the licensee that may have caused or threatens to cause:

(A) an individual to receive:

(*i*) a total effective dose equivalent of 25 rems (0.25 Sv) or more;

(*ii*) a lens dose equivalent of 75 rems (0.75 Sv) or more; or

(*iii*) a shallow dose equivalent to the skin or extremities or a total organ dose equivalent of 250 rads (2.5 grays) or more; or

(B) the release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake five times the occupational ALI. This provision does not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures.

(2) Each licensee shall, within 24 hours of discovery of the event, report to the agency each event involving loss of control of a licensed source of radiation possessed by the licensee that may have caused, or threatens to cause:

(A) an individual to receive, in a period of 24 hours:

(*i*) a total effective dose equivalent exceeding 5 rems (0.05 Sv);

(*ii*) a lens dose equivalent exceeding 15 rems (0.15 Sv); or

(*iii*) a shallow dose equivalent to the skin or extremities or a total organ dose equivalent exceeding 50 rems (0.5 Sv); or

(B) the release of radioactive material, inside or outside of a restricted area, so that, had an individual been present for 24 hours, the individual could have received an intake in excess of one occupational ALI. This provision does not apply to locations where personnel are not normally stationed during routine operations, such as hot-cells or process enclosures.

(3) Licensees shall make the initial notification reports required by paragraphs (1) and (2) of this subsection by telephone to the agency and shall confirm the initial notification report within 24 hours by telegram, mailgram, or facsimile to the agency.

(4) The licensee shall prepare each report filed with the agency in accordance with this section so that names of individuals who have received exposure to sources of radiation are stated in a separate and detachable portion of the report.

(5) The provisions of this section do not apply to doses that result from planned special exposures, provided such doses are within the limits for planned special exposures and are reported in accordance with section (zz) of this section.

(6) Each licensee shall notify the agency as soon as possible but not later than four hours after the discovery of an event that prevents immediate protective actions necessary to avoid exposures to radioactive materials that could exceed regulatory limits or releases of radioactive materials that could exceed regulatory limits (events may include fires, explosions, toxic gas releases, etc.).

(7) Each licensee shall notify the agency within 24 hours after the discovery of any of the following events involving radioactive material:

(A) an unplanned contamination event that:

(*i*) requires access to the contaminated area, by workers or the public, to be restricted for more than 24 hours by imposing additional radiological controls or by prohibiting entry into the area;

(*ii*) involves a quantity of material greater than five times the lowest annual limit on intake specified in subsection (ggg)(2) of this section for the material; and

(*iii*) has access to the area restricted for a reason other than to allow isotopes with a half-life of less than 24 hours to decay prior to decontamination.

(B) an event in which equipment is disabled or fails to function as designed when:

(*i*) the equipment is required by rule or license condition to prevent releases exceeding regulatory limits, to prevent exposures to radioactive materials exceeding regulatory limits, or to mitigate the consequences of an accident;

(*ii*) the equipment is required to be available and operable when it is disabled or fails to function; and

(*iii*) no redundant equipment is available and operable to perform the required safety function;

(C) an event that requires unplanned medical treatment at a medical facility of an individual with spreadable radioactive contamination on the individual's clothing or body; or

(D) an unplanned fire or explosion damaging any radioactive material or any device, container, or equipment containing radioactive material when:

(*i*) the quantity of material involved is greater than five times the lowest annual limit on intake specified in subsection (ggg)(2) of this section for the material; and

(*ii*) the damage affects the integrity of the radioactive material or its container.

(8) Preparation and submission of reports. Reports made by licensees in response to the requirements of paragraphs (6) and (7) of this subsection shall be made as follows.

(A) Licensees shall make reports required by paragraphs (6) and (7) of this subsection by telephone to the agency. To the extent that the information is available at the time of notification, the information provided in these reports shall include:

(*i*) the caller's name and call back telephone number;

(*ii*) a description of the event, including date and time;

(*iii*) the exact location of the event;

(*iv*) the isotopes, quantities, and chemical and physical form of the radioactive material involved; and

(*v*) any personnel radiation exposure data available.

(B) Each licensee who makes a report required by paragraphs (6) and (7) of this subsection shall submit to the agency a written follow-up report within 30 days of the initial report. Written reports prepared in accordance with other requirements of this chapter may be submitted to fulfill this requirement if the reports contain all of the necessary information and the appropriate distribution is made. The reports must include the following:

(*i*) a description of the event, including the probable cause and the manufacturer and model number (if applicable) of any equipment that failed or malfunctioned;

(*ii*) the exact location of the event;

(*iii*) the isotopes, quantities, and chemical and physical form of the radioactive material involved;

(*iv*) date and time of the event;

(*v*) corrective actions taken or planned and the results of any evaluations or assessments; and

(*vi*) the extent of exposure of individuals to radioactive materials without identification of individuals by name.

(yy) Reports of exposures, radiation levels, and concentrations of radioactive material exceeding the limits.

(1) In addition to the notification required by subsection (xx) of this section, each licensee shall submit a written report within 30 days after learning of any of the following occurrences:

(A) incidents for which notification is required by subsection (xx) of this section;

(B) doses in excess of any of the following:

(*i*) the occupational dose limits for adults in subsection (f) of this section;

(*ii*) the occupational dose limits for a minor in subsection (l) of this section;

(*iii*) the limits for an embryo/fetus of a declared pregnant woman in subsection (m) of this section;

(*iv*) the limits for an individual member of the public in subsection (n) of this section;

(*v*) any applicable limit in the license; or

(*vi*) the ALARA constraints for air emissions as required by subsection (e)(4) of this section;

(C) levels of radiation or concentrations of radioactive material in:

(*i*) a restricted area in excess of applicable limits in the license; or

(*ii*) an unrestricted area in excess of 10 times the applicable limit set forth in this section or in the license, whether or not involving exposure of any individual in excess of the limits in subsection (n) of this section; or

(D) for licensees subject to the provisions of the EPA's generally applicable environmental radiation standards in 40 CFR 190, levels of radiation or releases of radioactive material in excess of those standards, or of license conditions related to those requirements.

(2) Each report required by paragraph (1) of this subsection shall describe the extent of exposure of individuals to radiation and radioactive material, including, as appropriate:

(A) estimates of each individual's dose;

(B) the levels of radiation and concentrations of radioactive material involved;

(C) the cause of the elevated exposures, dose rates, or concentrations; and

(D) corrective steps taken or planned to ensure against a recurrence, including the schedule for achieving conformance with applicable limits, ALARA constraints, generally applicable environmental standards, and associated license conditions.

(3) Each report filed in accordance with paragraph (1) of this subsection shall include for each individual exposed: the name, identification number, and date of birth. With respect to the limit for the embryo/fetus in subsection (m) of this section, the identifiers should be those of the declared pregnant woman. The report shall be prepared so that this information is stated in a separate and detachable portion of the report.

(4) All licensees who make reports in accordance with paragraph (1) of this subsection shall submit the report in writing to the agency.

(zz) Reports of planned special exposures. The licensee shall submit a written report to the agency within 30 days following any planned special exposure conducted in accordance with subsection (k) of this section, informing the Agency that a planned special exposure was conducted and indicating the date the planned special exposure occurred and the information required by subsection (qq) of this section.

(aaa) Notifications and reports to individuals.

(1) Requirements for notification and reports to individuals of exposure to sources of radiation are specified in §289.203 of this title.

(2) When a licensee is required in accordance with subsection (yy) or (zz) of this section to report to the agency any exposure of an identified occupationally exposed individual, or an identified member of the public, to sources of radiation, the licensee shall also notify the individual and provide a copy of the report submitted to the agency, to the individual. Such notice shall be transmitted at a time not later than the transmittal to the agency, and shall comply with the provisions of §289.203(d)(1) of this title.

(bbb) Reports of leaking or contaminated sealed sources. The licensee shall immediately notify the agency if the test for leakage or contamination required in accordance with §289.201(g) of this title indicates a sealed source is leaking or contaminated. A written report of a leaking or contaminated source shall be submitted to the agency within five days. The report shall include the equipment involved, the test results and the corrective action taken.

(ccc) Vacating premises.

(1) Each licensee or person possessing non-exempt sources of radiation shall, no less than 30 days before vacating and relinquishing possession or control of premises, notify the agency, in writing, of the intent to vacate.

(2) The licensee or person possessing non-exempt radioactive material shall decommission the premises to a degree consistent with subsequent use as an unrestricted area and in accordance with the requirements of subsection (ddd) of this section or, for uranium recovery and byproduct material disposal facilities licensed in accordance with §289.260 of this title, subsection (eee) of this section.

(ddd) Radiological requirements for license termination.

(1) General provisions and scope.

(A) The requirements in this section apply to the decommissioning of facilities licensed in accordance with §289.252 of this title (relating to Licensing of Radioactive Material), §289.254 of this title (relating to Licensing of Radioactive Waste Processing and Storage Facilities), §289.255 of this title (relating to Radiation Safety Requirements and Licensing and Registration Procedures for Industrial Radiography), and §289.258 of this title (relating to Licensing and Radiation Safety Requirements for Irradiators). The requirements do not apply to uranium recovery and byproduct material disposal facilities already subject to the requirements of §289.260 of this title (relating to Licensing of Uranium Recovery and Byproduct Material Disposal Facilities).

(B) The requirements in this section do not apply to the following:

(*i*) sites that have been decommissioned prior to October 1, 2000, in accordance with requirements identified in this section and in §289.252 of this title; or

(*ii*) sites that have previously submitted and received approval on a decommissioning plan by October 1, 2000.

(C) After a site has been decommissioned and the license terminated in accordance with the requirements in the subsection, the agency will require additional cleanup if it determines that the requirements of the subsection were not met and residual radioactivity remaining at the site could result in significant threat to public health and safety.

(D) When calculating TEDE to the average member of the critical group, the licensee shall determine the peak annual TEDE dose expected within the first 1,000 years after decommissioning.

(2) Radiological requirements for unrestricted use. A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a TEDE to an average member of the critical group that does not exceed 25 mrem (0.25 mSv) per year, including that from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are ALARA. Determination of the levels that are ALARA must take into account consideration of any detriments, such as deaths from transportation accidents, expected to potentially result from decontamination and waste disposal.

(3) Alternate requirements for license termination.

(A) The agency may terminate a license using alternate requirements greater than the dose requirements specified in paragraph (2) of this subsection if the licensee does the following:

(*i*) provides assurance that public health and safety would continue to be protected, and that it is unlikely that the dose from all man-made sources combined, other than medical, would be more than the 1 mSv per year (100 mrem per year) limit specified in subsection (o) of this section, by submitting an analysis of possible sources of exposure;

(*ii*) reduces doses to ALARA levels, taking into consideration any detriments such as traffic accidents expected to potentially result from decontamination and waste disposal; and

(*iii*) has submitted a decommissioning plan to the agency indicating the licensee's intent to decommission in accordance with the requirements in §289.252(l)(7) of this title, and specifying that the licensee proposes to decommission by use of alternate requirements. The licensee shall document in the decommissioning plan how the advice of individuals and institutions in the community who may be affected by the decommissioning has been sought and addressed, as appropriate, following analysis of that advice. In seeking such advice, the licensee shall provide for the following:

(*I*) participation by representatives of a broad cross section of community interests who may be affected by the decommissioning;

(*II*) an opportunity for a comprehensive, collective discussion on the issues by the participants represented; and

(*III*) a publicly available summary of the results of all such discussions, including a description of the individual viewpoints of the participants on the issues and the extent of agreement and disagreement among the participants on the issues.

(B) The use of alternate requirements to terminate a license requires the approval of the agency after consideration of the agency's recommendations that will address any comments provided by the EPA and any public comments submitted in accordance with paragraph (4) of this subsection.

(4) Public notification and public participation. Upon receipt of a decommissioning plan from the licensee, or a proposal from the licensee for release of a site in accordance with paragraph (3) of this subsection, or whenever the agency deems such notice to be in the public interest, the agency will do the following:

(A) notify and solicit comments from the following:

(*i*) local and state governments in the vicinity of the site and any Indian Nation or other indigenous people that have treaty or statutory rights that could be affected by the decommissioning; and

(*ii*) the EPA for cases where the licensee proposes to release a site in accordance with paragraph (3) of this subsection; and

(B) publish a notice in the *Texas Register* and a forum, such as local newspapers, letters to state of local organizations, or other appropriate forum, that is readily accessible to individuals in the vicinity of the site, and solicit comments from affected parties.

(5) *Minimization of contamination*. Applicants for licenses, other than renewals, after October 1, 2000, shall describe in the application how facility design and procedures for operation will minimize, to the extent practical, contamination of the facility and the environment, facilitate eventual decommissioning, and minimize, to the extent practical, the generation of LLRW.

(eee) Limits for contamination of soil, surfaces of facilities and equipment, and vegetation.

(1) No licensee shall possess, receive, use, or transfer radioactive material in such a manner as to cause contamination of surfaces of facilities or equipment in unrestricted areas to the extent that the contamination exceeds the limits specified in subsection (ggg)(6) of this section.

(2) No licensee shall possess, receive, use, or transfer radioactive material in such a manner as to cause contamination of soil in unrestricted areas, to the extent that the contamination exceeds, on a dry weight basis, the concentration limits specified in:

(A) subsection (ggg)(8) of this section; or

(B) the effluent concentrations in Table II, Column 2 of subsection (ggg)(2)(F) of this section, with the units changed from microcuries per milliliter to microcuries per gram, for radionuclides not specified in subsection (ggg)(8) of this section or paragraph (4) of this subsection.

(3) Where combinations of radionuclides are involved, the sum of the ratios between the concentrations present and the limits specified in paragraph (2) of this subsection shall not exceed one.

(4) Notwithstanding the limits specified in paragraph (2) of this subsection, no licensee shall cause the concentration of radium-226 or radium-228 in soil in unrestricted areas, averaged over any 100 square meters (m^2), to exceed the background level by more than:

(A) 5 picocuries per gram (pCi/g) (0.185 becquerel per gram (Bq/g)), averaged over the first 15 cm of soil below the surface; and

(B) 15 pCi/g (0.555 Bq/g), averaged over 15 cm thick layers of soil more than 15 cm below the surface.

(5) No licensee shall possess, receive, use, or transfer radioactive material in such a manner as to cause contamination of vegetation in unrestricted areas to exceed 5 pCi/g (0.185 Bq/g), based on dry weight, for radium-226 or radium-228.

(6) Notwithstanding the limits specified in paragraph (2) of this subsection, no licensee shall cause the concentration of natural uranium with no daughters present, based on dry weight and averaged over any 100 m^2 of area, to exceed the following limits:

(A) 30 pCi/g (1.11 Bq/g), averaged over the top 15 cm of soil below the surface; and

(B) 150 pCi/g (5.55 Bq/g), average concentration at depths greater than 15 centimeters below the surface so that no individual member of the public will receive an effective dose equivalent in excess of 100 mrem (1 mSv) per year.

(fff) Exemption of specific wastes.

(1) A licensee may discard the following licensed material without regard to its radioactivity:

(A) 0.05 microcurie (μCi) (1.85 kilobecquerels (kBq)), or less, of hydrogen-3, carbon-14, or iodine-125 per gram of medium used for liquid scintillation counting or *in vitro* clinical or *in vitro* laboratory testing; and

(B) 0.05 μCi (1.85 kBq), or less, of hydrogen-3, carbon-14, or iodine-125, per gram of animal tissue, averaged over the weight of the entire animal.

(2) A licensee shall not discard tissue in accordance with paragraph (1)(B) of this subsection in a manner that would permit its use either as food for humans or as animal feed.

(3) The licensee shall maintain records in accordance with subsection (tt) of this section.

(4) Any licensee may, upon agency approval of procedures required in paragraph (6) of this subsection, discard licensed material included in subsection (ggg)(7) of this section, provided that it does not exceed the concentration and total curie limits contained therein, in a Type I municipal solid waste site as defined in the Municipal Solid Waste Regulations of the authorized regulatory agency (31 Texas Administrative Code Chapter 330), unless such licensed material also contains hazardous waste, as defined in Section 3(15) of the Solid Waste Disposal Act, Health and Safety Code, Chapter 361. Any licensed material included in subsection (ggg)(7) of this section and which is a hazardous waste as defined in the Solid Waste Disposal Act may be discarded at a facility authorized to manage hazardous waste by the authorized regulatory agency.

(5) Each licensee who discards material described in paragraphs (1) or (4) of this subsection shall:

(A) make surveys adequate to assure that the limits of paragraphs (1) or (4) of this subsection are not exceeded; and

(B) remove or otherwise obliterate or obscure all labels, tags, or other markings that would indicate that the material or its contents is radioactive.

(6) Prior to authorizations in accordance with paragraph (4) of this subsection, a licensee shall submit procedures to the agency for:

(A) the physical delivery of the material to the disposal site;

(B) surveys to be performed for compliance with paragraph (5)(A) of this subsection;

(C) maintaining secure packaging during transportation to the site; and

(D) maintaining records of any discards made under paragraph (4) of this subsection.

(7) Nothing in this section relieves the licensee of maintaining records showing the receipt, transfer, and discard of such radioactive material as specified in §289.201(d) of this title.

(8) Nothing in this section relieves the licensee from complying with other applicable federal, state, and local regulations governing any other toxic or hazardous property of these materials.

(9) Licensed material discarded under this section is exempt from the requirements of §289.252(t) of this title.

(ggg) Appendices.

(1) Protection factors for respirators. The following table contains protection factors for respirators[a]:

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		Protection Factors[d]		Tested & Certified Equipment
Description[b]	Modes[c]	Particulates only	Particulates, gases, vapors[e]	National Institute for Occupational Safety and Health & Mine Safety and Health Administration tests for permissibility
1. AIR-PURIFYING RESPIRATORS[f]				
Facepiece, half-mask[g]	NP	10		30 CFR 11, Subpart K.
Facepiece, full	NP	50		
Facepiece, half-mask, full, or hood	PP	1,000		
2. ATMOSPHERE-SUPPLYING RESPIRATORS				
A. Air-line respirator				
Facepiece, half-mask	CF		1,000	
Facepiece, half-mask	D		5	
Facepiece, full	CF		2,000	
Facepiece, full	D		5	30 CFR 11, Subpart J.
Facepiece, full	PD		2,000[h]	
Hood	CF		[i]	[j]
Suit	CF			
B. Self-contained breathing apparatus (SCBA)				
Facepiece, full	D		50	
Facepiece, full	PD		10,000[k]	30 CFR 11, Subpart H.
Facepiece, full	RD		50	
Facepiece, full	RP		5,000[l]	

See footnotes at end of this paragraph.

Description[b]	Modes[c]	Protection Factors[d]: Particulates only	Protection Factors[d]: Particulates, gases, vapors[e]	Tested & Certified Equipment: National Institute for Occupational Safety and Health & Mine Safety and Health Administration tests for permissibility
3. COMBINATION RESPIRATORS				
Any combination of air-purifying and atmosphere-supplying respirators	Protection factor for type and mode of operation as listed above			30 CFR 11, 11.63(b).

See footnotes at end of this paragraph.

FOOTNOTES

(a) For use in the selection of respiratory protective equipment to be used only where the contaminants have been identified and the concentrations, or possible concentrations, are known.

(b) Only for shaven faces and where nothing interferes with the seal of tight-fitting facepieces against the skin. Hoods and suits are excepted.

(c) The mode symbols are defined as follows:

CF = continuous flow
D = demand
NP = negative pressure, that is, negative phase during inhalation
PD = pressure demand, that is, always positive pressure
PP = positive pressure
RD = demand, recirculating or closed circuit
RP = pressure demand, recirculating or closed circuit

(d) (1) The protection factor is a measure of the degree of protection afforded by a respirator, defined as the ratio of the concentration of airborne radioactive material outside the respiratory protective equipment to that inside the equipment, usually inside the facepiece, under conditions of use. It is applied to the ambient airborne concentration to estimate the concentrations inhaled by the wearer according to the following formula:

$$\textit{Concentration inhaled} = \frac{\textit{Ambient airborne concentration}}{\textit{Protection factor}}$$

(2) The protection factors apply:

(i) only for individuals trained in using respirators and wearing properly fitted respirators that are used and maintained under supervision in a well-planned respiratory protective program;

(ii) for air-purifying respirators only when high efficiency particulate filters, above 99.97% removal efficiency by thermally generated 0.3 micrometer dioctyl phthalate (DOP) test or equivalent, are used in atmospheres not deficient in oxygen and not containing radioactive gas or vapor respiratory hazards;

(iii) no adjustment is to be made for the use of sorbents against radioactive material in the form of gases or vapors;

(iv) for atmosphere-supplying respirators only when supplied with adequate respirable air. Respirable air shall be provided of the quality and quantity required in accordance with the NIOSH and the MSHA certification described in 30 CFR 11. Oxygen and air shall not be used in the same apparatus.

(e) Excluding radioactive contaminants that present an absorption or submersion hazard. For tritium oxide, approximately one-third of the intake occurs by absorption through the skin so that an overall protection factor of less than 2 is appropriate when atmosphere-supplying respirators are used to protect against tritium oxide. If the protection factor for respiratory protective equipment is 5, the effective protection factor for tritium is about 1.4; with protection factors of 10, the effective factor for tritium oxide is about 1.7; and with protection factors of 100 or more, the effective factor for tritium oxide is about 1.9. Air-purifying respirators are not suitable for protection against tritium oxide. See also footnote (i) concerning supplied-air suits.

(f) Canisters and cartridges shall not be used beyond service-life limitations.

(g) Under-chin type only. This type of respirator is not satisfactory for use where it might be possible, such as, if an accident or emergency were to occur, for the ambient airborne concentrations to reach instantaneous values greater than 10 times the pertinent values in Column 3 of Table I of subsection (ggg)(2) of this section. This type of respirator is not suitable for protection against plutonium or other high-toxicity materials. The mask is to be tested for fit prior to use, each time it is donned.

(h) (1) Equipment shall be operated in a manner that ensures that proper air flow-rates are maintained. A protection factor of no more than 1000 may be utilized for tested-and-certified supplied-air hoods when a minimum air flow of 6 ft^3/min (0.17 m^3/min) is maintained and calibrated air line pressure gauges or flow measuring devices are used. A protection factor of up to 2000 may be used for tested and certified hoods only when the air flow is maintained at the manufacturer's recommended maximum rate for the equipment, this rate is greater than 6 ft^3/min (0.17 m^3/min) and calibrated air line pressure gauges or flow measuring devices are used.

(2) The design of the supplied-air hood or helmet, with a minimum flow of 6 ft^3/min (0.17 m^3/min) of air, may determine its overall efficiency and the protection it provides. For example, some hoods aspirate contaminated air into the breathing zone when the wearer works with hands-over-head. This aspiration may be overcome if a short cape-like extension to the hood is worn under a coat or overalls. Other limitations specified by the approval agency shall be considered before using a hood in certain types of atmospheres. See footnote (i).

(i) Appropriate protection factors shall be determined, taking into account the design of the suit and its permeability to the contaminant under conditions of use. There shall be a standby rescue person equipped with a respirator or other apparatus appropriate for the potential hazards and communications equipment whenever supplied-air suits are used.

(j) No approval schedules are currently available for this equipment. Equipment is to be evaluated by testing or on the basis of reliable test information.

(k) This type of respirator may provide greater protection and be used as an emergency device in unknown concentrations for protection against inhalation hazards. External radiation hazards and other limitations to permitted exposure, such as skin absorption, must be taken into account in such circumstances.

(l) Quantitative fit testing shall be performed on each individual, and no more than 0.02% leakage is allowed with this type of apparatus. Perceptible outward leakage of gas from this or any positive pressure self-contained breathing apparatus is unacceptable because service life will be reduced substantially. Special training in the use of this type of apparatus shall be provided to the wearer.

Note 1: Protection factors for respirators approved by the United States Bureau of Mines and the NIOSH, according to applicable approvals for respirators for type and mode of use to protect against airborne radionuclides, may be used to the extent that they do not exceed the protection factors listed in this table. The protection factors listed in this table may not be appropriate to circumstances where chemical or other respiratory hazards exist in addition to radioactive hazards. The selection and use of respirators for such circumstances should take into account applicable approvals of the United States Bureau of Mines and the NIOSH.

Note 2: Radioactive contaminants, for which the concentration values in Column 3 of Table I of subsection (ggg)(2) of this section are based on internal dose due to inhalation, may present external exposure hazards at higher concentrations. Under these circumstances, limitations on occupancy may have to be governed by external dose limits.

(2) Annual limits on intake (ALI) and derived air concentrations (DAC) of radionuclides for occupational exposure; effluent concentrations; concentrations for release to sanitary sewerage.

(A) Introduction.

(*i*) For each radionuclide, Table I of subparagraph (F) of this paragraph indicates the chemical form that is to be used for selecting the appropriate ALI or DAC value. The ALIs and DACs for inhalation are given for an aerosol with an activity median aerodynamic diameter (AMAD) of 1 micron, and for three classes (D,W,Y) of radioactive material, which refer to their retention (approximately days, weeks, or years) in the pulmonary region of the lung. This classification applies to a range of clearance half-times for D if less than 10 days, for W from 10 to 100 days, and for Y greater than 100 days. Table II of subparagraph (F) of this paragraph provides concentration limits for airborne and liquid effluents released to the general environment. Table III of subparagraph (F) of this paragraph provides concentration limits for discharges to sanitary sewerage.

(*ii*) The values in Tables I, II, and III of subparagraph (F) of this paragraph are presented in the computer "E" notation. In this notation a value of 6E-02 represents a value of 6×10^{-2} or 0.06, 6E+2 represents 6×10^{2} or 600, and 6E+0 represents 6×10^{0} or 6.

(B) Occupational values.

(*i*) Note that the columns in Table I of subparagraph (F) of this paragraph captioned "Oral Ingestion ALI," "Inhalation ALI," and "DAC," are applicable to occupational exposure to radioactive material.

(*ii*) The ALIs in subparagraph (F) of this paragraph are the annual intakes of given radionuclide by "Reference Man" that would result in either a committed effective dose equivalent of 5 rems (0.05 Sv), stochastic ALI, or a committed dose equivalent of 50 rems (0.5 Sv) to an organ or tissue, non-stochastic ALI. The stochastic ALIs were derived to result in a risk, due to irradiation of organs and tissues, comparable to the risk associated with deep dose equivalent to the whole body of 5 rems (0.05 Sv). The derivation includes multiplying the committed dose equivalent to an organ or tissue by a weighting factor, w_T. This weighting factor is the proportion of the risk of stochastic effects resulting from irradiation of the organ or tissue, T, to the total risk of stochastic effects when the whole body is irradiated uniformly. The values of w_T are listed under the definition of "weighting factor" in subsection (c) of this section. The non-stochastic ALIs were derived to avoid non-stochastic effects, such as prompt damage to tissue or reduction in organ function.

(*iii*) A value of $w_T = 0.06$ is applicable to each of the five organs or tissues in the "remainder" category receiving the highest dose equivalents, and the dose equivalents of all other remaining tissues may be disregarded. The following portions of the GI tract; stomach, small intestine, upper large intestine, and lower large intestine, are to be treated as four separate organs.

(*iv*) The dose equivalents for an extremity, skin, and lens of the eye are not considered in computing the committed effective dose equivalent, but are subject to limits that must be met separately.

(*v*) When an ALI is defined by the stochastic dose limit, this value alone is given. When an ALI is determined by the non-stochastic dose limit to an organ, the organ or tissue to which the limit applies is shown, and the ALI for the stochastic limit is shown in parentheses. Abbreviated organ or tissue designations are used as follows:

(I) LLI wall = lower large intestine wall;

(II) St. wall = stomach wall;

(III) Blad wall = bladder wall; and

(IV) Bone surf= bone surface.

(*vi*) The use of the ALIs listed first, the more limiting of the stochastic and non-stochastic ALIs, will ensure that non-stochastic effects are avoided and that the risk of stochastic effects is limited to an acceptably low value. If, in a particular situation involving a radionuclide for which the non-stochastic ALI is limiting, use of that non-stochastic ALI is considered unduly conservative, the licensee may use the stochastic ALI to determine the committed effective dose equivalent. However, the licensee shall also ensure that the 50 rems (0.5 sievert) dose equivalent limit for any organ or tissue is not exceeded by the sum of the external deep dose equivalent plus the internal committed dose equivalent to that organ, not the effective dose. For the case where there is no external dose contribution, this would be demonstrated if the sum of the fractions of the nonstochastic ALIs (ALI_{ns}) that contribute to the committed dose equivalent to the organ receiving the highest dose does not exceed unity, that is, $\sum$ (intake (in μCi) of each radionuclide/ALI_{ns}) ≤ 1.0. If there is an external deep dose equivalent contribution of H_d, then this sum must be less than $1 - (H_d/50)$, instead of ≤ 1.0.

(*vii*) The dose equivalents for an extremity, skin, and lens of the eye are not considered in computing the committed effective dose equivalent, but are subject to limits that must be met separately.

(*viii*) The DAC values are derived limits intended to control chronic occupational exposures. The relationship between the DAC and the ALI is given by:

$$DAC = ALI(\text{in } \mu Ci)/(2000 \text{ hours per working year} \times 60 \text{ minutes/hour} \times 2 \times 10^4 \text{ ml per minute}) = [ALI/2.4 \times 10^9]\ \mu Ci/ml,$$

where 2×10^4 milliliter is the volume of air breathed per minute at work by Reference Man under working conditions of light work.

(*ix*) The DAC values relate to one of two modes of exposure: either external submersion or the internal committed dose equivalents resulting from inhalation of radioactive materials. DACs based upon submersion are for immersion in a semi-infinite cloud of uniform concentration and apply to each radionuclide separately.

(*x*) The ALI and DAC values include contributions to exposure by the single radionuclide named and any in-growth of daughter radionuclides produced in the body by decay of the parent. However, intakes that include both the parent and daughter radionuclides should be treated by the general method appropriate for mixtures.

(*xi*) The values of ALI and DAC do not apply directly when the individual both ingests and inhales a radionuclide, when the individual is exposed to a mixture of radionuclides by either inhalation or ingestion or both, or when the individual is exposed to both internal and external irradiation. See subsection (g) of this section. When an individual is exposed to radioactive materials which fall under several of the translocation classifications of the same radionuclide, such as, Class D, Class W, or Class Y, the exposure may be evaluated as if it were a mixture of different radionuclides.

(*xii*) It should be noted that the classification of a compound as Class D, W, or Y is based on the chemical form of the compound and does not take into account the radiological half-life of different radionuclides. For this reason, values are given for Class D, W, and Y compounds, even for very short-lived radionuclides.

(C) Effluent concentrations.

(*i*) The columns in Table II of subparagraph (F) of this paragraph captioned "Effluents," "Air," and "Water" are applicable to the assessment and control of dose to the public, particularly in the implementation of the provisions of subsection (o) of this section. The concentration values given in Columns 1 and 2 of Table II of subparagraph (F) of this paragraph are equivalent to the radionuclide concentrations which, if inhaled or ingested continuously over the course of a year, would produce a total effective dose equivalent of 0.05 rem (0.5 mSv).

(*ii*) Consideration of non-stochastic limits has not been included in deriving the air and water effluent concentration limits because non-stochastic effects are presumed not to occur at or below the dose levels established for individual members of the public. For radionuclides, where the non-stochastic limit was governing in deriving the occupational DAC, the stochastic ALI was used in deriving the corresponding airborne effluent limit in Table II of subparagraph (F) of this paragraph. For this reason, the DAC and airborne effluent limits are not always proportional as they were in the previous radiation protection standards.

(*iii*) The air concentration values listed in Column I of Table II of subparagraph (F) of this paragraph were derived by one of two methods. For those radionuclides for which the stochastic limit is governing, the occupational stochastic inhalation ALI was divided by 2.4×10^9, relating the inhalation ALI to the DAC, as explained in subparagraph (B)(*viii*) of this paragraph, and then divided by a factor of 300. The factor of 300 includes the following components:

(*I*) a factor of 50 to relate the 5 rems (0.05 Sv) annual occupational dose limit to the 0.1 rem limit for members of the public;

(*II*) a factor of 3 to adjust for the difference in exposure time and the inhalation rate for a worker and that for members of the public; and

(*III*) a factor of 2 to adjust the occupational values, derived for adults, so that they are applicable to other age groups.

(*iv*) For those radionuclides for which submersion, that is external dose, is limiting, the occupational DAC in Column 3 of Table I of subparagraph (F) of this paragraph was divided by 219. The factor of 219 is composed of a factor of 50, as described in clause (*iii*) of this subparagraph, and a factor of 4.38 relating occupational exposure for 2,000 hours per year to full-time exposure (8,760 hours per year). Note that an additional factor of 2 for age considerations is not warranted in the submersion case.

(*v*) The water concentrations were derived by taking the most restrictive occupational stochastic oral ingestion ALI and dividing by 7.3×10^7. The factor of 7.3×10^7 milliliters (ml) includes the following components:

(*I*) the factors of 50 and 2 described in clause (*iii*) of this subparagraph; and

(*II*) a factor of 7.3×10^5 (ml) which is the annual water intake of "Reference Man."

(*vi*) Note 2 of subparagraph (F) of this paragraph provides groupings of radionuclides that are applicable to unknown mixtures of radionuclides. These groupings, including occupational inhalation ALIs and DACs, air and water effluent concentrations, and releases to sewer, require demonstrating that the most limiting radionuclides in successive classes are absent. The limit for the unknown mixture is defined when the presence of one of the listed radionuclides cannot be definitely excluded as being present either from knowledge of the radionuclide composition of the source or from actual measurements.

(D) Releases to sewers. The monthly average concentrations for release to sanitary sewerage are applicable to the provisions in subsection (gg) of this section. The concentration values were derived by taking the most restrictive occupational stochastic oral ingestion ALI and dividing by 7.3×10^6 (ml). The factor of 7.3×10^6 (ml) is composed of a factor of 7.3×10^5 (ml), the annual water intake by "Reference Man," and a factor of 10, such that the concentrations, if the sewage released by the licensee were the only source of water ingested by a "Reference Man" during a year, would result in a committed effective dose equivalent of 0.5 rem.

(E) List of elements.

Name	Symbol	Atomic Number	Name	Symbol	Atomic Number
Actinium	Ac	89	Chlorine	Cl	17
Aluminum	Al	13	Chromium	Cr	24
Americium	Am	95	Cobalt	Co	27
Antimony	Sb	51	Copper	Cu	29
Argon	Ar	18	Curium	Cm	96
Arsenic	As	33	Dysprosium	Dy	66
Astatine	At	85	Einsteinium	Es	99
Barium	Ba	56	Erbium	Er	68
Berkelium	Bk	97	Europium	Eu	63
Beryllium	Be	4	Fermium	FM	100
Bismuth	Bi	83	Fluorine	F	9
Bromine	Br	35	Francium	Fr	87
Cadmium	Cd	48	Gadolinium	Gd	64
Calcium	Ca	20	Gallium	Ga	31
Californium	Cf	98	Germanium	Ge	32
Carbon	C	6	Gold	Au	79
Cerium	Ce	58	Hafnium	Hf	72
Cesium	Cs	55	Holmium	Ho	67

§289.202(ggg)(2)(E)

Hydrogen	H1
Indium	In49

Name	Symbol	Atomic Number	Name	Symbol	Atomic Number
Iodine	I	53	Silicon	Si	14
Iridium	Ir	77	Silver	Ag	47
Iron	Fe	26	Sodium	Na	11
Krypton	Kr	36	Strontium	Sr	38
Lanthanum	La	57	Sulful	S	16
Lead	Pb	82	Tantalum	Ta	73
Lutetium	Lu	71	Technetium	Tc	43
Magnesium	Mg	12	Tellurium	Te	52
Manganese	Mn	25	Terbium	Tb	65
Mendelevium	Md	101	Thallium	Tl	81
Mercury	Hg	80	Thorium	Th	90
Molybdenum	Mo	42	Thulium	Tm	69
Neodymium	Nd	60	Tin	Sn	50
Neptunium	Np	93	Titanium	Ti	22
Nickel	Ni	28	Tungsten	W	74
Niobium	Nb	41	Uranium	U	92
Osmium	Os	76	Vanadium	V	23
Palladium	Pd	46	Xenon	Xe	54
Phosphorus	P	15	Ytterbium	Yb	70
Platinum	Pt	78	Yttrium	Y	39
Plutonium	Pu	94	Zinc	Zn	30
Polonium	Po	84	Zirconium	Zr	40
Potassium	K	19			
Praseodymium	Pr	59			
Promethium	Pm	61			
Protactinium	Pa	91			
Radium	Ra	88			
Radon	Rn	86			
Rhodium	Rh	45			
Rubidium	Rb	37			
Ruthenium	Ru	44			
Samarium	Sm	62			
Scandium	Sc	21			
Selenium	Se	34			

(F) Tables - Values for annual limits. The following tables contain values for annual limits on intake (ALI) and derived air concentrations (DAC) of radionuclides for occupational exposure; effluent concentrations; concentrations for release to sanitary sewerage:

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Attachment D

Instrument Calibration Certifications

Instruments   SWEETWATER TEXAS 79556 U.S.A.

CUSTOMER US ECOLOGY OAK RIDGE — ORDER NO. 263764 255716

Ludlum Measurements, Inc. Model 19 — Serial No. 160093

Model — Serial No.

Cal. Date 25-May-01 — Cal Due Date 25-May-02 — Cal. Interval 1 Year — Meterface 202-

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 74 °F RH 25 % Alt 704.8 mm Hg

☐ New Instrument — Instrument Received ☑ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☑ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity

☑ F/S Resp. ck ☑ Reset ck. ☐ Window Operation ☑ Geotropism

☑ Audio ck. ☐ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 2.2 VDC

☐ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☑ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97

Instrument Volt Set 550 V Input Sens. 33 mV Det. Oper ___ V at ___ mV Threshold Dial Ratio ___ = ___

☐ HV Readout (2 points) Ref./Inst. ___ / ___ V Ref./Inst. ___ / ___

COMMENTS:

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
5000	4000 µR/hr	4400	4000
5000	1000 µR/hr	1000	1000
500	400 µR/hr = 69.4K cpm	400	400
500	100 µR/hr	100	100
250	200 µR/hr = 32.8K cpm	180	200
250	100 µR/hr	100	110
50	6.94K cpm	40	40
50	1.74K cpm	10	10
25	3.28K cpm	19	20
25	820 cpm	4.5	5

*Uncertainty within ± 10% C.F. within ± 20%

50, 25 **Range(s) Calibrated Electronically**

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*		REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout				Log Scale			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources:

Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☑ M565 ☐ 5105 ☐ T1008 ☐ 7879 ☐ E552 ☑ E551 — ☐ Neutron Am-241 Be S/N T-3

☐ Alpha S/N ___ ☐ Beta S/N ___ ☐ Other ___

☑ m 500 S/N 121025 ☐ Oscilloscope S/N ___ ☑ Multimeter S/N 73760305

Calibrated By: [signature] — Date 25-May-01

Reviewed By: [signature] — Date 29 May 01

This certificate shall not be reproduced except in full, without the written approval of Ludlum Measurements, Inc. ☐ Passed Dielectric (Hi-Pot) and Continuity Test

FORM C22A 12/28/2000

Designer and Manufacturer of Scientific and Industrial Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 915-235-5494
501 OAK STREET FAX NO. 915-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER US ECOLOGY OAK RIDGE ORDER NO. 263764/255718

Mfg. Ludlum Measurements, Inc. Model 12S Serial No. 11818

Mfg. Model Serial No.

Cal. Date 29-May-01 Cal Due Date 29-May-02 Cal. Interval 1 Year Meterface 202-004

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 72 °F RH 40 % Alt 696.8 mm Hg

☐ New Instrument Instrument Received ☐ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☑ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☑ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity
☑ F/S Resp. ck ☑ Reset ck. ☐ Window Operation ☑ Geotropism
☑ Audio ck. ☐ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 2.2 VDC

☐ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☑ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 800 V Input Sens. 35 mV Det. Oper. V at mV Threshold Dial Ratio =

☐ HV Readout (2 points) Ref./Inst. / V Ref./Inst. /

COMMENTS:

Gamma Calibration GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
X 1000	2000 μR/hr	N/A	2
X 1000	1000 μR/hr		1
X 100	200 μR/hr= 35.6Kcpm		2
X 100	100 μR/hr		1.1
X 10	3.56K cpm		2
X 10	177K cpm		1
X1	356 cpm		2
X1	177 cpm		1

*Uncertainty within ± 10% C.F. within ± 20%

X10,X1 **Range(s) Calibrated Electronically**

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*		REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout				Log Scale			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978
State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources:

Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☑ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N ☐ Beta S/N ☐ Other

☑ m 500 S/N 121025 ☐ Oscilloscope S/N ☑ Multimeter S/N 73760305

Calibrated By: Ronald [signature] Date 29-May-01

Reviewed By: Rhonda Harris Date 29 May 01

SWEETWATER TEXAS 79556, U.S.A.

CUSTOMER US ECOLOGY OAK RIDGE ORDER NO. 263764/255713

Mfg. Ludlum Measurements, Inc Model 177 Serial No. 120411

Mfg. Ludlum Measurements, Inc. Model 44-9 Serial No. RN-013602

Cal. Date 29-May-01 Cal Due Date 29-May-02 Cal. Interval 1 Year Meterface 202-C

Check mark ✓ applies to applicable instr. and/or detector IAW m'fg. spec. T. 72 °F RH 40 % Alt 696.8 mm

☐ New Instrument Instrument Received ☑ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comment

☑ Mechanical ck. ☑ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity

☑ F/S Resp. ck ☑ Reset ck. ☐ Window Operation ☐ Geotropism

☑ Audio ck. ☑ Alarm Setting ck. ☐ Batt. ck. (Min. Volt) 5.97 VDC

☑ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☐ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 900 V Input Sens. 80 mV Det. Oper. 900 V at 80 mV Threshold Dial Ratio =

☑ HV Readout (2 points) Ref./Inst. 500 / 500 V Ref./Inst. 1000 / 1000

COMMENTS:

Instrument calibrated with 5' cable

Alarm checked but not set.

Gamma Calibration GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
X1000	400 K cpm	400	400
X1000	100 K cpm	100	100
X100	40 K cpm	400	400
X100	10 K cpm	100	100
X10	4 K cpm	400	400
X10	1 K cpm	100	100
X1	400 cpm	400	400
X1	100 cpm	100	100

*Uncertainty within ± 10% C.F. within ± 20% ALL Range(s) Calibrated Electronically

Digital Readout	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	Log Scale	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration technique. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-

Reference Instruments and/or Sources:

Cs-137 Gamma S/N ☐ 1162 ☑ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☑ E551 ☐ Neutron Am-241 Be S/N

☐ Alpha S/N ☐ Beta S/N ☐ Other

☑ m 500 S/N 121025 ☐ Oscilloscope S/N ☑ Multimeter S/N 73760305

Calibrated By: [signature] Date 29-May-01

Reviewed By: [signature] Date 29 May 01

This certificate shall not be reproduced except in full, without the written approval of Ludlum Measurements, Inc.
FORM C22A 12/28/2000

☑ Passed Dielectric (Hi-Pot) and Continuity Test

Designer and Manufacturer
of
Scientific and Industrial
Instruments

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 915-235-5494
501 OAK STREET FAX NO. 915-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CONVERSION CHART

Customer US ECOLOGY OAK RIDGE Date 29-May-01 Order #. 263764/255718

Model 177 Serial No. 120411 Detector Model 44-9 Serial No. RN-013602

Source Cs-137 194.6 mCi Cs-137 20 mCi High Voltage 900 V

Input Sensitivity 80 mV

Reference Point	"As Found" Readings (CPM): Meter Reading	Range/Scale	After Adjustment Readings (CPM): Meter Reading	Range/Scale
150 mR/hr	N/A		340	X1000
50 mR/hr			150	"
15 mR/hr			480	X100
5 mR/hr			180	"
1.5 mR/hr			480	X10
1.0 mR/hr			330	"

Signature: [signature] Date 29-May-01

FORM C?-?A 05/20/98

Scientific and Industrial Instruments

CERTIFICATE OF CALIBRATION

POST OFFICE BOX 810 PH. 915-235-5494
501 OAK STREET FAX NO. 915-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER US ECOLOGY OAK RIDGE ORDER NO. 263764255718

Mfg. Ludlum Measurements, Inc. Model 2221 Serial No. 126533

Mfg. Ludlum Measurements, Inc. Model 44-62 Serial No. PR113401

Cal. Date 23-May-01 Cal Due Date 23-May-02 Cal. Interval 1 Year Meterface 202-159

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 74 °F RH 20 % Alt 703.8 mm Hg

☐ New Instrument Instrument Received ☑ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☑ Meter Zeroed ☐ Background Subtract ☑ Input Sens. Linearity
☑ F/S Resp. ck ☑ Reset ck. ☑ Window Operation ☑ Geotropism
☑ Audio ck. ☐ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 5.0 VDC

☑ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☐ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 1050 V Input Sens. 10 mV Det. Oper. 1050 V at 10 mV Threshold Dial Ratio 100 = 10 mV

☑ HV Readout (2 points) Ref./Inst. 498 / 500 V Ref./Inst. 1993 / 2000 V

COMMENTS:

Instrument calibrated with 100' cable
HV set with detector connected.
Firmware:261010

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
X 1000	400K cpm	400	400
X 1000	100 K cpm	100	100
X 100	40 K cpm	400	400
X 100	10 K cpm	100	100
X 10	4 K cpm	400	400
X 10	1 K cpm	100	100
X 1	400 cpm	400	400
X 1	100 cpm	100	100

*Uncertainty within ± 10% C.F. within ± 20% ALL Range(s) Calibrated Electronically

Digital Readout

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
400 K cpm	399744	399744
40 K cpm	39978	39978
4 K cpm	3998	3998
400 cpm	400	400
40 cpm	40	40

Log Scale

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
500 K cpm	500K	500K
50 K cpm	50K	50K
5 K cpm	5K	5K
500 cpm	500	500

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources:

Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N ☐ Beta S/N ☑ Other Am-241 ~0.77uCi

☑ m 500 S/N 121025 ☐ Oscilloscope S/N ☑ Multimeter S/N 73760305

Calibrated By: Kenneth [signature] Date 23-May-01

Reviewed By: Rhonda Ham Date 29 May 01

FORM C22A 12/28/2000 ☐ Passed Dielectric (Hi-Pot) and Continuity Test

Designer and Manufacturer of Scientific and Industrial Instruments

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 915-235-5494
501 OAK STREET FAX NO. 915-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

Bench Test Data For Detector

Detector 44-62 Serial No. PR113401

Customer US ECOLOGY OAK RIDGE Order #. 263764255718

Counter 2221 Serial No. 126533 Counter Input Sensitivity 10 mV

Count Time 0.1min Distance Source to Detector Surface

Other

High Voltage	Background	Isotope Am-241 Size ≈0.77µCi	Isotope Size	Isotope Size	Isotope Size
900	73	4230			
950	80	4745			
1000	79	4833			
1050	58	5010			
1100	81	4987			
1150	68	4727			
1200	71	4808			

Signature [signature] Date 23-May-01

Scientific and Industrial Instruments

CERTIFICATE OF CALIBRATION

501 OAK STREET FAX NO. 915-235-46
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER US ECOLOGY OAK RIDGE ORDER NO. 263764/255718

Mfg. Ludlum Measurements, Inc. Model 2221 Serial No. 126523

Mfg. Ludlum Measurements, Inc. Model 43-5 Serial No. PR092793

Cal. Date 24-May-01 Cal Due Date 24-May-02 Cal. Interval 1 Year Meterface 202-15

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 73 °F RH 28 % Alt 700.8 mm

☐ New Instrument Instrument Received ☑ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☑ Meter Zeroed ☐ Background Subtract ☑ Input Sens. Linearity
☑ F/S Resp. ck ☑ Reset ck. ☑ Window Operation ☑ Geotropism
☑ Audio ck. ☐ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 5.0 VDC

☑ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☐ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 800 V Input Sens. 10 mV Det. Oper. 800 V at 10 mV Threshold Dial Ratio 100 = 10

☑ HV Readout (2 points) Ref./Inst. 500 / 500 V Ref./Inst. 2003 / 2000

COMMENTS:

Instrument calibrated with 5' cable
Firmware:261010
OL checked but not set.

Gamma Calibration GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
X 1000	400K cpm	400	400
X 1000	100 K cpm	100	100
X 100	40 K cpm	400	400
X 100	10 K cpm	100	100
X 10	4 K cpm	400	400
X 10	1 K cpm	100	100
X 1	400 cpm	400	400
X 1	100 cpm	100	100

*Uncertainty within ± 10% **C.F. within ± 20%

ALL Range(s) Calibrated Electronically

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*		REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout	400 K cpm	399522	399522	Log Scale	500 K cpm	500K	500K
	40 K cpm	39961	39961		50 K cpm	50K	50K
	4 K cpm	3996	3996		5 K cpm	5K	5K
	400 cpm	400	400		500 cpm	500	500
	40 cpm	40	40				

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration technique. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-

Reference Instruments and/or Sources:

Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ Neutron Am-241 Be S/N

☑ Alpha S/N Pu-239 4337 15.7Kcpm ☐ Beta S/N ☐ Other

☑ m 500 S/N 121025 ☐ Oscilloscope S/N ☑ Multimeter S/N 73760305

Calibrated By: [signature] Date 24-May-01

Reviewed By: Rhonda Harris Date 29 May 01

FORM C22A 12/28/2000

☐ Passed Dielectric (Hi-Pot) and Continuity Test

Designer and Manufacturer of Scientific and Industrial Instruments

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 915-235-5494
501 OAK STREET FAX NO. 915-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

Bench Test Data For Alpha Detector

Detector 43-5 Serial No. PR092793

Customer US ECOLOGY OAK RIDGE Order #. 263764/255718

Counter 2221 Serial No. 126523 Counter Input Sensitivity 10 mV

Count Time 1 min Distance Source to Detector Surface

Isotope Pu-239 4337 15.7Kcpm Other

43-4/43-44 HV Adjust for Altitude

Altitude	High Voltage
Sea Level	2050 V
1000 foot	2025 V
2000 foot	2000 V
3000 foot	1975 V
4000 foot	1950 V
5000 foot	1925 V
6000 foot	1900 V
7000 foot	1875 V

Alpha Scintillation Detector

HV Plateau	Background	Source Count
650	0	2949
700	0	3705
750	0	3956
800	0	4107
850	2	4216
900	2	4098
950	5	4370

Operating Voltage Set at 800 V

Air Proportional	43-5	43-65	43-90	Background	Meter Reading	Range/Scale
Toe	Toe	L/S*	Toe	0	3995	—
Center	Center	Center	Center	0	4107	—
Heel	Heel	Other**	Heel	0	3918	—

✓ Uniformity (± 10%) Average Efficiency 26 %

* Least Sensitive Position (Heel of Detector)
** Opposite Least Sensitive Position (Top of Detector)

Signature Ronald H

Date 24-May-01

Ludlum Measurements Instruments

CERTIFICATE OF CALIBRATION

POST OFFICE BOX 810 PH. 915-235-5494
501 OAK STREET FAX NO. 915-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER US ECOLOGY OAK RIDGE ORDER NO. 263764/255718

Mfg. Ludlum Measurements, Inc. Model 2221 Serial No. 125469

Mfg. Ludlum Measurements, Inc. Model 43-90 Serial No. PR124875

Cal. Date 24-May-01 Cal Due Date 24-May-02 Cal. Interval 1 Year Meterface 202-159

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 73 °F RH 28 % Alt 700.8 mm Hg

☐ New Instrument Instrument Received ☑ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☑ Meter Zeroed ☐ Background Subtract ☑ Input Sens. Linearity

☑ F/S Resp. ck ☑ Reset ck. ☑ Window Operation ☑ Geotropism

☑ Audio ck. ☐ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 5.0 VDC

☑ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☐ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 650 V Input Sens. 10 mV Det. Oper. 650 V at 10 mV Threshold Dial Ratio 100 = 10 mV

☑ HV Readout (2 points) Ref./Inst. 500 / 500 V Ref./Inst. 1995 / 2000 V

COMMENTS:

OL set to simulate light leak.
Ffirmware: 261010
Calibrated with 5' Cable.

Gamma Calibration GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
X 1000	400K cpm	400	400
X 1000	100 K cpm	100	100
X 100	40 K cpm	400	400
X 100	10 K cpm	100	100
X 10	4 K cpm	400	400
X 10	1 K cpm	100	100
X 1	400 cpm	400	400
X 1	100 cpm	100	100

*Uncertainty within ± 10% C.F. within ± 20% ALL Range(s) Calibrated Electronically

Digital Readout

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
400 K cpm	400003	400003
40 K cpm	40003	40003
4 K cpm	4000	4000
400 cpm	400	400
40 cpm	40	40

Log Scale

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
500 K cpm	500K	500K
50 K cpm	50K	50K
5 K cpm	5K	5K
500 cpm	500	500

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources:

Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☐ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ Neutron Am-241 Be S/N T-304

☑ Alpha S/N Pu-239 4339 15.7Kcpm ☐ Beta S/N ☐ Other

☑ m 500 S/N 121025 ☐ Oscilloscope S/N ☑ Multimeter S/N 73760305

Calibrated By: [signature] Date 24-May-01

Reviewed By: Rhonda Harris Date 29 May 01

FORM C22A 12/28/2000 ☐ Passed Dielectric (Hi-Pot) and Continuity Test

Designer and Manufacturer
of
Scientific and Industrial
Instruments

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 915-235-5494
501 OAK STREET FAX NO. 915-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

Bench Test Data For Alpha Detector

Detector 43-90 Serial No. PR124875

Customer US ECOLOGY OAK RIDGE Order #. 263764/255718

Counter 2221 Serial No. 125469 Counter Input Sensitivity 10 mV

Count Time 1 min Distance Source to Detector Surface

Isotope Pu-239 4339 15.7Kcpm Other

43-4/43-44 HV Adjust for Altitude

Altitude	High Voltage
Sea Level	2050 V
1000 foot	2025 V
2000 foot	2000 V
3000 foot	1975 V
4000 foot	1950 V
5000 foot	1925 V
6000 foot	1900 V
7000 foot	1875 V

Alpha Scintillation Detector

HV Plateau	Background	Source Count
550	2	5610
600	1	6283
650	1	6662
700	2	6520
750	6	6939

Operating Voltage Set at 650 V

Air Proportional	43-5	43-65	43-90	Background	Meter Reading	Range/Scale
Toe	Toe	L/S*	Toe	1	6403	—
Center	Center	Center	Center	1	6662	—
Heel	Heel	Other**	Heel	1	6939	—

☑ Uniformity (± 10%) Average Efficiency 42 %

* Least Sensitive Position (Heel of Detector)
** Opposite Least Sensitive Position (Top of Detector)

Signature [signature] Date 24-May-01

Scientific and Industrial Instruments

CERTIFICATE OF CALIBRATION

501 OAK STREET FAX NO. 915-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER US ECOLOGY OAK RIDGE ORDER NO. 263768/255722

Mfg. Ludlum Measurements, Inc. Model 9 Serial No. 161684

Mfg. ______ Model ______ Serial No. ______

Cal. Date 22-May-01 Cal Due Date 22-May-02 Cal. Interval 1 Year Meterface 200

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 73 °F RH 20 % Alt 707.8 mm Hg

☐ New Instrument Instrument Received ~~☐ Within Toler. +-10%~~ ☑ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☑ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity
☐ F/S Resp. ck ☑ Reset ck. ☐ Window Operation ☑ Geotropism
☑ Audio ck. ☐ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 2.2 VDC

☐ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☑ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set ______ V Input Sens. ______ mV Det. Oper. ______ V at ______ mV Threshold Dial Ratio ______ = ______

☐ HV Readout (2 points) Ref./Inst. ______ / ______ V Ref./Inst. ______ / ______ V

COMMENTS:

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
X 1000	4 R/hr	4.2	4
X 1000	1 R/hr	1	1
X 100	400 mR/hr	4.2	4
X 100	100 mR/hr	1.1	1
X 10	40 mR/hr	4.2	4
X 10	10 mR/hr	1.1	1
X 1	4 mR/hr	4.1	4
X 1	1 mR/hr	0.8	1

*Uncertainty within ± 10% C.F. within ± 20% NONE **Range(s) Calibrated Electronically**

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*		REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout				Log Scale			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration technique. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978. State of Texas Calibration License No. LO-1

Reference Instruments and/or Sources:

Cs-137 Gamma S/N ☐ 1162 ☑ G112 ☐ M565 ☐ 5105 ☑ T1008 ☐ T879 ☐ E552 ☑ E551 ☐ Neutron Am-241 Be S/N

☐ Alpha S/N ______ ☐ Beta S/N ______ ☐ Other ______

☐ m 500 S/N ______ ☐ Oscilloscope S/N ______ ☐ Multimeter S/N ______

Calibrated By: [signature] Date 22 May 01

Reviewed By: Rhonda Harn Date 23 May 01

FORM C22A 10/28/2000

☐ Passed Dielectric (Hi-Pot) and Continuity Test

Attachment E

Survey Data

SMEAR COUNTING ANALYSIS REPORT

Date: 10/17/01 Analysis Performed by: Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID: 2929/171600 DETECTOR ID: 43-10-1/179311
EFFICIENCIES: α .34 βγ .43
MDA: α 13 βγ 484
PERFORMED BY: J. Sitzler

Sample Count Time: 1 min. Activity Report In ☒ dpm ☐ μCi

α Background: .1 cpm βγ Background: 73 cpm

SAMPLE I.D. OR DESCRIPTION	GROSS COUNTS α	GROSS COUNTS βγ	NET COUNTS α	NET COUNTS βγ	ACTIVITY α	ACTIVITY βγ
Room 1-1	4	94	3.9	21	11	49
1-2	10	80	9.9	7	29	16
1-3	0	78	0	5	0	12
1-4	0	74	0	1	0	2
1-5	2	78	1.9	5	6	12
2-1	10	102	9.9	29	29	67
2-2	4	82	3.9	9	11	21
2-3	0	86	0	13	0	30
2-4	2	64	1.9	0	6	0
2-5	4	74	3.9	1	11	2
3-1	10	92	9.9	19	29	44
3-2	0	66	0	0	0	0
3-3	2	90	1.9	17	6	40
3-4	2	88	1.9	15	6	35
3-5	4	74	3.9	1	11	2
4-1	4	76	3.9	3	11	7

Remarks:

Reviewed by: [signature] Date: 10/18/01

SMEAR COUNTING ANALYSIS REPORT

Date 10/17/01 Analysis Performed By Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID 2929/171600 DETECTOR ID 43-10-1/179311
EFICIENCIES α .34 βγ .43
MDA: α 13 βγ 484
PERFORMED BY J. Sitzler

Sample Count Time 1 min. Activity Report In x cpm μCi
α Background .1 cpm βγ Background 73 cpm

SAMPLE I.D. OR DESCRIPTION	GROSS COUNTS α	GROSS COUNTS βγ	NET COUNTS α	NET COUNTS βγ	ACTIVITY α	ACTIVITY βγ
Room 4-2	4	72	3.9	0	11	0
4-3	0	78	0	5	0	12
4-4	0	80	0	7	0	16
4-5	2	96	1.9	23	6	53
5-1	2	92	1.9	19	6	44
5-2	2	76	1.9	3	6	7
5-3	2	594	1.9	521	6	1212
5-4	2	88	1.9	15	6	35
5-5	2	126	1.9	53	6	123
6-1	0	74	0	1	0	2
6-2	2	76	1.9	3	6	7
6-3	0	62	0	0	0	0
6-4	4	86	3.9	13	11	30
6-5	6	84	5.9	11	17	26
7-1	2	82	1.9	9	6	21
7-2	0	72	0	0	0	0

Reviewed By [signature] Date 10/17/01

SMEAR COUNTING ANALYSIS REPORT

Date: 10/17/01　　　Analysis Performed By: Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID 2929/171600　　　DETECTOR # 43-10-1/L79311

EFICIENCIES α .34 βγ .43

MDA: α 13 βγ 484

PERFORMED BY J. Sitzler

Sample Count Time: 1 min.　　　Activity Report In: X dpm □ μCi

α Background: .1 cpm　　　βγ Background 73 cpm

SAMPLE I.D. OR DESCRIPTION	GROSS COUNTS		NET COUNTS		ACTIVITY	
	α	βγ	α	βγ	α	βγ
Room 7-3	0	84	0	11	0	26
7-4	0	80	0	7	0	16
7-5	0	68	0	0	0	0
8-1	2	88	1.9	15	6	35
8-2	2	84	1.9	11	6	26
8-3	0	78	0	5	0	12
8-4	0	74	0	1	0	2
8-5	12	70	11.9	0	35	0
9-1	14	80	13.9	7	41	16
9-2	2	80	1.9	7	6	16
9-3	2	74	1.9	1	6	2
9-4	2	78	1.9	5	6	12
9-5	0	88	0	15	0	35
10-1	4	86	3.9	13	11	30
10-2	2	76	1.9	3	6	7
10-3	0	80	0	7	0	16

Remarks:

Reviewed By: Neil White　　　Date 10/17/01

SMEAR COUNTING ANALYSIS REPORT

Date 10/17/01 Analysis Performed by Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID 2929/171600 DETECTOR # 43-10-1/179311
EFICIENCIES α .34 βγ .43
MDA: α 13 βγ 484
PERFORMED BY J. Sitzler

Sample Count Time 1 min. Activity Report In x cpm μCi

α Background .1 cpm βγ Background 73 cpm

SAMPLE ID OR DESCRIPTION	GROSS COUNTS α	GROSS COUNTS βγ	NET COUNTS α	NET COUNTS βγ	ACTIVITY α	ACTIVITY βγ
Room 10-4	0	82	0	9	0	21
10-5	2	74	1.9	1	6	2
11-1	0	76	0	3	0	7
11-2	2	140	1.9	67	6	156
11-3	6	88	5.9	15	17	35
11-4	2	94	1.9	21	6	49
11-5	0	82	0	9	0	21
12-1	0	90	0	17	0	40
12-2	2	86	1.9	13	6	30
12-3	0	82	0	9	0	21
12-4	0	84	0	11	0	26
12-5	4	58	3.9	0	11	0
13-1	2	130	1.9	57	6	133
13-2	0	86	0	13	0	30
13-3	0	124	0	51	0	119
13-4	0	88	0	15	0	35

Notes:

Reviewed by Nil Wt Date 10/17/01

SMEAR COUNTING ANALYSIS REPORT

Date 10/17/01 Analysis Performed by Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID 2929/171600 DETECTOR ID 43-10-1/179311
EFICIENCIES α .34 β/γ .43
MDA α 13 β/γ 484
PERFORMED BY J. Sitzler

Sample Count Time 1 min. Activity Report In ☒ cpm ☐ μCi
α Background .1 cpm β/γ Background 73 cpm

SAMPLE I.D. OR DESCRIPTION	GROSS COUNTS α	GROSS COUNTS β/γ	NET COUNTS α	NET COUNTS β/γ	ACTIVITY α	ACTIVITY β/γ
Room 13-5	0	112	0	39	0	91
16-1	0	52	0	0	0	0
16-2	2	102	1.9	29	6	67
16-3	0	78	0	5	0	12
16-4	0	72	0	0	0	0
16-5	10	84	9.9	11	29	26
17-1	4	80	3.9	7	11	16
17-2	2	80	1.9	7	6	16
17-3	0	88	0	15	0	35
17-4	0	80	0	7	0	16
17-5	0	108	0	35	0	81
18-1	0	68	0	0	0	0
18-2	0	72	0	0	0	0
18-3	0	102	0	29	0	67
18-4	2	68	1.9	0	6	0
18-5	4	80	3.9	7	11	16

Remarks

Reviewed by [signature] Date 10/17/01

SMEAR COUNTING ANALYSIS REPORT

Date 10/18/01 Analysis Performed By Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID 2929/171600 DETECTOR ID 43-10-1/179311
EFFICIENCIES α .34 β .43
MDA: α 13 β 484
PERFORMED BY J. Sitzler

Sample Count Time: 1 min. Activity Report In x cpm / dpm
α Background .1 cpm β Background 73 cpm

SAMPLE ID OR DESCRIPTION	GROSS COUNTS α	GROSS COUNTS β	NET COUNTS α	NET COUNTS β	ACTIVITY α	ACTIVITY β
Room 1-6	4	96	3.9	23	11	53
2-6	2	134	1.9	61	6	142
3-6	0	90	0	73	0	40
4-6	4	116	3.9	43	11	100
5-6	2	146	1.9	73	6	170
8-6	0	70	0	0	0	0
10-6	0	86	0	13	0	30
11-6	0	68	0	0	0	0
15-6	2	90	1.9	17	6	40
17-6	0	82	0	9	0	21
19-6	0	88	0	15	0	35
14-1	2	120	1.9	47	6	109
14-2	2	70	1.9	0	6	0
14-3	0	68	0	0	0	0
14-4	2	86	1.9	13	6	30
14-5	0	72	0	0	0	0

Reviewed By [illegible] Date 10/19/01

SMEAR COUNTING ANALYSIS REPORT

Date 10/18/01 Analysis Performed By: Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID 2929/171600 DETECTOR ID 43-10-1/179311
EFFICIENCIES α .34 $\beta\gamma$ .43
MDA: α 13 $\beta\gamma$ 484
PERFORMED BY J. Sitzler

Sample Count Time: 1 min. Activity Report In: x dpm μCi

α Background .1 cpm $\beta\gamma$ Background 73 cpm

SAMPLE I.D. OR DESCRIPTION	GROSS COUNTS α	GROSS COUNTS $\beta\gamma$	NET COUNTS α	NET COUNTS $\beta\gamma$	ACTIVITY α	ACTIVITY $\beta\gamma$
Room 15-1	2	82	1.9	9	6	21
15-2	8	82	7.9	9	23	21
15-3	0	82	0	9	0	21
15-4	0	74	0	1	0	2
15-5	0	70	0	0	0	0
19-1	2	78	1.9	5	6	12
19-2	0	64	0	0	0	0
19-3	4	50	3.9	0	11	0
19-4	2	64	1.9	0	6	0
19-5	0	80	0	7	0	16
20-1	2	72	1.9	0	6	0
20-2	0	84	0	11	0	26
20-3	0	68	0	0	0	0
20-4	0	70	0	0	0	0
20-5	2	88	1.9	15	6	35
21-1	2	90	1.9	17	6	40

Remarks

Reviewed By: [signature] Date 10/19/01

SMEAR COUNTING ANALYSIS REPORT

Date 10/18/01 Analysis Performed by Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID 2929/171600 DETECTOR # 43-10-1/179311
EFFICIENCIES α .34 βγ .43
MDA: α 13 βγ 484
PERFORMED BY J. Sitzler

Sample Count Time: 1 min. Activity Report In x dpm □ μCi
α Background .1 cpm βγ Background 73 cpm

SAMPLE I.D. OR DESCRIPTION	GROSS COUNTS α	GROSS COUNTS βγ	NET COUNTS α	NET COUNTS βγ	ACTIVITY α	ACTIVITY βγ
Room 21-2	2	58	1.9	0	6	0
21-3	0	86	0	13	0	30
21-4	2	84	1.9	11	6	26
21-5	0	56	0	0	0	0
22-1	0	98	0	25	0	58
22-2	0	120	0	47	0	109
22-3	0	88	0	15	0	35
23-1	0	80	0	7	0	16
23-2	0	92	0	19	0	44
23-3	0	78	0	5	0	12
* 22-4	0	72	0	0	0	0
23-4	4	78	3.9	5	11	12
24-1	0	90	0	17	0	40
24-2	0	108	0	35	0	81
24-3	4	90	3.9	17	11	40
25-1	0	74	0	1	0	2

Remarks

Reviewed by Ned Whitt Date 10/19/01

SMEAR COUNTING ANALYSIS REPORT

Date: 10/18/01 Analysis Performed by: Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID 2929/171600 DETECTOR # 43-10-1/179311
EFICIENCIES α .34 βγ .43
MDA: α 13 βγ 484
PERFORMED BY J. Sitzler

Sample Count Time: 1min. Activity Report In ✗ cpm ☐ μCi
α Background .1 cpm βγ Background 73 cpm

SAMPLE I.D. OR DESCRIPTION	GROSS COUNTS α	GROSS COUNTS βγ	NET COUNTS α	NET COUNTS βγ	ACTIVITY α	ACTIVITY βγ
Room 25-2	0	98	0	25	0	58
26-1	0	112	0	39	0	91
26-2	0	78	0	5	0	12
26-3	0	76	0	3	0	7
27-1	0	72	0	0	0	0
27-2	0	78	0	5	0	12
27-3	0	82	0	9	0	21
28-1	2	334	1.9	261	6	607
28-2	0	92	0	19	0	44
28-3	2	370	1.9	297	6	691
28-4	0	98	0	25	0	58
29-1	2	290	1.9	217	6	505
29-2	0	92	0	19	0	44
29-3	4	112	3.9	39	11	91
30-1	6	308	5.9	235	17	547
30-2	0	2456	0	2383	0	5542

Remarks:

Reviewed by [signature] Date 10/18/01

SMEAR COUNTING ANALYSIS REPORT

Date: 10/18/01 Analysis Performed by: Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID: 2929/171600 DETECTOR ID: 4310-1/179311

EFFICIENCIES α .34 βγ .43

MDA α 13 βγ 484

PERFORMED BY J. Sitzler

Sample Count Time 1min. Activity Report In: ☒ dpm ☐ μCi

α Background .1 cpm βγ Background 73 cpm

SAMPLE I.D. OR DESCRIPTION		GROSS COUNTS α	GROSS COUNTS βγ	NET COUNTS α	NET COUNTS βγ	ACTIVITY α	ACTIVITY βγ
Room	30-3	8	448	7.9	375	23	872
	30-4	0	106	0	33	0	77
	31-1	0	204	0	131	0	305
	31-2	0	324	0	251	0	584
	31-3	4	296	3.9	223	11	519
	31-4	6	118	5.9	45	17	105
	32-1	4	380	3.9	307	11	714
	32-2	0	132	0	59	0	137
	32-3	0	172	0	99	0	230
	32-4	0	90	0	17	0	40
	33-1	4	126	3.9	53	11	123
	33-2	26	140	25.9	67	76	156
	33-3	264	4504	263.9	4431	776	10,305
	33-4	4	200	3.9	127	11	295
	37-1	226	140	225.9	67	664	156
	37-2	14	78	13.9	5	41	12

Date 10/18/01

SMEAR COUNTING ANALYSIS REPORT

Date: 10/18/01 Analysis Performed by: Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID: 2929/171600 DETECTOR ID: 43-10-1/179311
EFFICIENCIES α .34 βγ .43
MDA: α 13 β 484
PERFORMED BY J. Sitzler

Sample Count Time: 1 min. Activity Report In: ☒ cpm ☐ μCi

α Background: .1 cpm βγ Background 73 cpm

SAMPLE I.D. OR DESCRIPTION	GROSS COUNTS α	GROSS COUNTS βγ	NET COUNTS α	NET COUNTS βγ	ACTIVITY α	ACTIVITY βγ
Room 37-3	38	106	37.9	33	111	77
37-4	2	88	1.9	15	6	35
37-5	0	112	0	39	0	91
37-6	10	88	9.9	15	29	35
37-7	4	68	3.9	0	11	0
37-8	20	100	19.9	27	59	63
37-9	16	168	15.9	95	47	221
37-10	0	92	0	19	0	44
38-1	12	108	11.9	35	35	81
38-2	0	84	0	11	0	26
38-3	6	92	5.9	19	17	44
38-4	0	106	0	33	0	77
38-5	20	70	19.9	0	59	0
38-6	0	106	0	33	0	77
39-1	14	128	13.9	55	41	128
39-2	2	74	1.9	1	6	2

Remarks

Reviewed by Neil [signature] Date 10/19/01

SMEAR COUNTING ANALYSIS REPORT

Date 10/18/01 Analysis Performed by Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID 2929/171600 DETECTOR ID 43-10-1/179311
EFICIENCIES α .34 βγ .43
MDA: α 13 βγ 484
PERFORMED BY J. Sitzler

Sample Count Time 1min. Activity Report In: x dpm μCi
α Background .1 cpm βγ Background 73 cpm

SAMPLE I.D. OR DESCRIPTION	GROSS COUNTS α	GROSS COUNTS βγ	NET COUNTS α	NET COUNTS βγ	ACTIVITY α	ACTIVITY βγ
Room 39-3	18	116	17.9	43	53	100
39-4	2	100	1.9	27	6	63
39-5	0	104	0	31	0	72
39-6	22	224	21.9	151	64	351
40-1	6	96	5.9	23	17	53
40-2	4	86	3.9	13	11	30
40-3	18	96	17.9	23	53	53
40-4	2	106	1.9	33	6	77
40-5	0	80	0	7	0	16
40-6	8	86	7.9	13	23	~~20~~ 30
41-1	246	204	245.9	131	723	305
41-2	0	79	0	6	0	14
41-3	2	90	1.9	17	6	40
41-4	4	116	3.9	43	11	100
41-5	38	166	37.9	93	111	216
41-6	2	70	1.9	0	6	0

Remarks

Reviewed by Nelson Date 10/18/01

SMEAR COUNTING ANALYSIS REPORT

Date: 10/18/01 Analysis Performed by: Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID: 2929/171600 DETECTOR ID: 43-10-1/179311
EFFICIENCIES α .34 βγ .43
MDA α 13 βγ 424
PERFORMED BY J. Sitzler

Sample Count Time 1min. Activity Report in: x cpm dpm
α Background .1 cpm βγ background 73 cpm

SAMPLE ID OR DESCRIPTION		GROSS COUNTS α	GROSS COUNTS βγ	NET COUNTS α	NET COUNTS βγ	ACTIVITY α	ACTIVITY βγ
Room	42-1	34	82	33.9	9	100	21
	42-2	0	108	0	35	0	81
	42-3	84	98	83.9	25	247	58
	42-4	4	98	3.9	25	11	58
	42-5	6	92	5.9	19	17	44
	42-6	8	84	7.9	11	23	26
	43-1	8	92	7.9	19	23	44
	43-2	8	80	7.9	7	23	16
	43-3	50	84	49.9	11	147	26
	43-4	6	58	5.9	0	17	0
	43-5	8	108	7.9	35	23	81
	43-6	2	82	1.9	9	6	21
	44-1	2	72	1.9	0	6	0
	44-2	2	74	1.9	1	6	2
	44-3	214	126	213.9	53	629	123
↓	44-4	58	116	57.9	43	170	100

Remarks

Reviewed by: [signature] Date 10/18/01

SMEAR COUNTING ANALYSIS REPORT

Date: 10/18/01 Analysis Performed by: Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID: 2929/171600 DETECTOR ID: 43-10-1/179311
EFFICIENCIES α .34 βγ .43
MDA: α 13 βγ 484
PERFORMED BY J. Sitzler

Sample Count Time: 1min. Activity Report In: ☒ dpm ☐ μCi
α Background: .1 cpm. βγ Background 73 cpm.

SAMPLE ID OR DESCRIPTION	GROSS COUNTS α	GROSS COUNTS βγ	NET COUNTS α	NET COUNTS βγ	ACTIVITY α	ACTIVITY βγ
Room 44-5	8	74	7.9	1	23	2
44-6	2	96	1.9	23	6	53
46-1	70	92	69.9	19	206	44
46-2	2	92	1.9	19	6	44
46-3	4	94	3.9	21	11	49
46-4	4	100	3.9	27	11	63
46-5	134	116	133.9	43	394	100
46-6	8	66	7.9	0	23	0
36-1	0	60	0	0	0	0
36-2	0	200	0	127	0	295
36-3	2	412	1.9	339	6	788
36-4	4	116	3.9	43	11	100
36-5	0	310	0	237	0	551
36-6	0	132	0	59	0	137

Remarks:

Reviewed by: [signature] Date 10/18/01

SMEAR COUNTING ANALYSIS REPORT

Date: 10/17/01 Analysis Performed by: Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID: 2929/171600 DETECTOR ID: 43-10-1/179311
EFICIENCIES: α .34 βγ .43
MDA: α 13 βγ 484
PERFORMED BY: J. Sitzler

Sample Count Time: 1 min. Activity Report In: ☒ dpm ☐ μCi

α Background: .1 cpm βγ Background: 73 cpm

SAMPLE I.D. OR DESCRIPTION	GROSS COUNTS		NET COUNTS		ACTIVITY	
	α	βγ	α	βγ	α	βγ
68-1	2	68	1.9	0	6	0
68-2	12	104	11.9	31	35	72
68-3	2	78	1.9	5	6	12
68-4	12	108	11.9	35	35	81
68-5	8	100	7.9	27	23	63
68-6	18	100	17.9	27	53	63
68-7	16	110	15.9	37	47	86
69-1	4	950	3.9	877	11	2040
69-2	4	2168	3.9	2095	11	4872
69-4	2	170	1.9	97	6	226
70-1	54	482	53.9	409	159	951
70-2	84	140	83.9	67	247	156
70-3	62	134	61.9	61	182	142
70-4	194	342	193.9	269	570	626
71-1	44	178	43.9	105	129	244
71-2	38	150	37.9	77	111	179

Remarks:

Reviewed by: [signature] Date: 10/18/01

SMEAR COUNTING ANALYSIS REPORT

Date: 10/17/01 Analysis Performed by: Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID: 2929/171600 DETECTOR ID: 43-10-1/179311

EFICIENCIES: α .34 βγ .43

MDA: α 13 βγ 484

PERFORMED BY: J. Sitzler

Sample Count Time: 1 min. Activity Report In: ☒ dpm ☐ μCi

α Background: .1 cpm βγ Background: 73 cpm

SAMPLE I.D. OR DESCRIPTION	GROSS COUNTS α	GROSS COUNTS βγ	NET COUNTS α	NET COUNTS βγ	ACTIVITY α	ACTIVITY βγ
71-3	10	122	9.9	49	29	114
71-4	34	110	33.9	37	100	86
71-5	18	242	17.9	169	53	393
72-1	6	102	5.9	29	17	67
72-2	38	146	37.9	73	111	170
72-3	42	598	41.9	525	123	1221
72-4	0	102	0	29	0	67
73-13	1260	368	1259.9	295	3706	686
73-14	1136	416	1135.9	343	3341	798
73-15	2492	600	2491.9	527	7329	1226
73-16	1572	520	1571.9	447	4623	1040
74-6	16	86	15.9	13	47	30
74-7	8	82	7.9	9	23	21
74-8	10	72	9.9	0	29	0
74-9	18	134	17.9	61	53	142
74-10	10	62	9.9	0	29	0

Remarks:

Reviewed by: Neil White Date 10/18/01

SMEAR COUNTING ANALYSIS REPORT

Date: 10/17/01 Analysis Performed by: Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID: 2929/171600 DETECTOR ID: 43-10-1/179311

EFICIENCIES: α .34 $\beta\gamma$ .43

MDA: α 13 $\beta\gamma$ 484

PERFORMED BY: J. Sitzler

Sample Count Time: 1 min. Activity Report In: ☒ dpm ☐ µCi

α Background: .1 cpm $\beta\gamma$ Background: 73 cpm

SAMPLE I.D. OR DESCRIPTION	GROSS COUNTS α	GROSS COUNTS $\beta\gamma$	NET COUNTS α	NET COUNTS $\beta\gamma$	ACTIVITY α	ACTIVITY $\beta\gamma$
+1	0	90	0	17	0	40
+2	1	98	.9	25	3	58
+3	0	78	0	5	0	12
+4	0	66	0	0	0	0
+5	2	82	1.9	9	6	21

Remarks:

Reviewed by: [signature] Date: 10/18/01

SMEAR COUNTING ANALYSIS REPORT

Date: 10/17/01 Analysis Performed by: Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID: 2929/171600 DETECTOR ID: 43-10-1/179311
EFICIENCIES: α .34 βγ .43
MDA: α 13 βγ 484
PERFORMED BY: J. Sitzler

Sample Count Time: 1 min. Activity Report In: ☒ dpm ☐ μCi

α Background: .1 cpm βγ Background: 73 cpm

SAMPLE I.D. OR DESCRIPTION	GROSS COUNTS α	GROSS COUNTS βγ	NET COUNTS α	NET COUNTS βγ	ACTIVITY α	ACTIVITY βγ
74-11	6	64	5.9	0	17	0
74-12	280	142	279.9	69	823	160
75-1	0	88	0	15	0	35
75-2	8	82	7.9	9	23	21
75-3	6	96	5.9	23	17	53
75-4	20	80	19.9	7	59	16
75-5	0	68	0	0	0	0

Remarks:

Reviewed by: [signature] Date: 10/18/01

SMEAR COUNTING ANALYSIS REPORT

Date: 10/17/01 Analysis Performed by: Janet Sitzler

COUNTING SYSTEM DATA

INSTRUMENT ID: 2929/171600 DETECTOR ID: 43-10-1/179311
EFICIENCIES α .34 βγ .43
MDA: α 13 βγ 484
PERFORMED BY: J. Sitzler

Sample Count Time: 1 min. Activity Report In ☒ dpm ☐ μCi

α Background: .1 cpm βγ Background: 73 cpm

SAMPLE I.D. OR DESCRIPTION	GROSS COUNTS α	GROSS COUNTS βγ	NET COUNTS α	NET COUNTS βγ	ACTIVITY α	ACTIVITY βγ
TCSL - 1	0	102	0	29	0	67
TCSL - 2	0	120	0	47	0	109
TCSL - 3	0	92	0	19	0	44
TCSL - 4	0	72	0	0	0	0
TCSL - 5	10	122	9.9	49	29	114
TCSL - 6	0	66	0	0	0	0
TCSL - 7	0	72	0	0	0	0
TCSL - 8	0	74	0	1	0	2
TCSL - 9	0	76	0	3	0	7
TCSL - 10	0	74	0	1	0	2
TCSL - 11	0	70	0	0	0	0
TCSL - 12	0	86	0	13	0	30
TCSL - 13	0	88	0	15	0	35
TCSL - 14	0	84	0	11	0	26
TCSL - 15	0	76	0	3	0	7
TCSL - 16	0	60	0	0	0	0

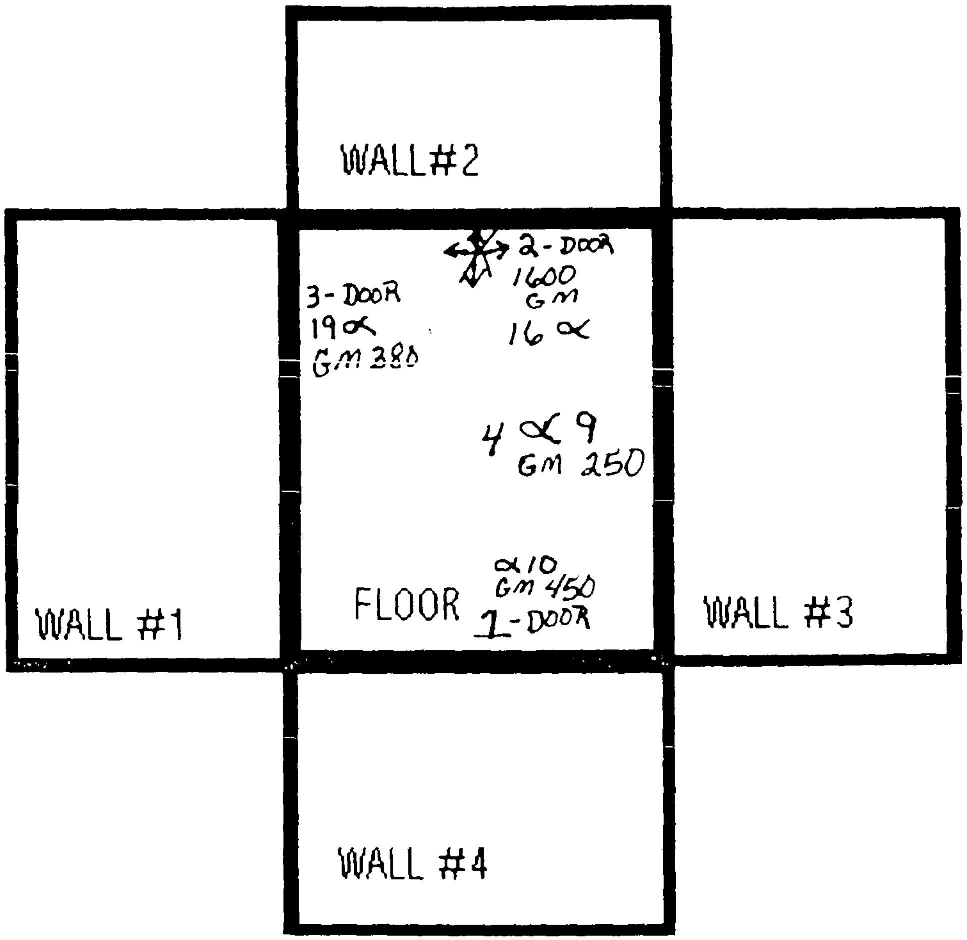
Remarks:

Reviewed by: Neil White Date 10/18/01

Attachment F

Maps

⑤ α
GM-320



ROOM NAME / # 22

COMMENTS

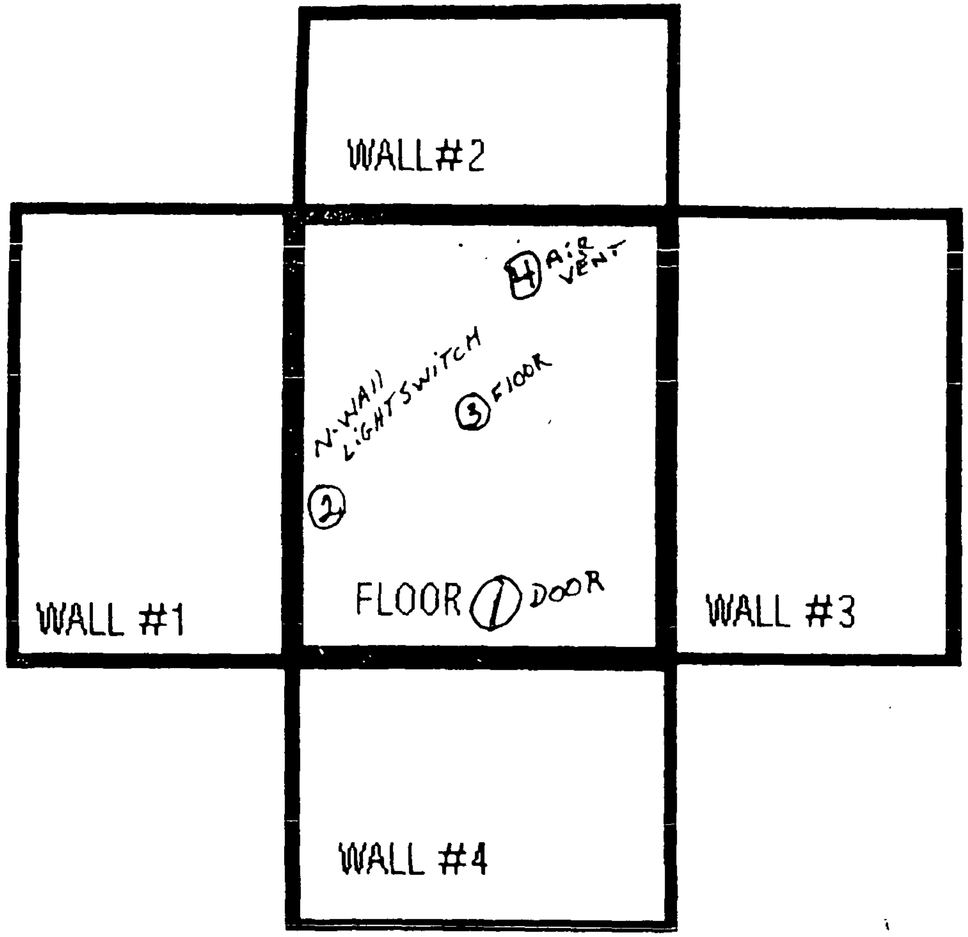
BK 150

1 220 Gm $\alpha = 8$ $\gamma =$

2 150 Gm γ.

3 150 Gm γ.

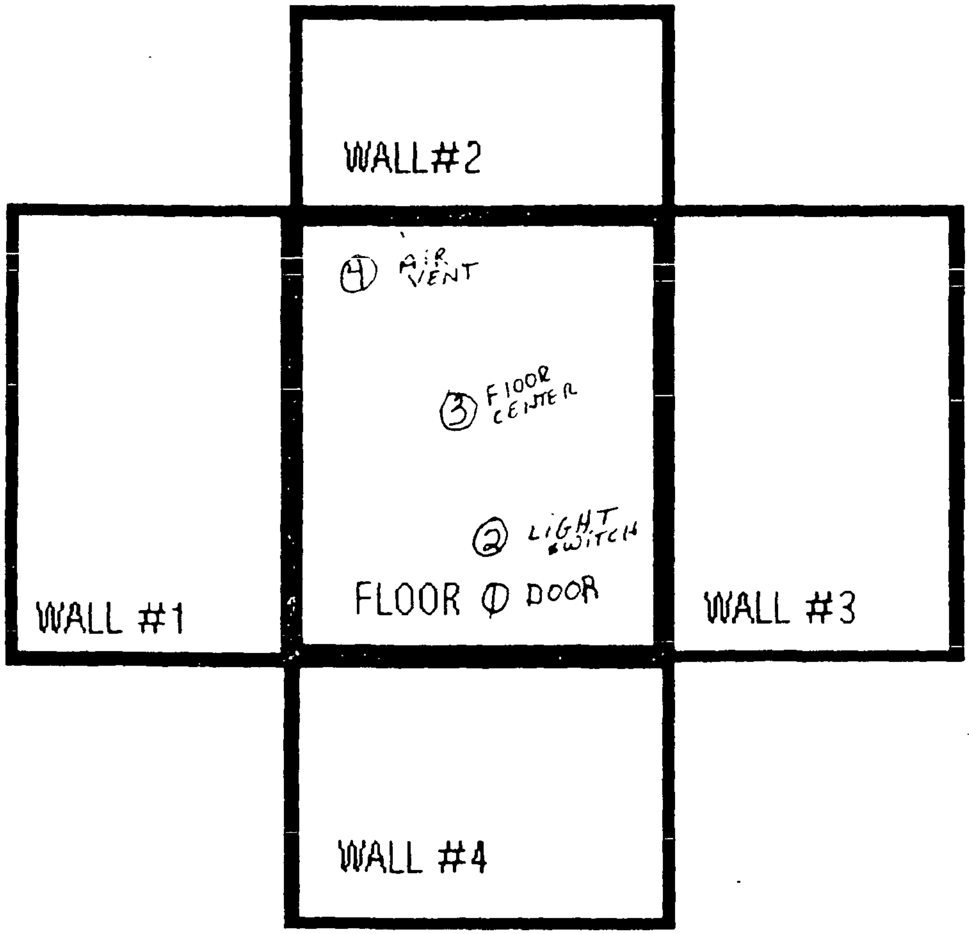
4 150 Gm $\gamma =$



ROOM NAME / # 23

COMMENTS

1-4 10 2 [illegible] DISP
3
4 GM 250
BX 250



ROOM NAME / # 24

COMMENTS

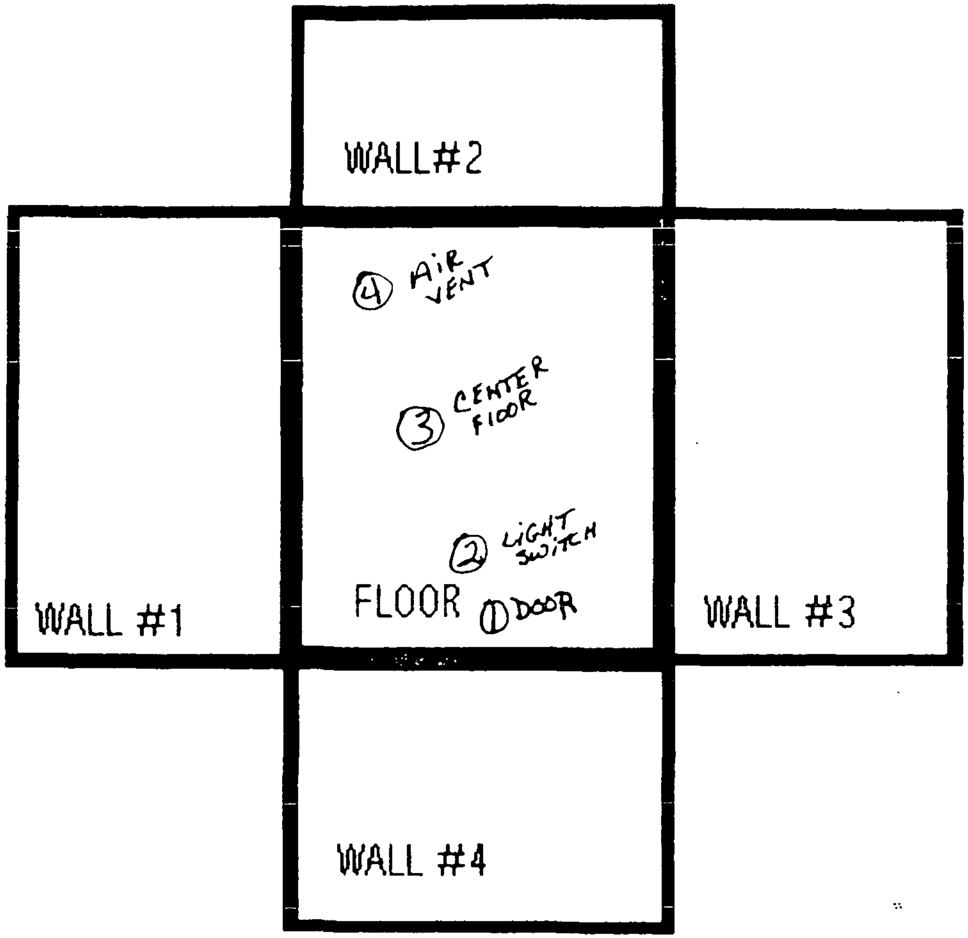
BK280

1 280 GM α: 12

2 280 GM

3 280 GM

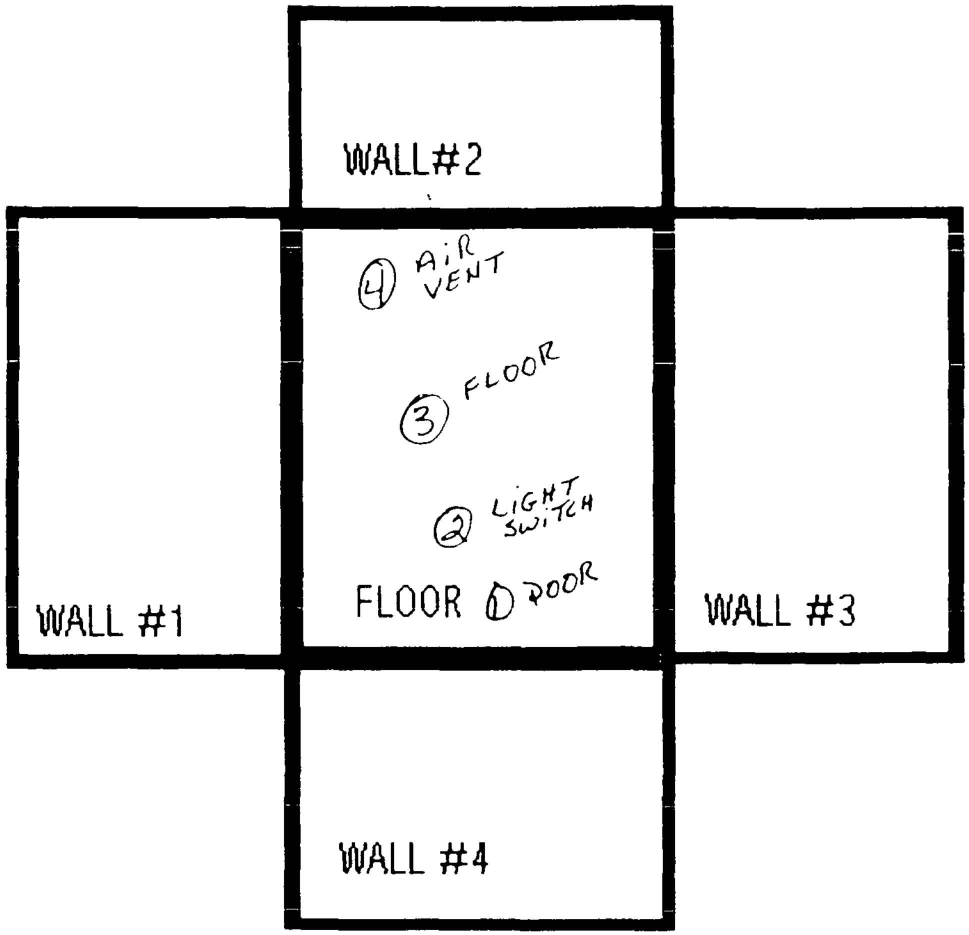
4 280 GM



ROOM NAME / # 25

COMMENTS

① GM:400 9
② GM·400 9
③ GM·400 9
④ GM·400 9



ROOM NAME / # 26

COMMENTS

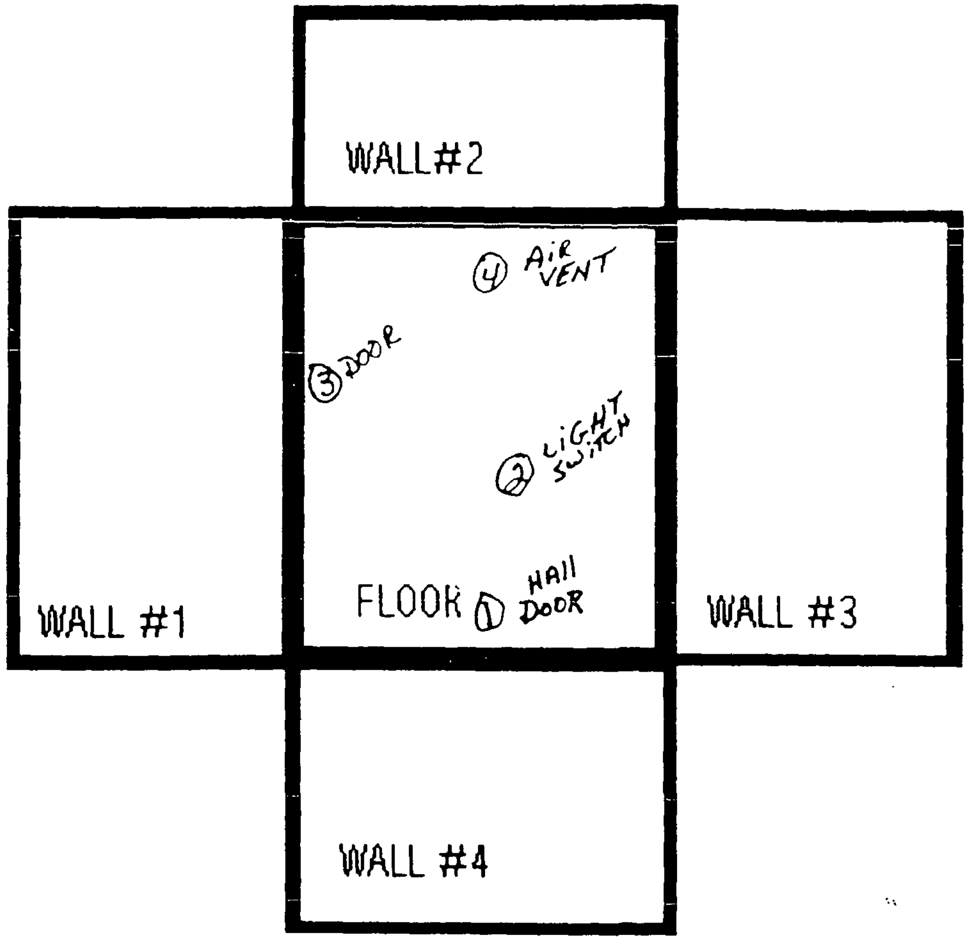
① 18 ⌀

②

③ 3 ⌀

④

BK-600



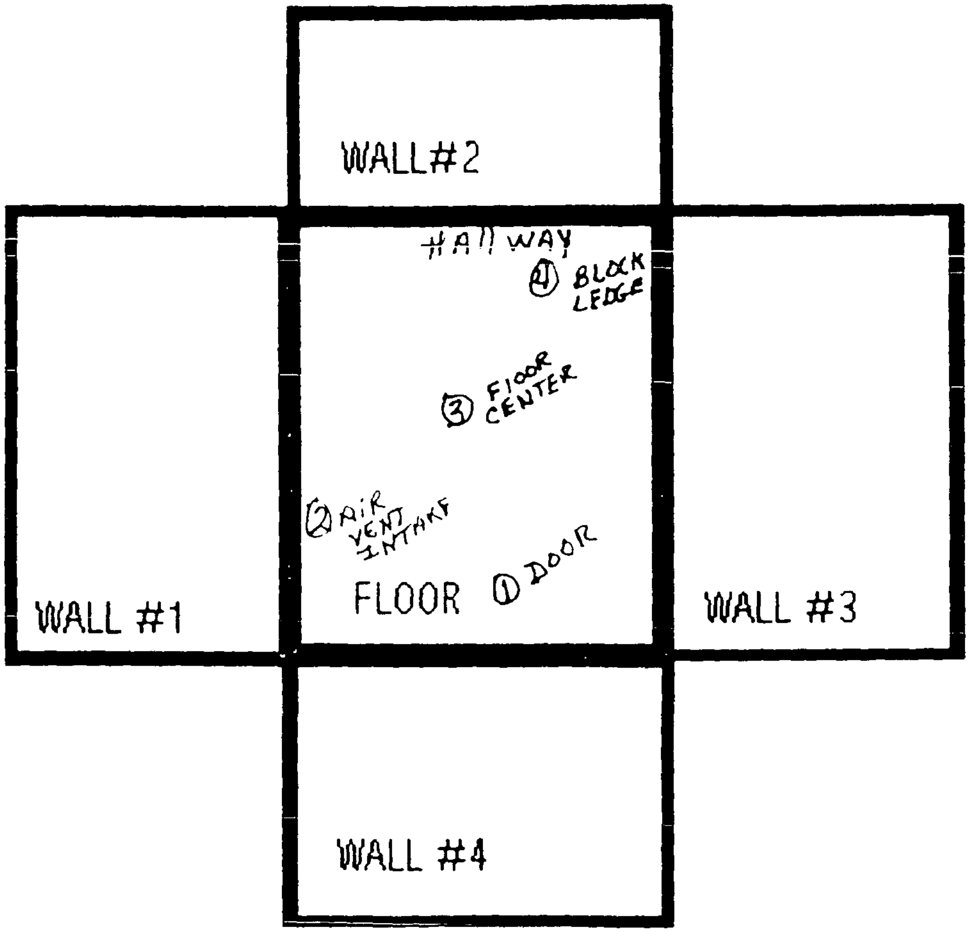
ROOM NAME / # 27

COMMENTS

CLEAN HALF OF 28

2
3 α 39 1.2
4

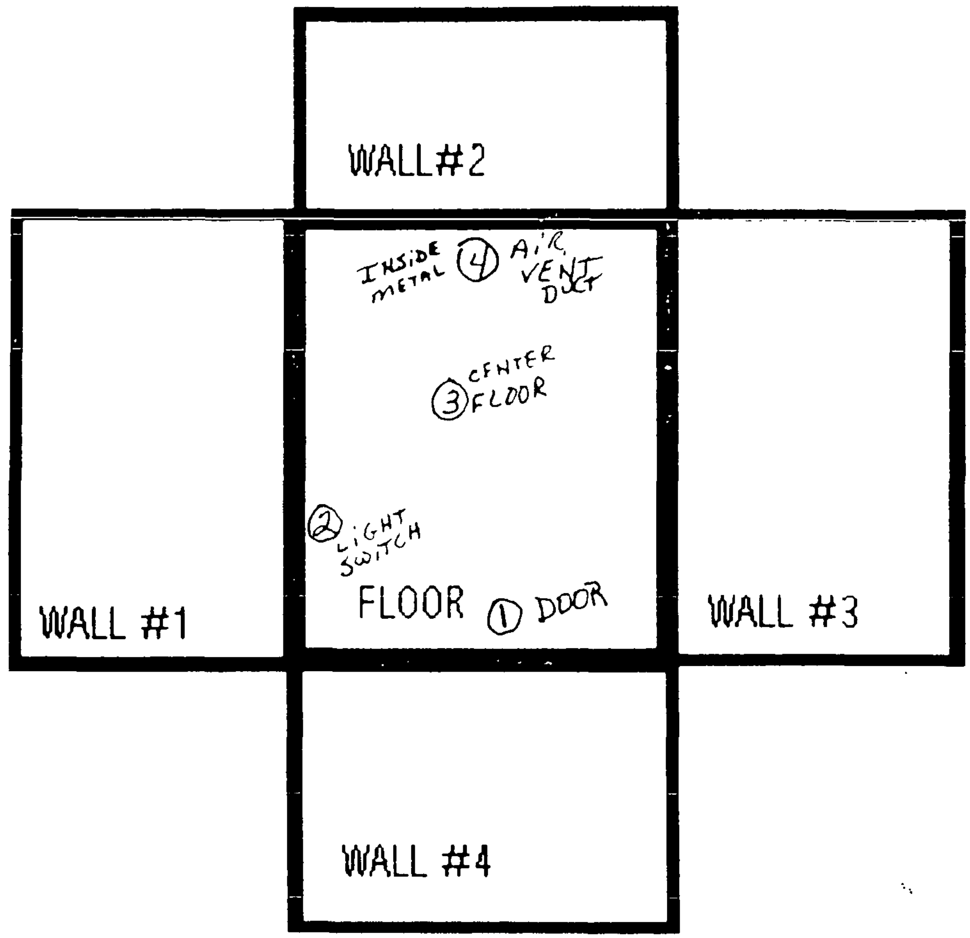
BK: ok



ROOM NAME / # 28

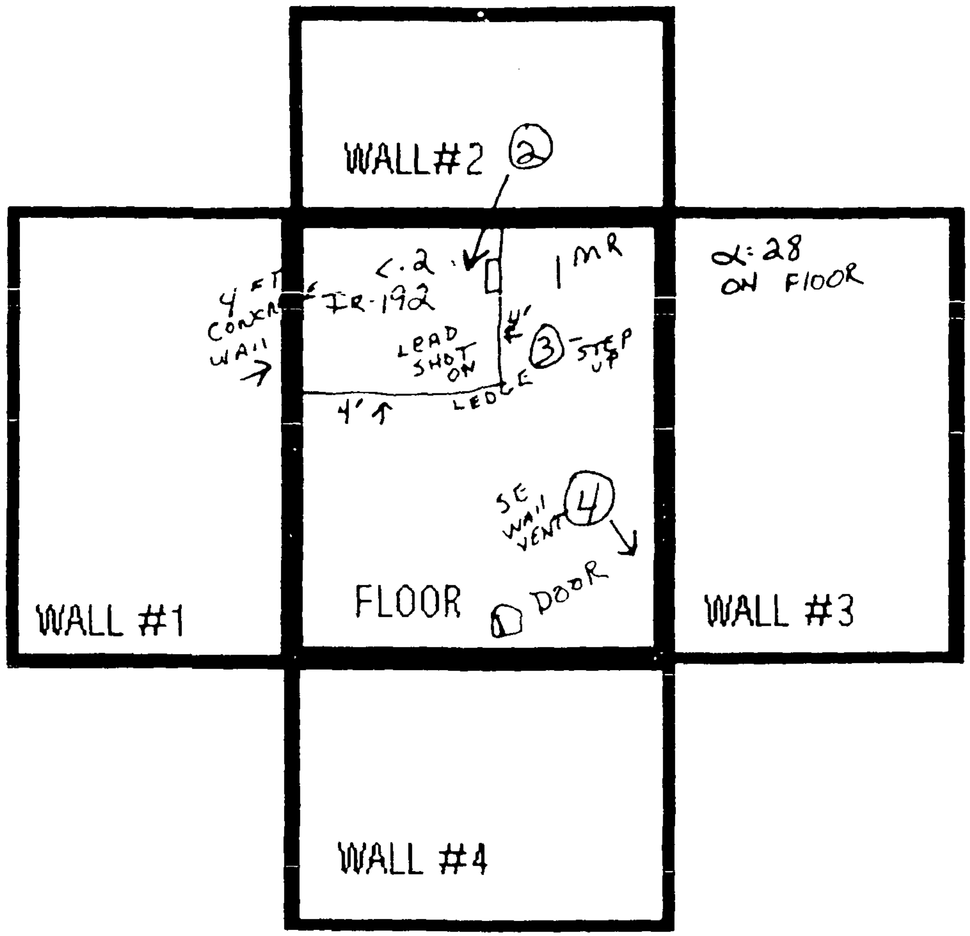
COMMENTS

1 $\alpha = U$
2
3
4 1.6 Rad SMEARABLE



ROOM NAME / # 29

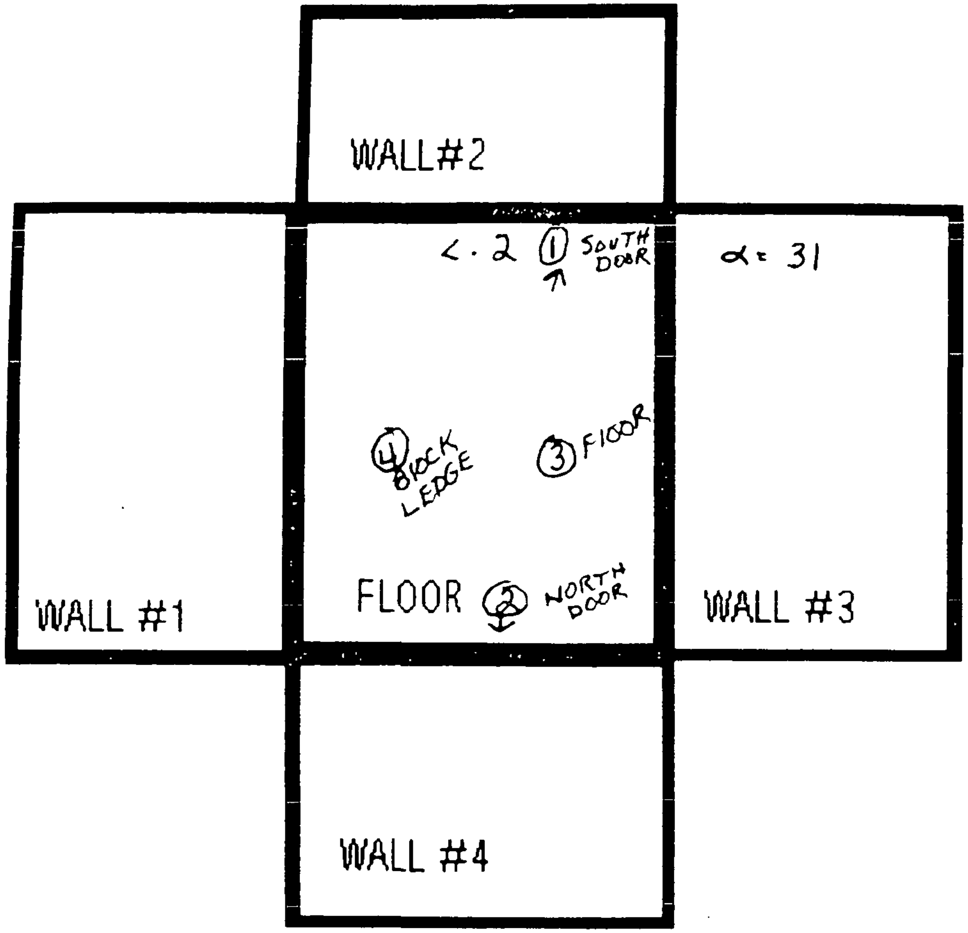
COMMENTS



N ↑

ROOM NAME / # 30

COMMENTS

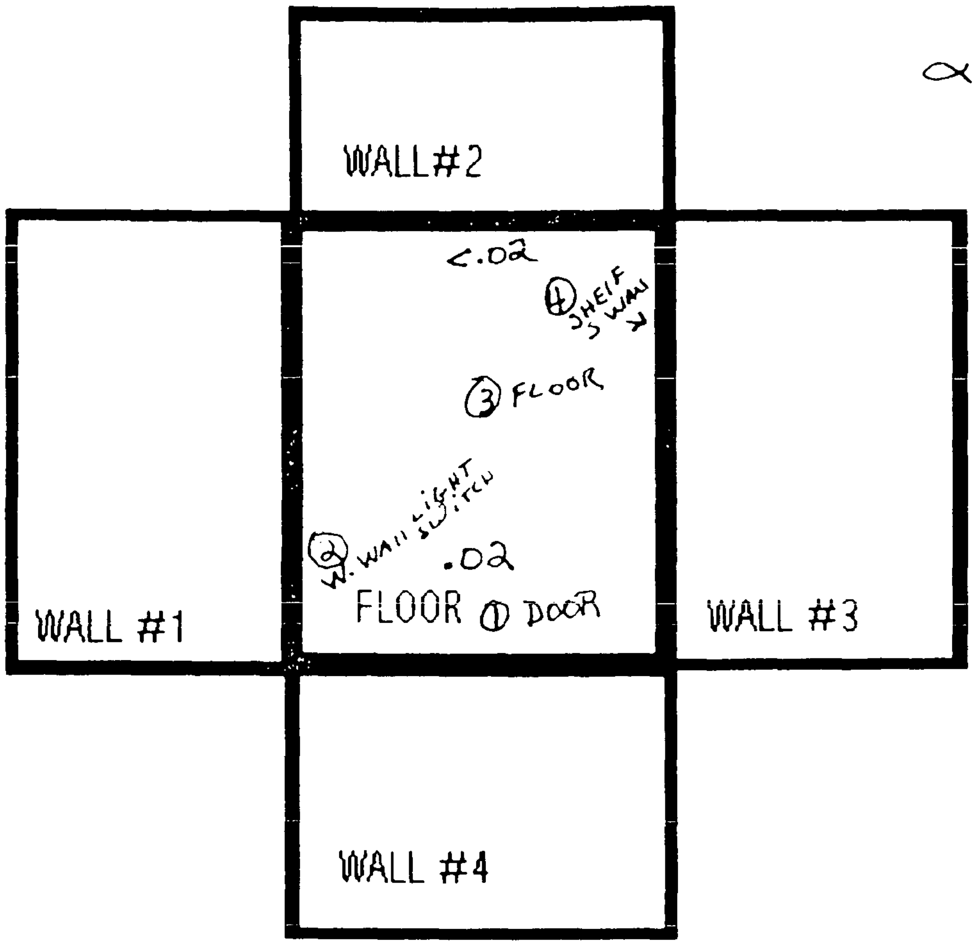


ROOM NAME / # 31

OMMENTS

$\alpha = 30$

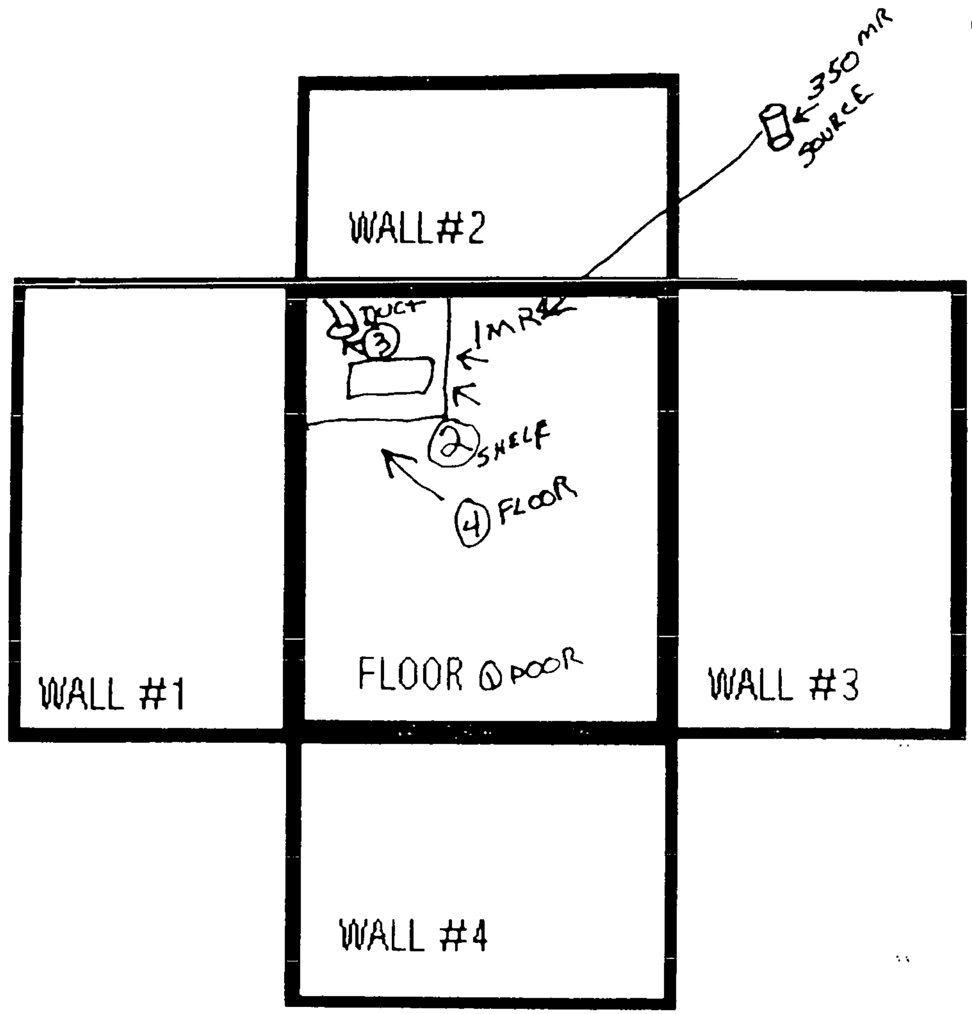
N ↑



ROOM NAME / # 32

COMMENTS

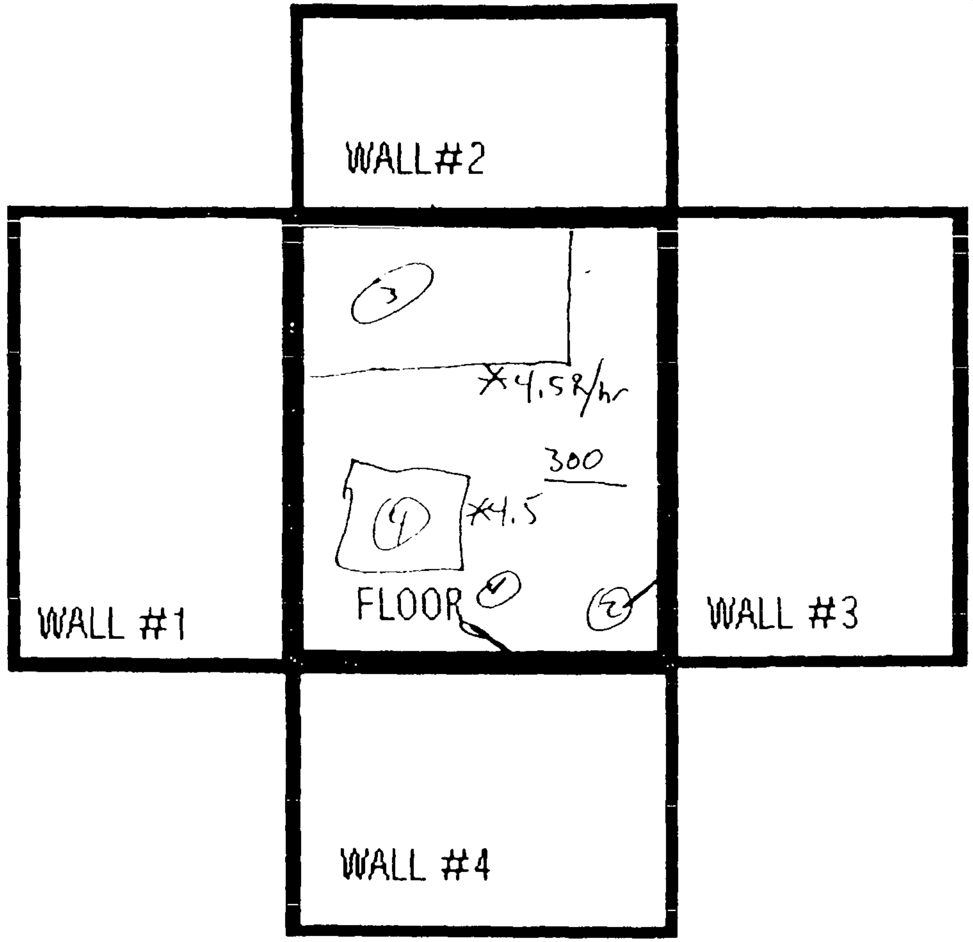
1. 20ow <.2cw
2. .2cw .4ow
3. VENT INSIDE 1.4 ow .2cw
4. cw <.2 ow .2



ROOM NAME / # 33

COMMENTS ______________________________

2 - light switch
3 - 0/s cell
4 - 0/s cell #2

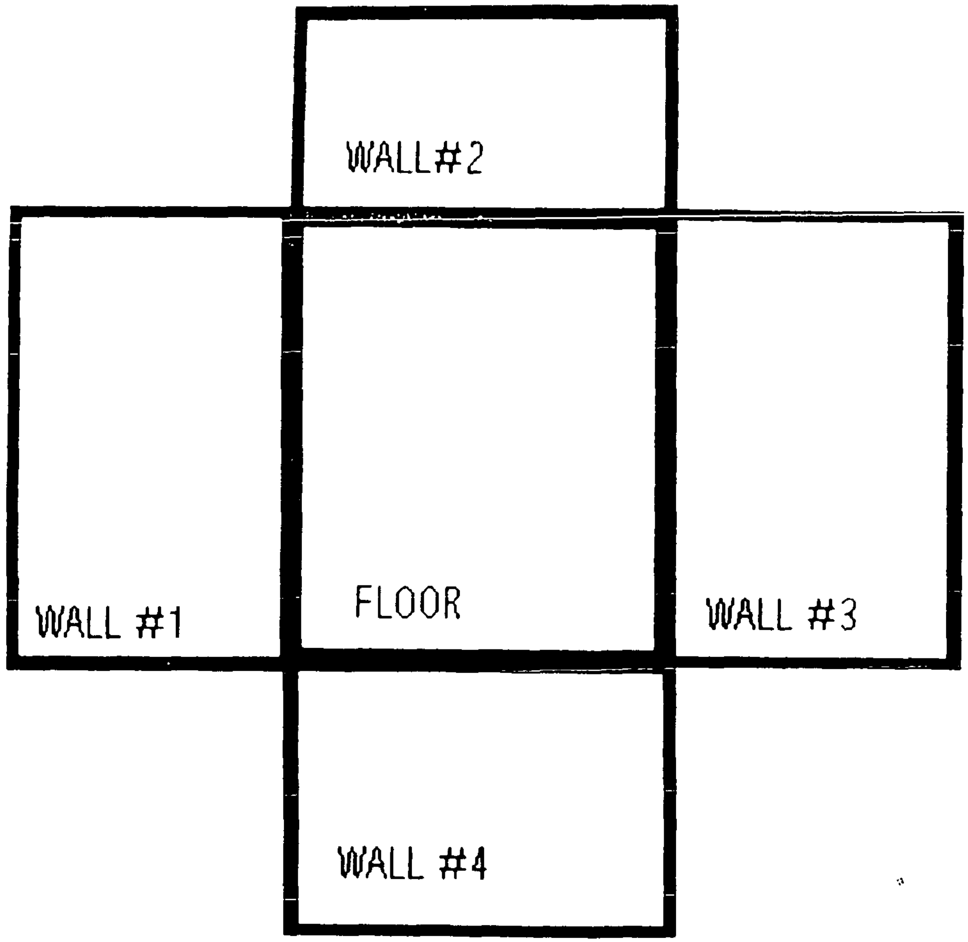


Small cell - 12 guage st.
4" leak
12 guage st..

1 <.2CW 5.0W
2 <.2CW 2.6 OW
3 <.2CW 6 OW
4 <.2CW 5 OW

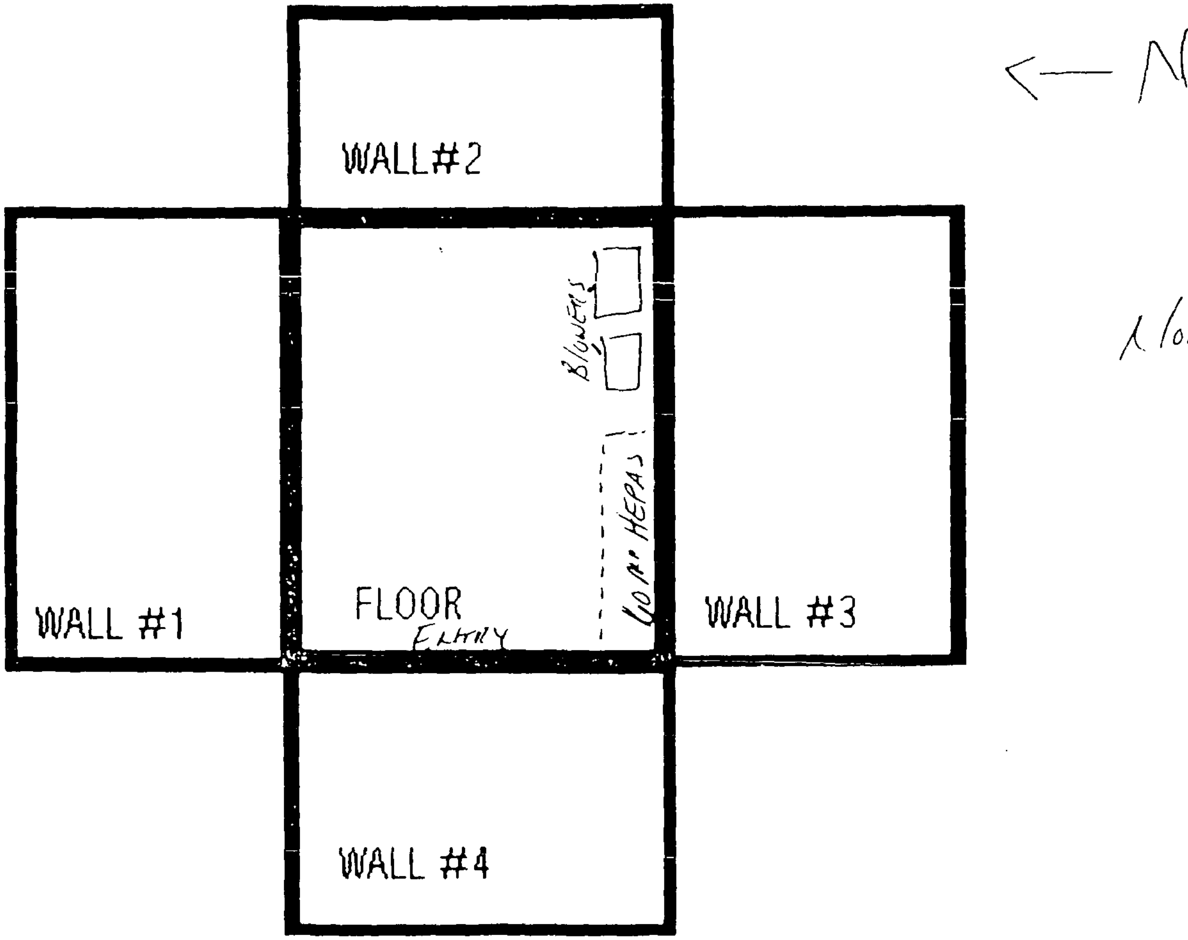
ROOM NAME / # 34

COMMENTS



ROOM NAME / # 35

COMMENTS



Note:
93 α

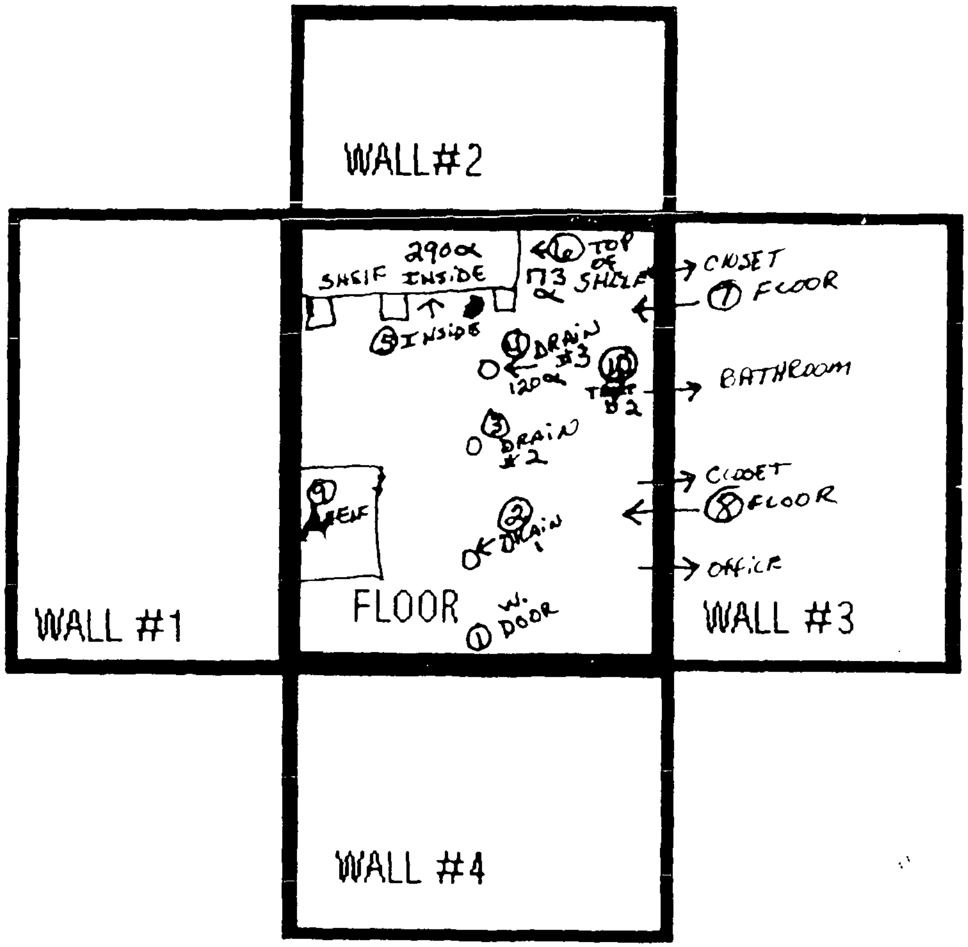
ROOM NAME / # Room 36

COMMENTS Smear 1 Entry, Smear 2 on Top of Block Wall, Smear 3 Front of Door
Smear 4 Blower Cage, Smear 5 Front of Door 053, Smear 6 on Top of Block Wall Near Window N.

SWIPE #2 OUTSIDE [illegible]

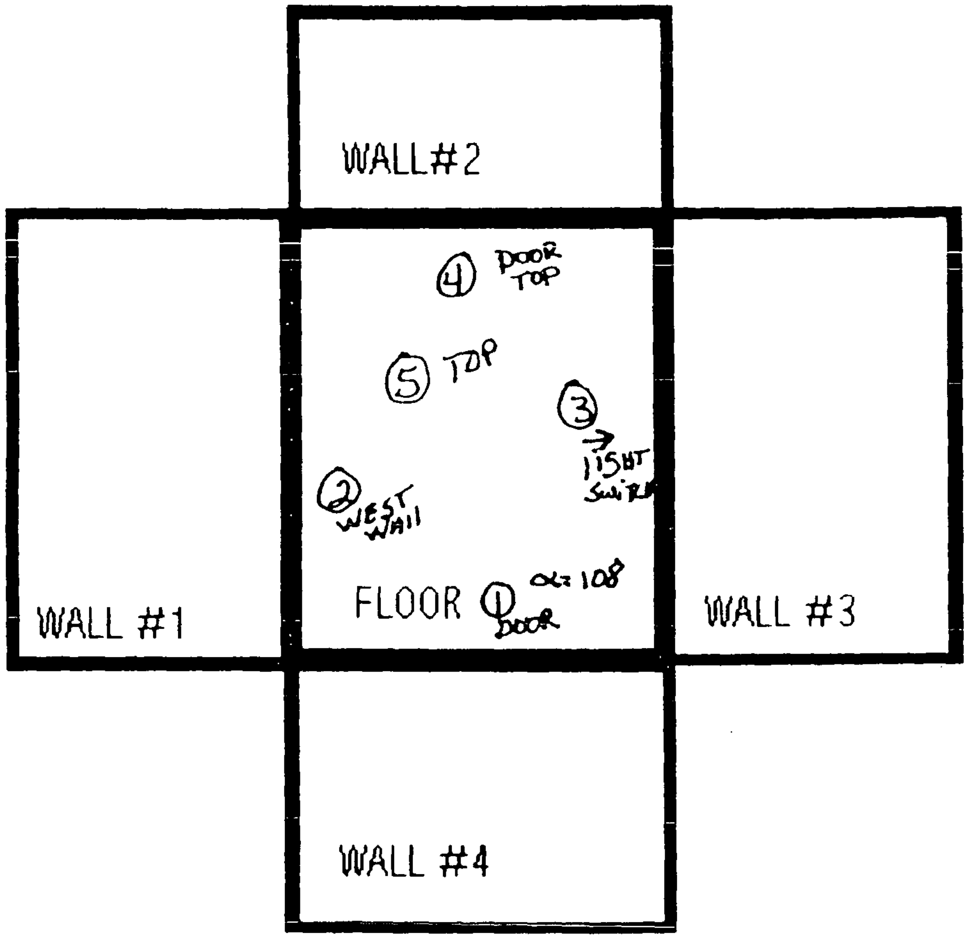
BK: 450
DRAIN #2 = 700 cpm
DRAIN #3 = 5[illegible] CPM - BK
DRAIN #1
All DRAINS CLOSED OR CLOSE[illegible]
3 AIR VENTS SOUTH WALL [illegible]

GENERAL
AREA BK 350-600 cp[illegible]



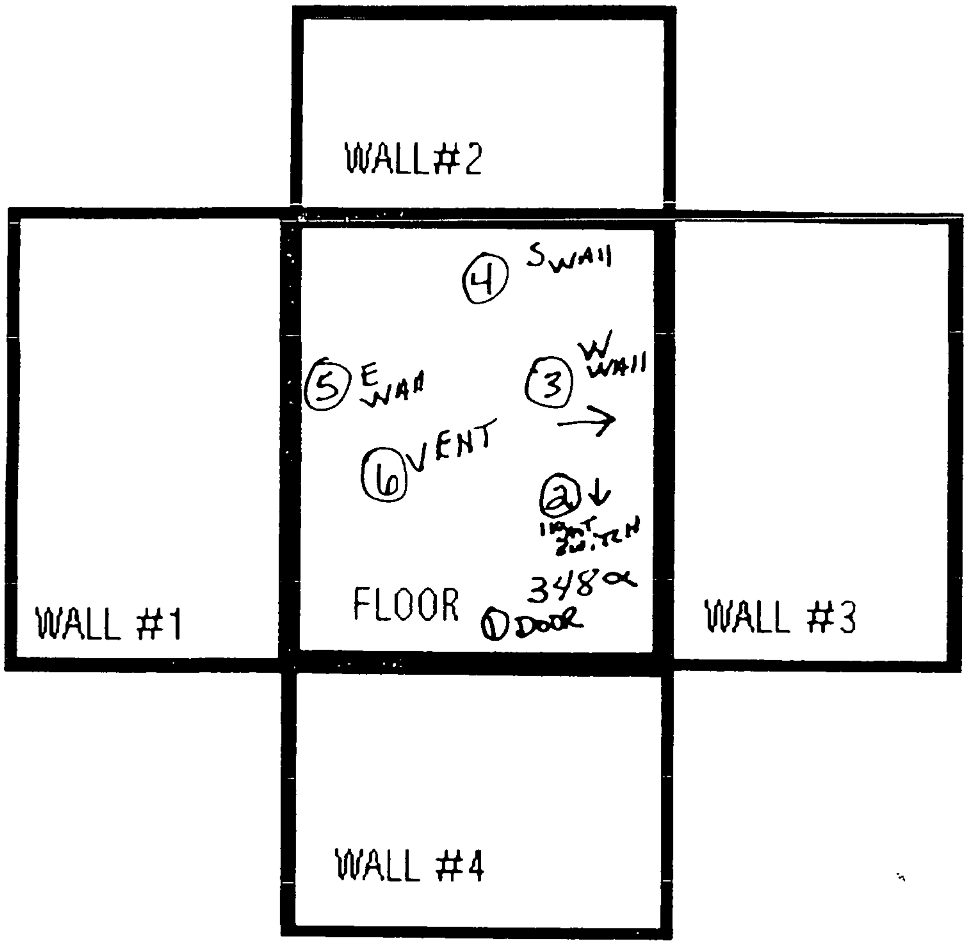
ROOM NAME / # 37

COMMENTS



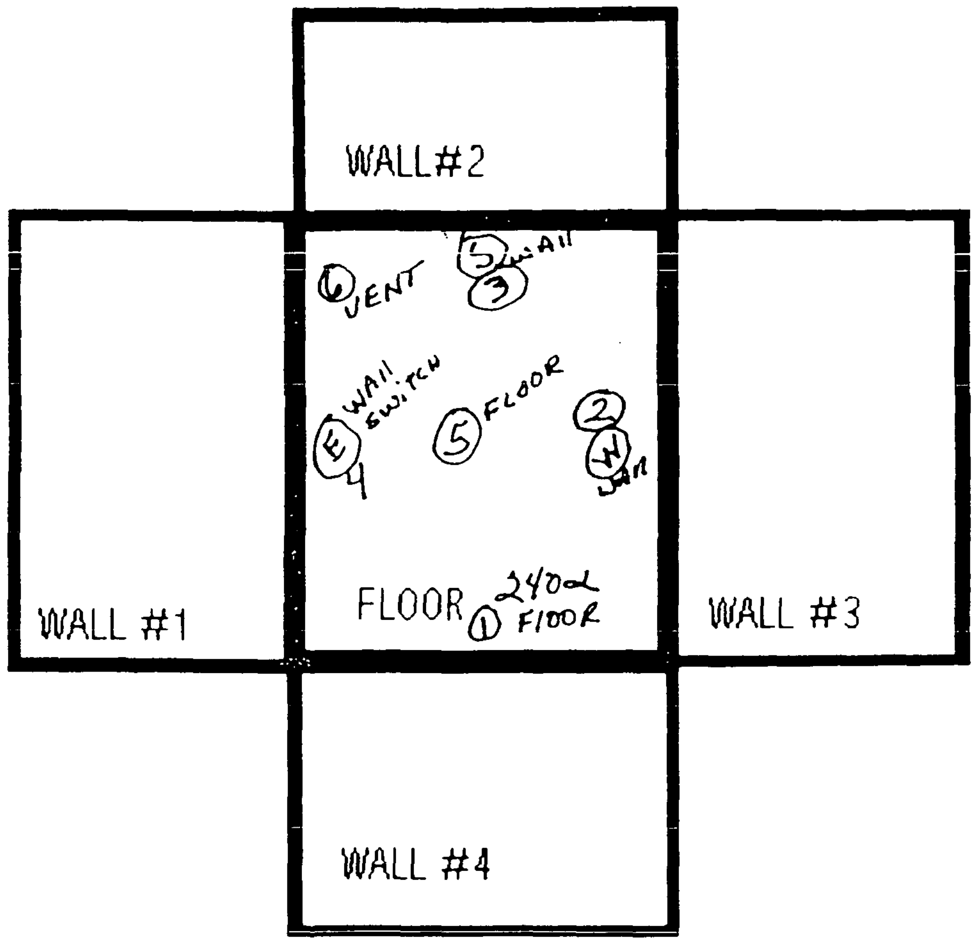
ROOM NAME / # 38

COMMENTS



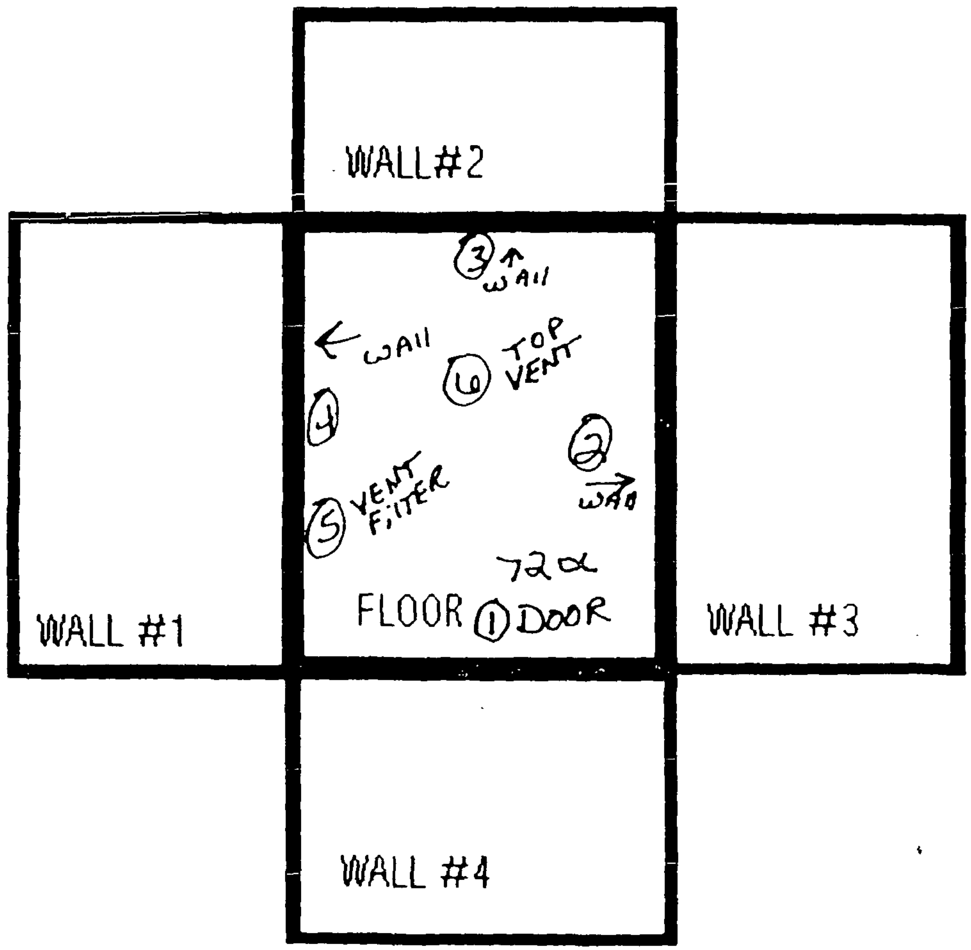
ROOM NAME / # 39

COMMENTS



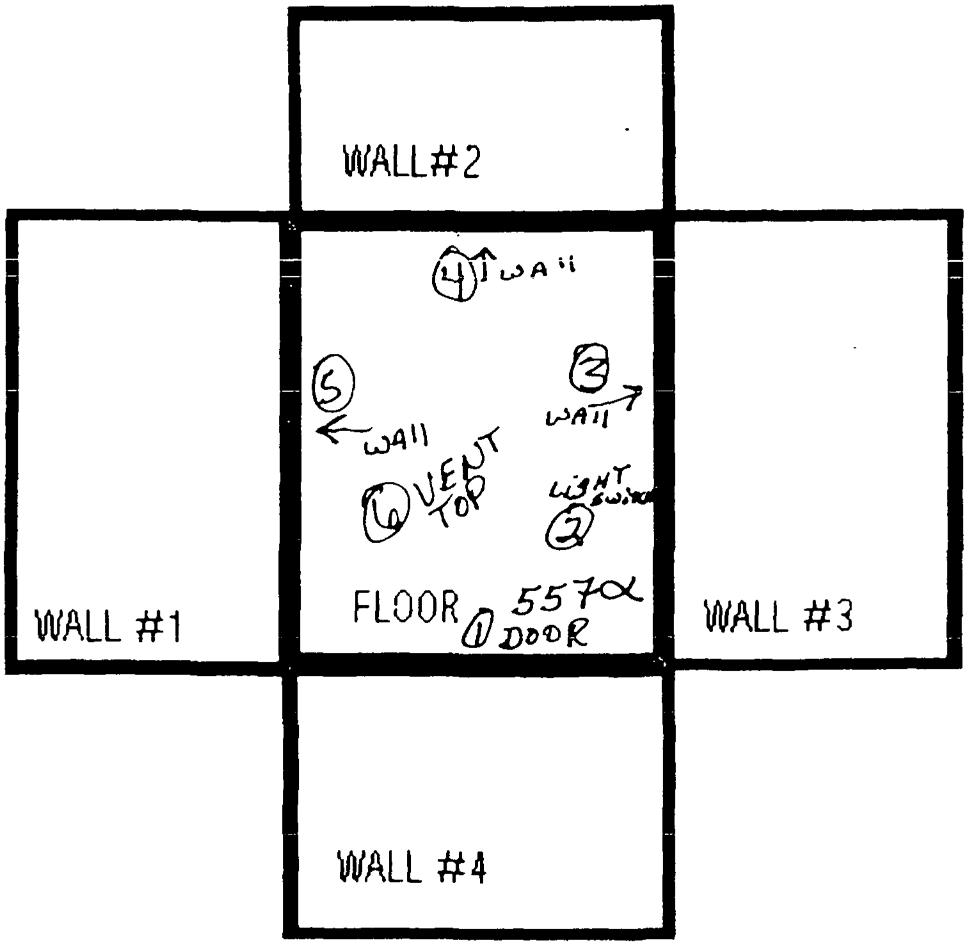
ROOM NAME / # 40

COMMENTS



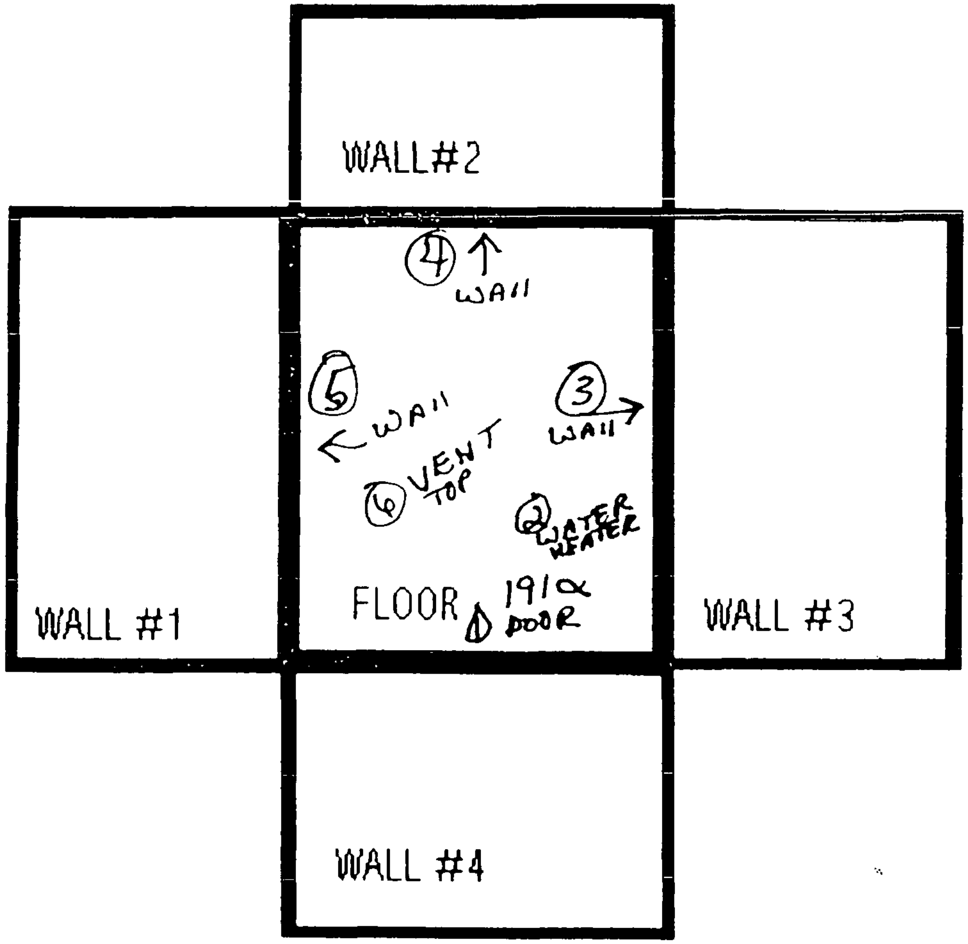
ROOM NAME / # 41

COMMENTS ______



ROOM NAME / # 42

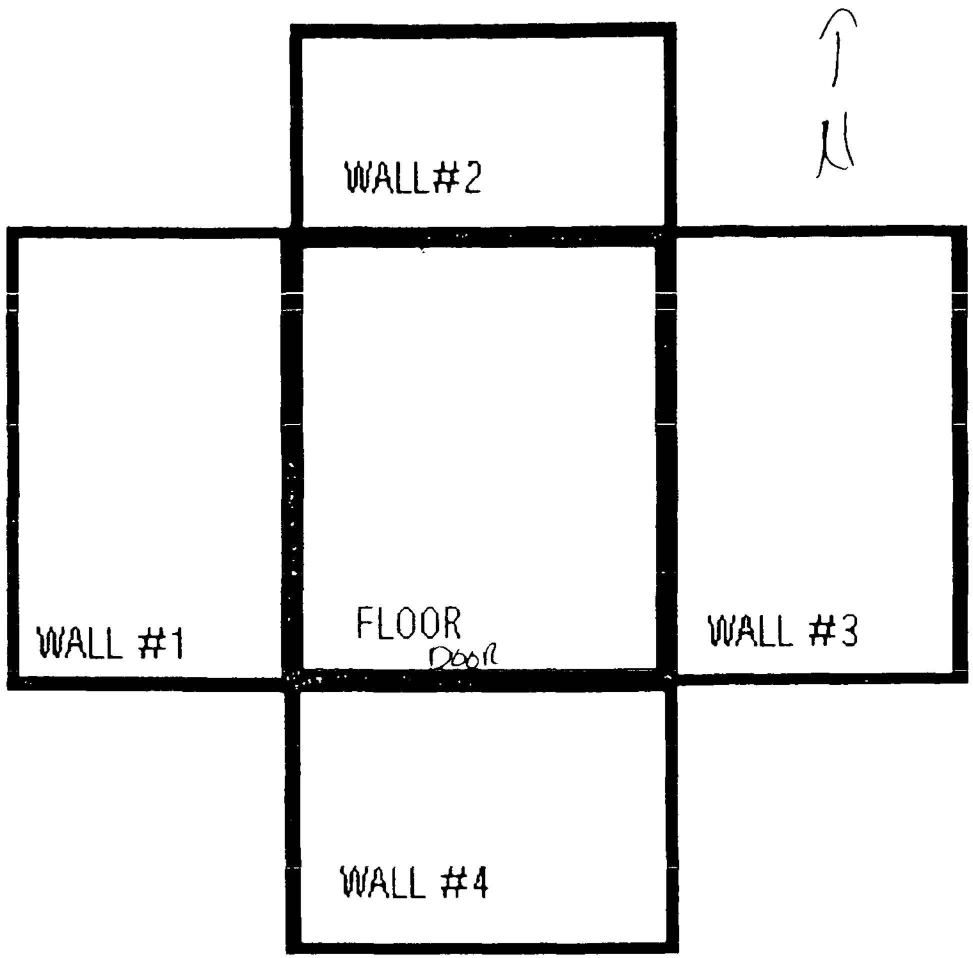
COMMENTS



ROOM NAME / # 43

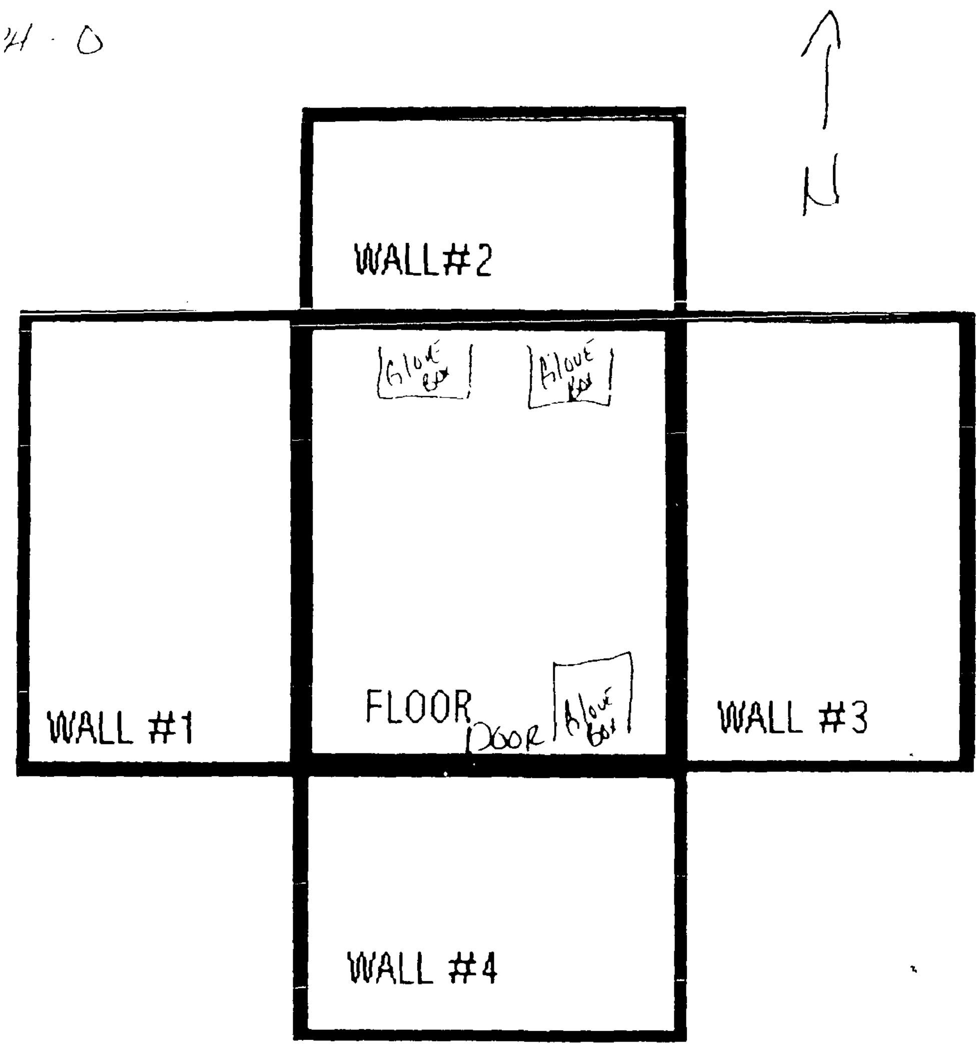
COMMENTS

Note: ALPH - O



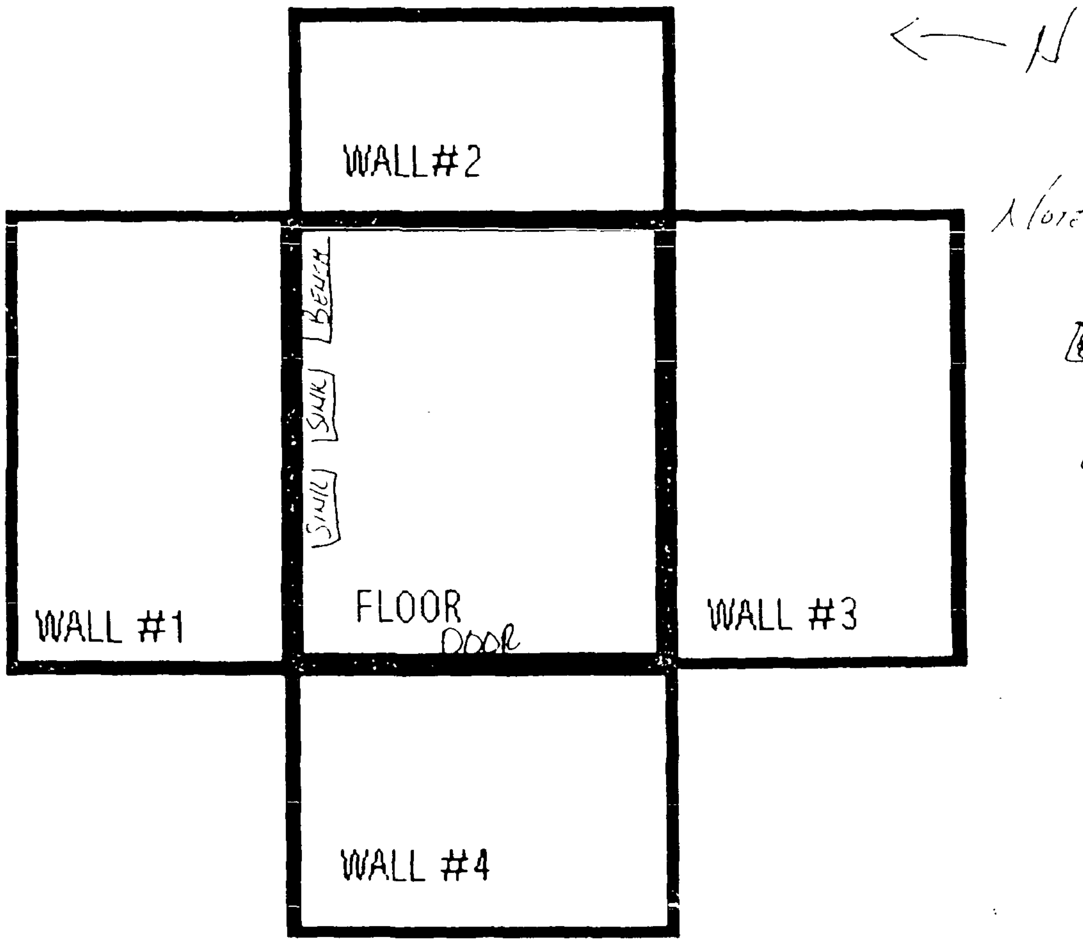
ROOM NAME / # 44

COMMENTS Smear 1 - Door, Smear 2 Light Switch, Smear 3 Door Knob of Closet. Smear 4 Center of Floor, Smear 5 Door to Am-Lab, Smear 6 Vent over 8D Lab



ROOM NAME / # 46

COMMENTS Smear 1 Doorway, Smear 2 Light Switch, Smear 3 Far E. Wall, Smear 4 Glove Box N.E Corner, Smear 5 Center of Floor, Smear 6 Air Vent.



Note:

9 – EMPTY SOURCE PIGS

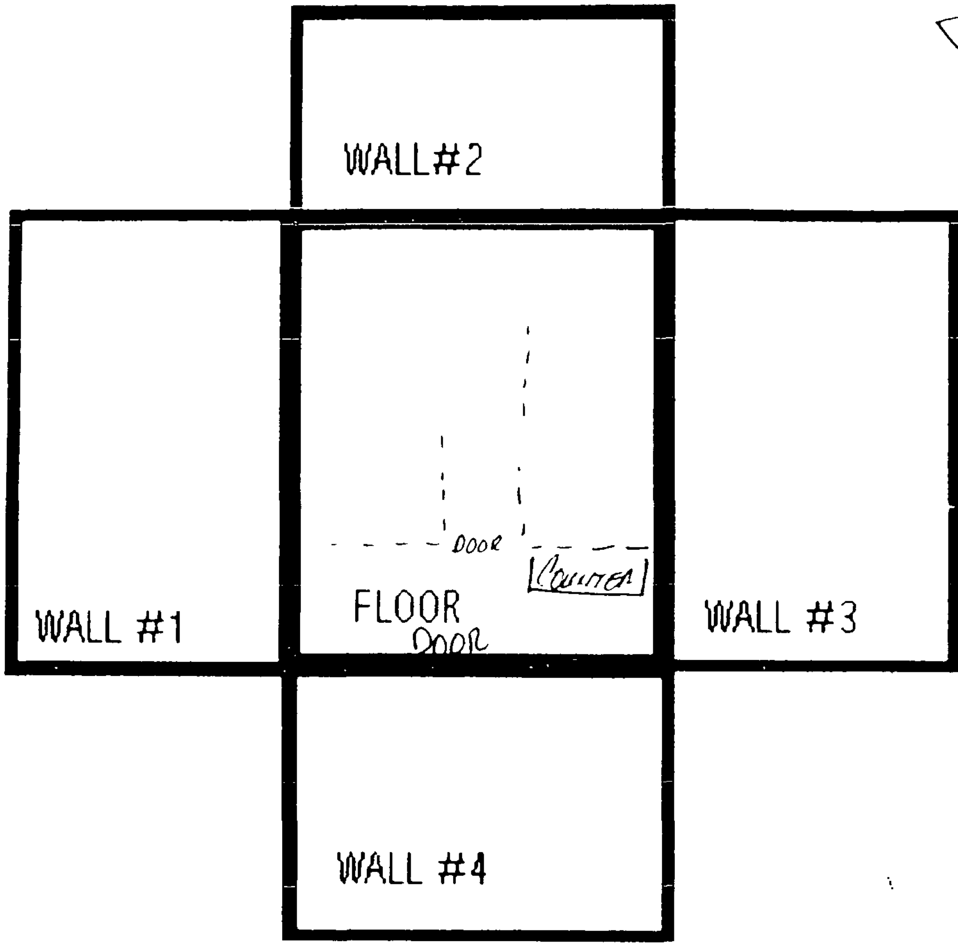
Sink Drain Tank
2mR

Cleaner Area – 1mR

ROOM NAME / # 66

COMMENTS Smear 1 inside Door, Smear 2 inside Sink, Smear 3 on Bench w/ Sink.
Smear 4 Floor Gen. Area.

← N



Note:

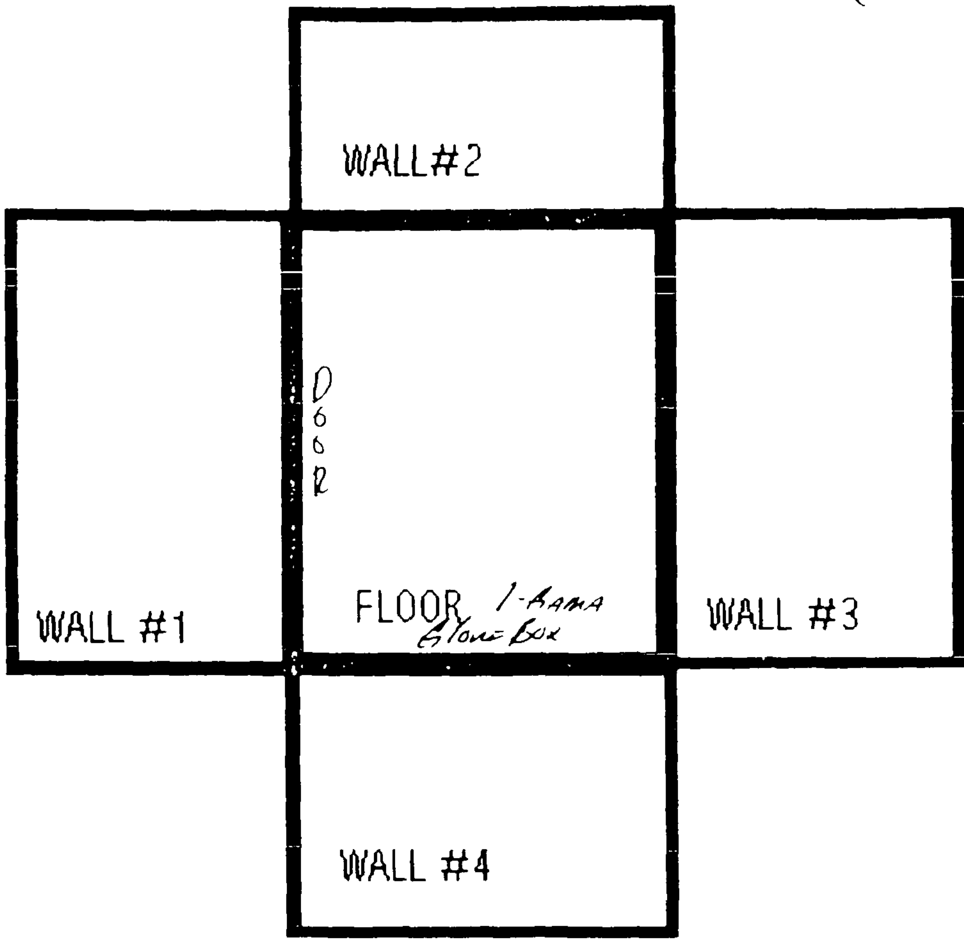
1-Cabinet - Full Acid
1-Cab Full Chemicals

5-Pigs - Cs 137
2-Pigs - Th 228
3 Pigs Gd 158
3 Sources Unknown
1-6 ft Pig - Full Chem

ROOM NAME / # 67

COMMENTS Smear 1 Front of Door, Smear 2,3 Floor Center, Smear 4 Acid Cabinet

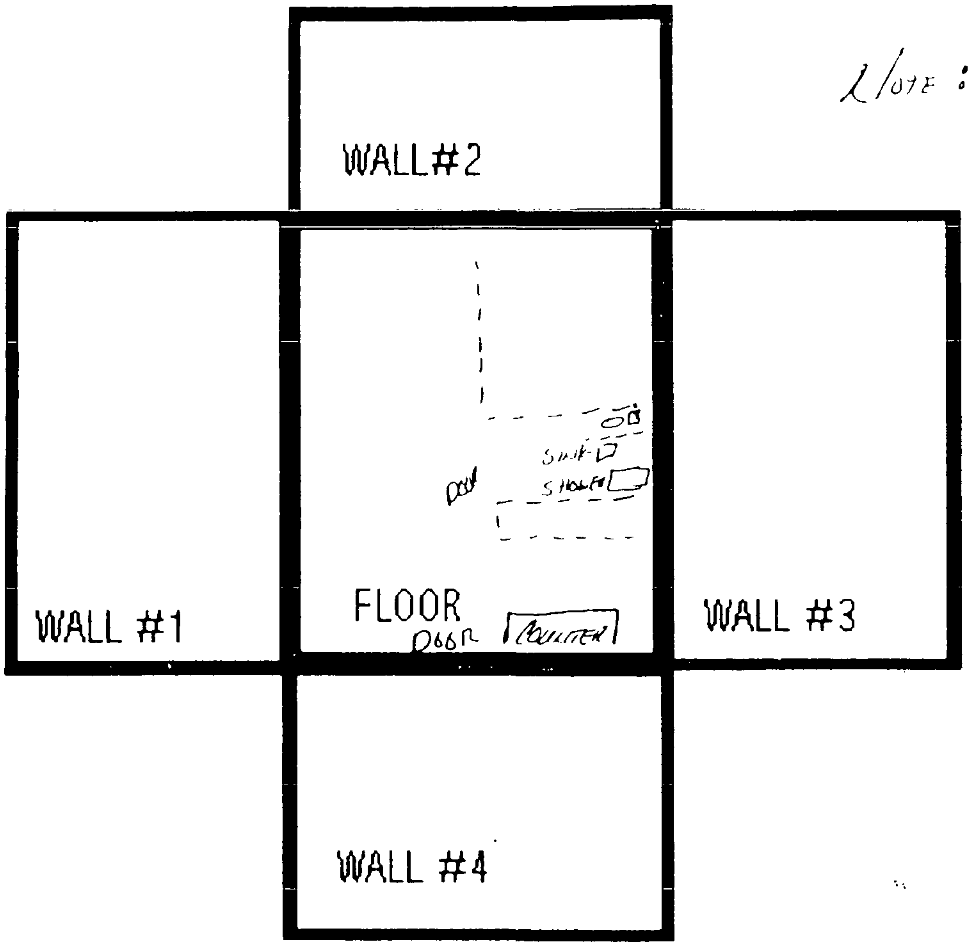
← N



2 HEPA Unit
Hepa 1 - White 1 R Collimact
Hepa 2 - 2R Collimact Smaller

ROOM NAME / # 67

COMMENTS Smear 1



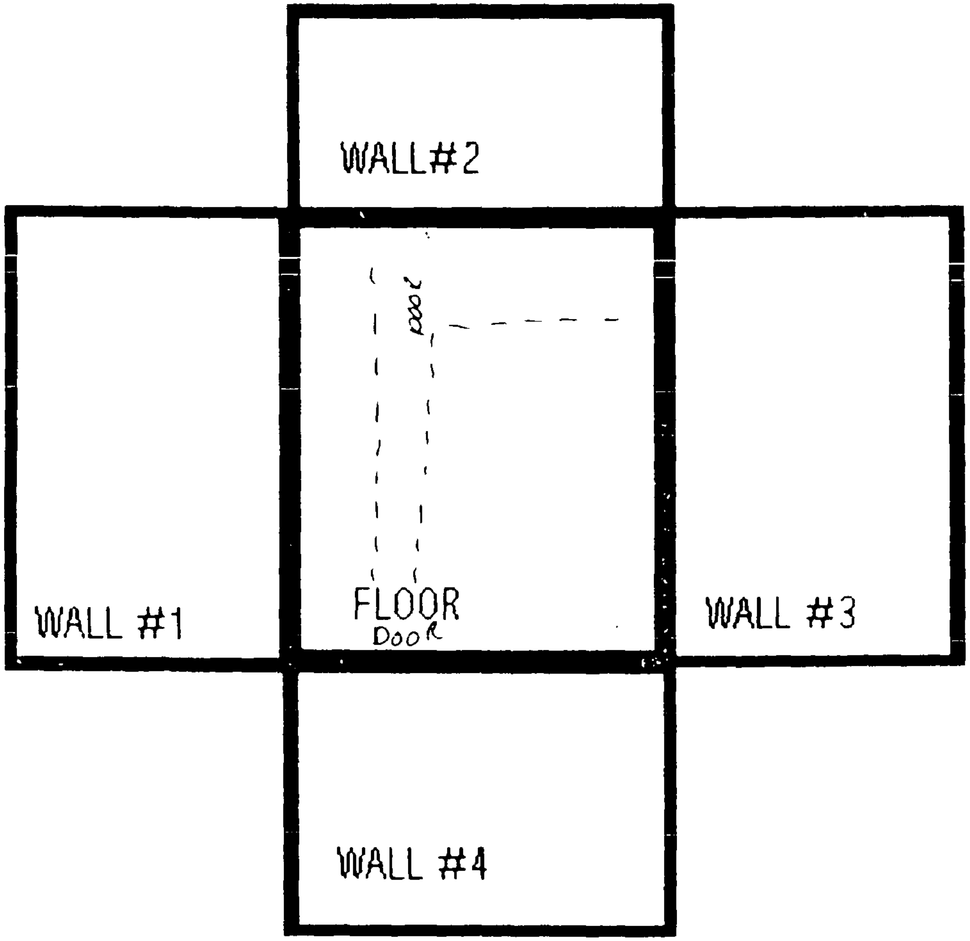
Note: Sink / Shower Drain To Holding Tank

Holding Tank - 4 [illegible]

ROOM NAME / # 68

COMMENTS Smear 1 Door / Door Knob, Smear 2 Shower / Drain, Smear 3 - Sink, Smear 4 Floor General Area, Smear 5 Hall Way, Smear 6 - Counter, Smear 7 Floor - Door.

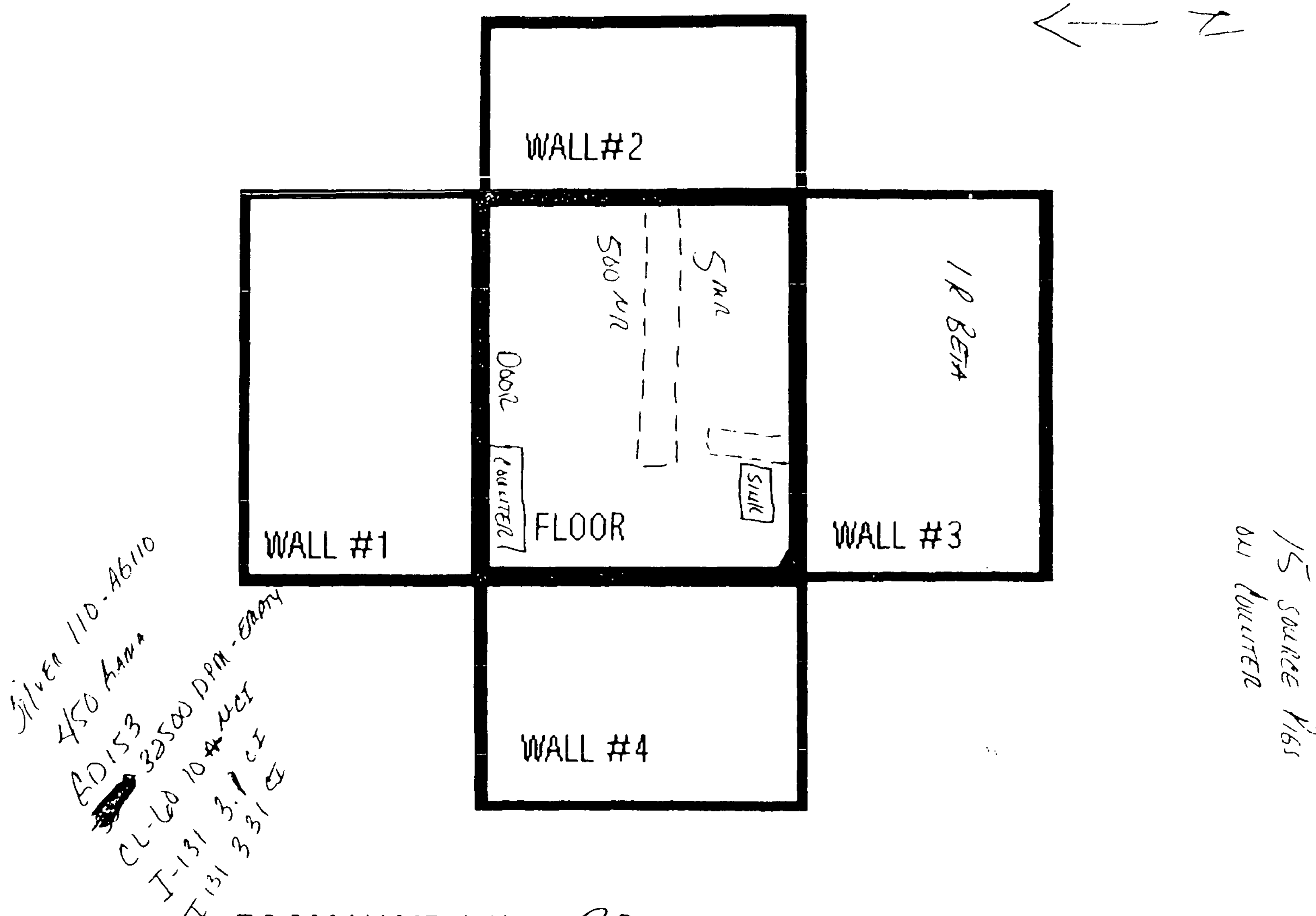
← N



Note - Room Full - Garbage
Note - Up To 40 mR At Door

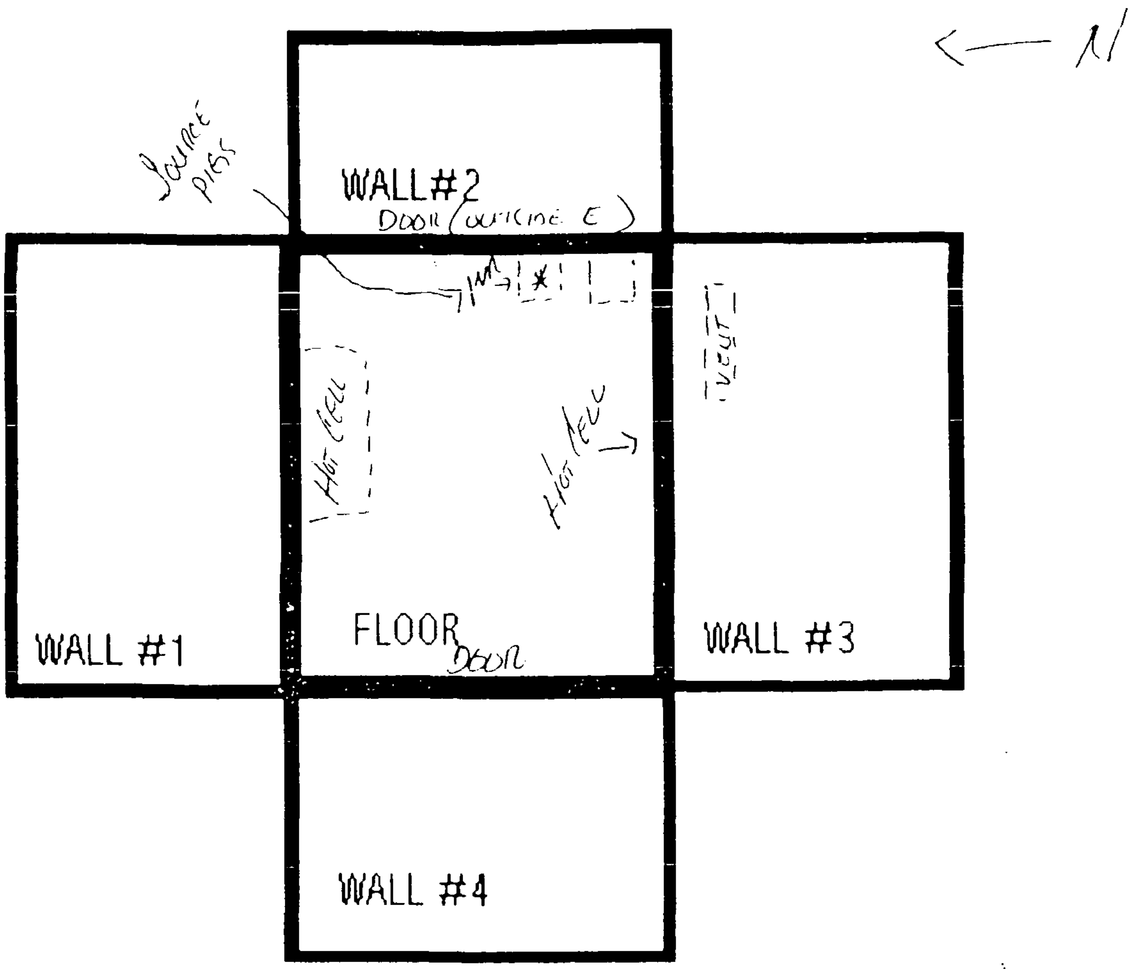
ROOM NAME / # Sand Cell 69

COMMENTS Smear 4 - Door, Smear 3 - General Area Inside Hot Cell, Smear 1 - General Area Hot Cell
Smear 2 Hot Cell Door.



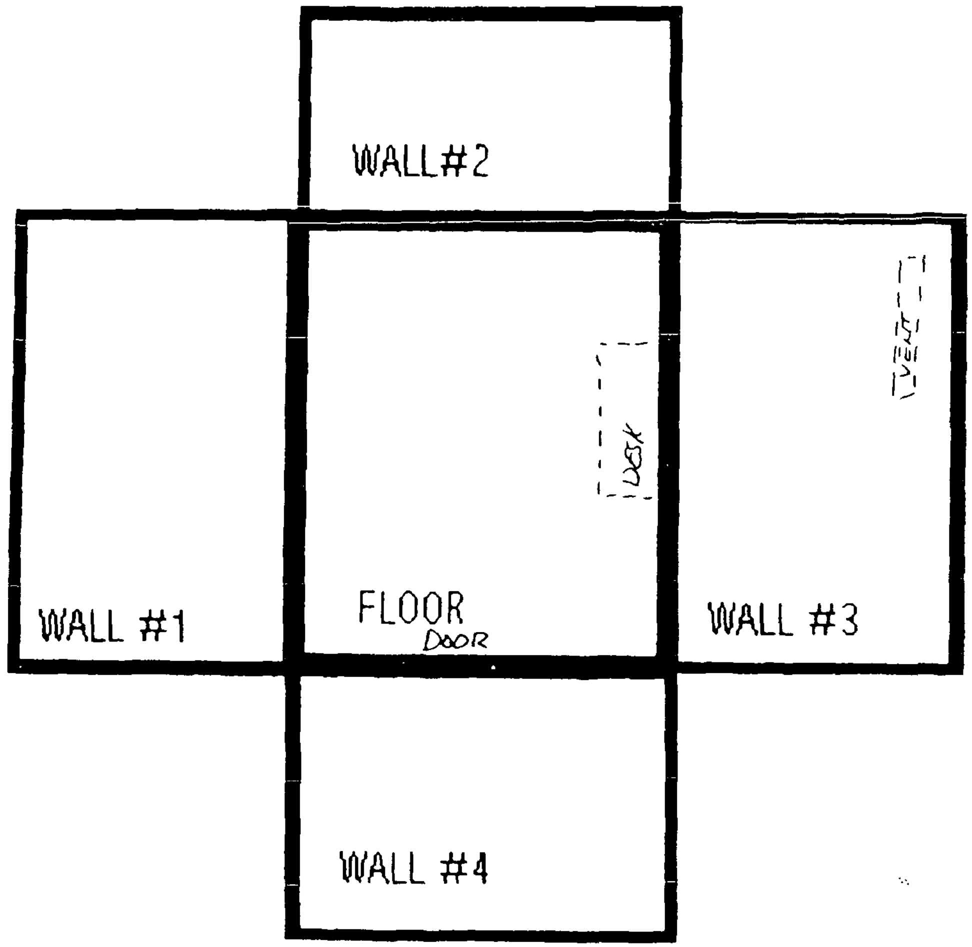
ROOM NAME / # 20

COMMENTS Smear 4 Entryway, Smear 3 Collimater Top, Smear 2 Inside Sink, Smear 1 Floor Back Area. General Area 500 NR.



ROOM NAME / # Tracer Lab 71

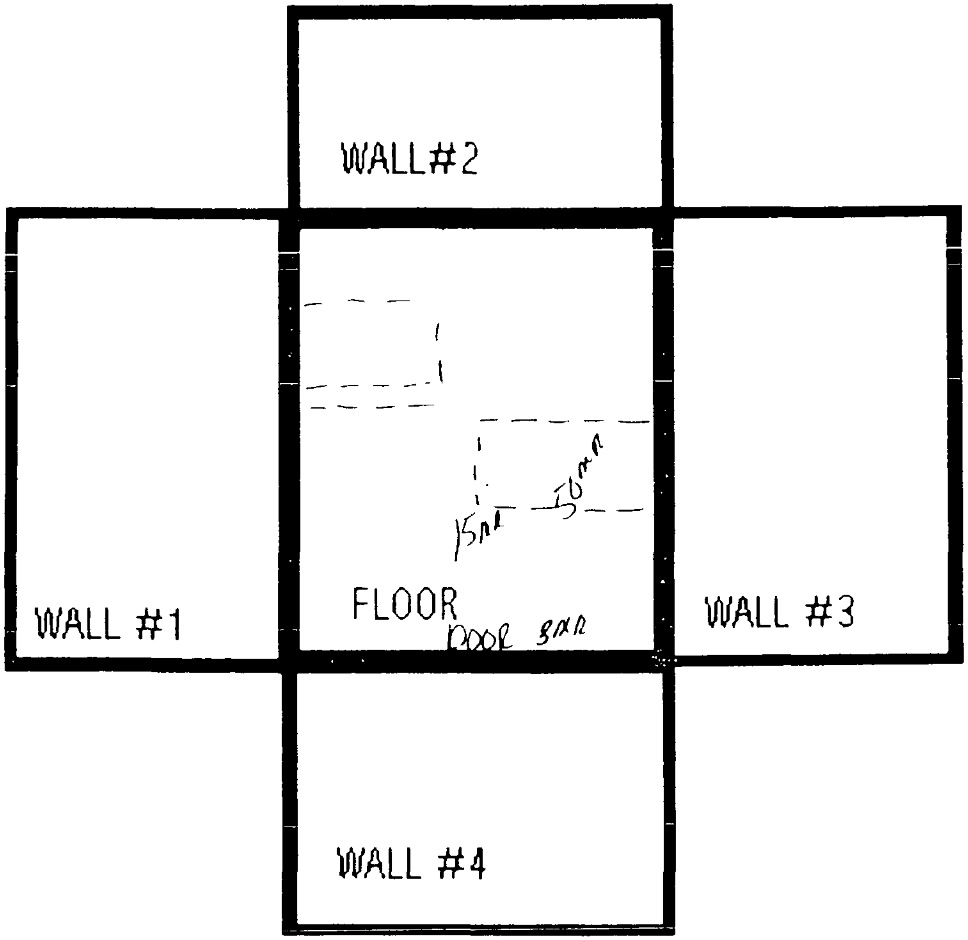
COMMENTS Smear 1 General Area Front Door, Smear 2 Door To Hot Cell, Smear 3 Entry Way To Hot Cell, Smear 4 Door To Outside (Outside East), Smear 5 Inside Glove Box.



ROOM NAME / # TRUCK BAY #22

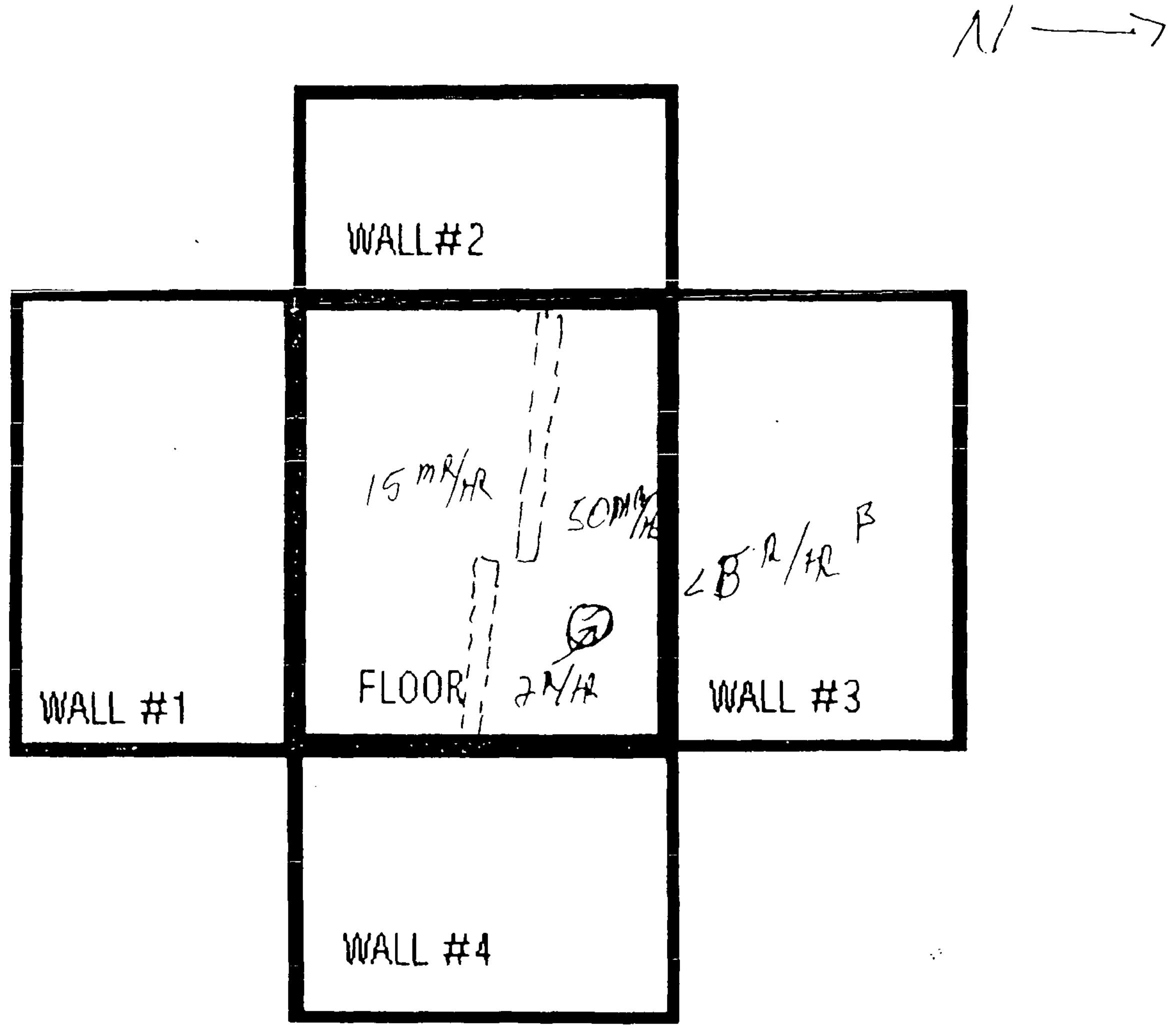
COMMENTS SMEAR 1-2 FLOOR GENERAL AREA, SMEAR 3 DOOR KNOB + TOP, GENERAL AREA 140 NR
SMEAR 4 VENT

N →



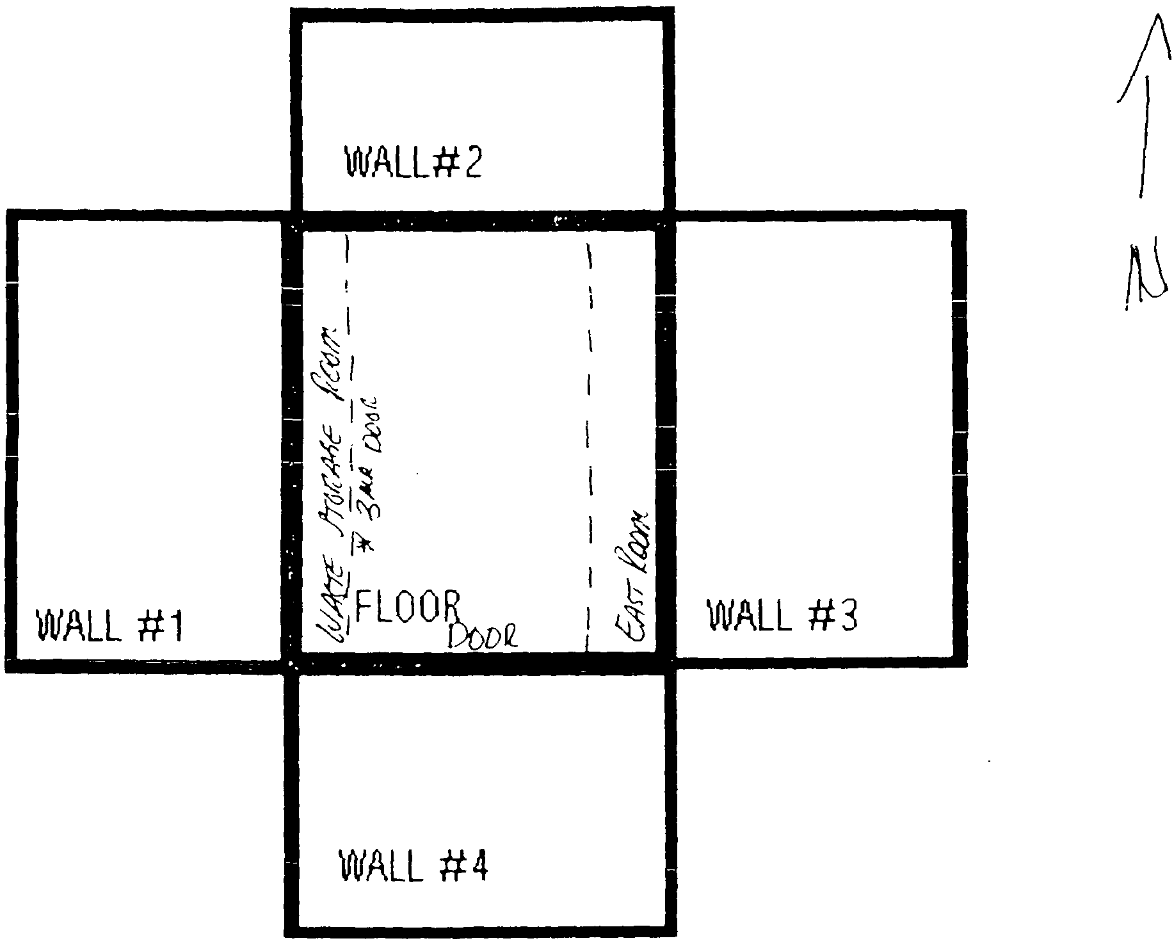
ROOM NAME / # Waste Storage Room #73

COMMENTS



ROOM NAME / # Waste Storage Room: # 73

COMMENTS Holes in Roof, Incear 14 - Vent, Walls 4' Concrete

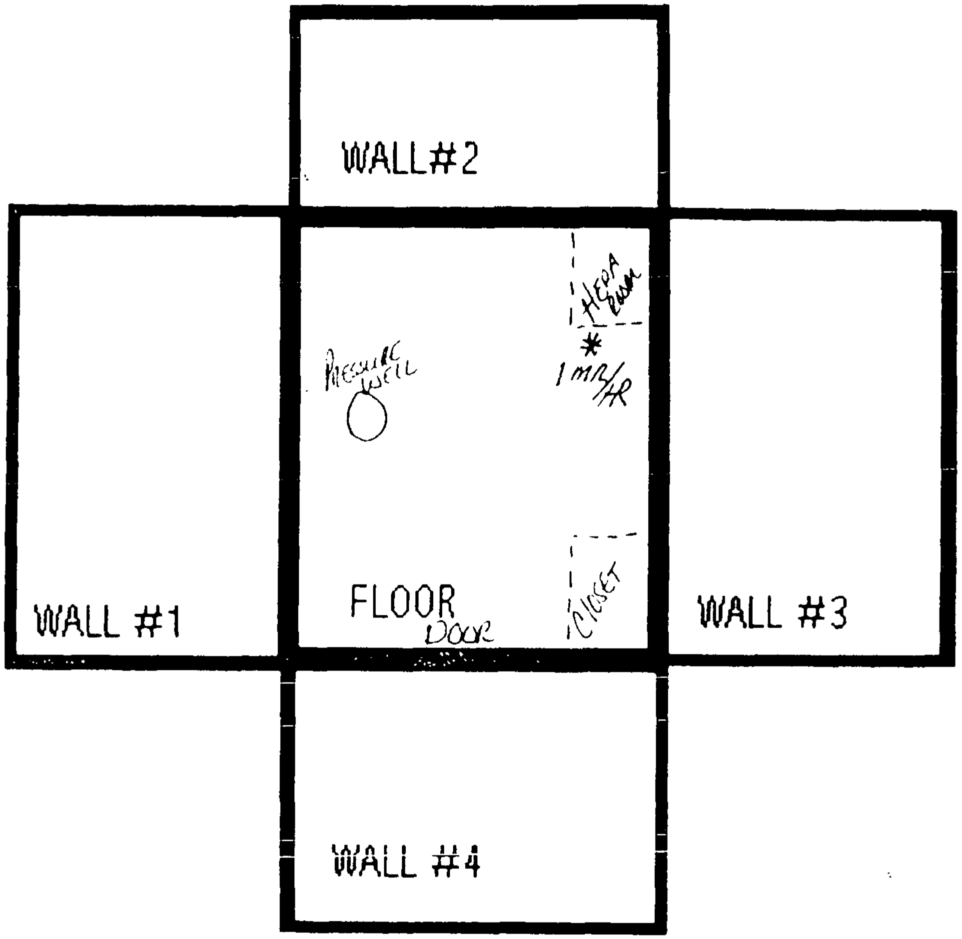


ROOM NAME / # Main Room WHSE #174

COMMENTS Roof Leaks, Shipping Pigs, Junk

← N

East Room



ROOM NAME / # East Room Wilse #175

COMMENTS ______

Ionizing Radiation Factsheet Series: No. 1

Ionizing radiation is radiation that has sufficient energy to remove electrons from atoms. In this document, it will be referred to simply as radiation. One source of radiation is the nuclei of unstable atoms. For these radioactive atoms (also referred to as radionuclides or radioisotopes) to become more stable, the nuclei eject or emit subatomic particles and high-energy photons (gamma rays). This process is called radioactive decay. Unstable isotopes of radium, radon, uranium, and thorium, for example, exist naturally. Others are continually being made naturally or by human activities such as the splitting of atoms in a nuclear reactor. Either way, they release ionizing radiation. The major types of radiation emitted as a result of spontaneous decay are alpha and beta particles, and gamma rays. X rays, another major type of radiation, arise from processes outside of the nucleus.

Alpha Particles

Alpha particles are energetic, positively charged particles (helium nuclei) that rapidly lose energy when passing through matter. They are commonly emitted in the radioactive decay of the heaviest radioactive elements such as uranium and radium as well as by some manmade elements. Alpha particles lose energy rapidly in matter and do not penetrate very far; however, they can cause damage over their short path through tissue. These particles are usually completely absorbed by the outer dead layer of the human skin and, so, alpha emitting radioisotopes are not a hazard outside the body. However, they can be very harmful if they are ingested or inhaled. Alpha particles can be stopped completely by a sheet of paper.

Beta Particles

Beta particles are fast moving, positively or negatively charged electrons emitted from the nucleus during radioactive decay. Humans are exposed to beta particles from manmade and natural sources such as tritium, carbon-14, and strontium-90. Beta particles are more penetrating than alpha particles, but are less damaging over equally traveled distances. Some beta particles are capable of penetrating the skin and causing radiation damage; however, as with alpha emitters, beta emitters are generally more hazardous when they are inhaled or ingested. Beta particles travel appreciable distances in air, but can be reduced or stopped by a layer of clothing or by a few millimeters of a substance such as aluminum.

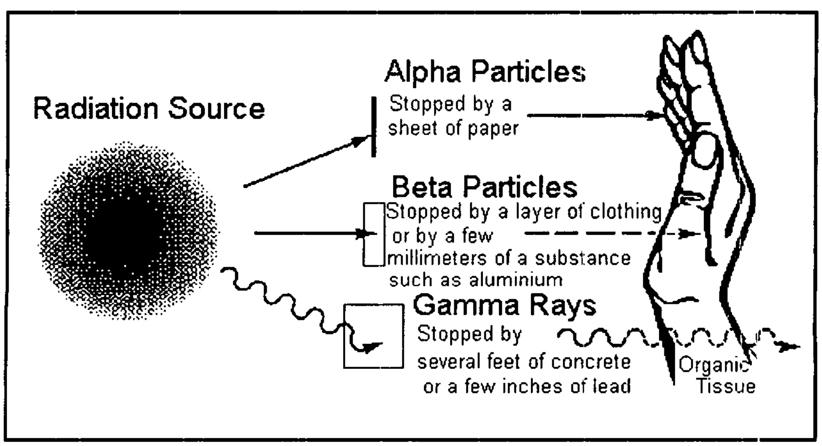
Gamma Rays

Like visible light and x rays, gamma rays are weightless packets of energy called photons. Gamma rays often accompany the emission of alpha or beta particles from a nucleus. They have neither a charge nor a mass and are very penetrating. One source of gamma rays in the environment is naturally occurring potassium-40. Manmade sources include plutonium-239 and cesium-137. Gamma rays can easily pass completely through the human body or be absorbed by tissue, thus constituting a radiation hazard for the entire body. Several feet of concrete or a few inches of lead may be required to stop the more energetic gamma rays.

X Rays

X rays are high-energy photons produced by the interaction of charged particles with matter. X rays and gamma rays have essentially the same properties, but differ in origin; i.e., x rays are emitted from processes outside the nucleus, while gamma rays originate inside the nucleus. They are generally lower in energy and therefore less penetrating than gamma rays. Literally thousands of x-ray machines are used daily in medicine and industry for examinations, inspections, and process controls. X rays are also used for cancer therapy to destroy malignant cells. Because of their many uses, x rays are the single largest source of manmade radiation exposure. A few millimeters of lead can stop medical x rays.

Penetrating Powers of Alpha & Beta Particles & Gamma Rays



Sources of Radiation

Natural Radiation

Humans are primarily exposed to natural radiation from the sun, cosmic rays, and naturally occurring radioactive elements found in the earth's crust. Radon, which emanates from the ground, is another important source of natural radiation. Cosmic rays from space include energetic protons, electrons, gamma rays, and x rays. The primary radioactive elements found in the earth's crust are uranium, thorium, and potassium, and their radioactive derivatives. These elements emit alpha and beta particles, or gamma rays.

Manmade Radiation

Radiation is used on an ever increasing scale in medicine, dentistry, and industry. Main users of manmade radiation include: medical facilities such as hospitals and pharmaceutical facilities; research and teaching institutions; nuclear reactors and their supporting facilities such as uranium mills and fuel preparation plants; and Federal facilities involved in nuclear weapons production as part of their normal operation.

Many of these facilities generate some radioactive waste; and some release a controlled amount of radiation into the environment. Radioactive materials are also used in common consumer products such as digital and luminous-dial wristwatches, ceramic glazes, artificial teeth, and smoke detectors.

Health Effects of Radiation Exposure

Depending on the level of exposure, radiation can pose a health risk. It can adversely affect individuals directly exposed as well as their descendants. Radiation can affect cells of the body, increasing the risk of cancer or harmful genetic mutations that can be passed on to future generations; or, if the dosage is large enough to cause massive tissue damage, it may lead to death within a few weeks of exposure. You can read more about the health effects from exposure to ionizing radiation from the following fact sheet.

Suggested Reading

To learn more about radiation, we suggest you read the following books:

- Cember, H. Introduction to Health Physics. New York: Pergamon Press, 1983.
- Martin, A. and Harbison, S.A. An Introduction to Radiation Protection. 3rd ed. London: Chapman and Hall, 1986.
- Shapiro, J. Radiation Protection. Cambridge: Harvard University Press, 1972.

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Last updated on Wednesday, August 21st, 2002
URL: http://www.epa.gov/radiation/docs/ionize/ionize.htm

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Penetrating Powers of Alpha & Beta Particles
& Gamma Rays
Penetrating Powers of Ionizing Radiation

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- Shapiro, J. Radiation Protection. Cambridge: Harvard University Press, 1972.

First of two links to related information Ionizing Radiation Factsheet Series: No. 2 Second of two links to related information Publications

Ionizing Radiation Factsheet Series: No. 2

Ionizing radiation can cause changes in the chemical balance of cells. Some of those changes can result in cancer. In addition, by damaging the genetic material (DNA) contained in all cells of the body, ionizing radiation can cause harmful genetic mutations that can be passed on to future generations. Exposure to large amounts of radiation, a rare occurrence, can cause sickness in a few hours or days and death within 60 days of exposure. In extreme cases, it can cause death within a few hours of exposure.

Sources of Exposure

The ionizing radiations of primary concern are alpha and beta particles, gamma rays, and x rays. Alpha and beta particles and gamma rays can come from natural sources or can be technologically produced. Most of the x-ray exposure people receive is technologically produced. Natural radiation comes from cosmic external sources, radiation exposure can occur internally by ingesting, inhaling, injecting, or absorbing radioactive materials. Both external and internal sources may irradiate the whole body or a portion of the body. The amount of radiation exposure is usually expressed in a unit called millirem (mrem). In the United States, the average person is exposed to an effective dose equivalent of approximately 360 mrem (whole-body exposure) per year from all sources (NCRP Report No. 93).

Results of Exposure

Ionizing radiation affects people by depositing energy in body tissue, which can cause cell damage or cell death. In some cases there may be no effect. In other cases, the cell may survive but become abnormal, either temporarily or permanently, or an abnormal cell may become malignant. Large doses of radiation can cause extensive cellular damage and result in death. With smaller doses, the person or particular irradiated organ(s) may survive, but the cells are damaged, increasing the chance of cancer. The extent of the damage depends upon the total amount of energy absorbed, the time period and dose rate of exposure, and the particular organ(s) exposed.

Evidence of injury from low or moderate doses of radiation may not show up for months or even years. For leukemia, the minimum time period between the radiation exposure and the appearance of disease (latency period) is 2 years. For solid tumors, the latency period is more than 5 years. The types of effects and their probability of occurrence can depend on whether the exposure occurs over a large part of a person's lifespan (chronic) or during a very short portion of the lifespan (acute). It should be noted that all of the health effects of exposure to radiation can also occur in unexposed people due to other causes. Also, there is no detectable difference in appearance between radiation induced cancers and genetic effects and those due to other causes.

Chronic Exposure

Chronic exposure is continuous or intermittent exposure to low levels of radiation over a long period of time. Chronic exposure is considered to produce only effects that can be observed some time following initial exposure. These include genetic effects and other effects such as cancer, precancerous lesions, benign tumors, cataracts, skin changes, and congenital defects.

Acute Exposure

Acute exposure is exposure to a large, single dose of radiation, or a series of doses, for a short period of time. Large acute doses can result from accidental or emergency exposures or from special medical procedures (radiation therapy). In most cases, a large acute exposure to radiation can cause both immediate and delayed effects. For humans and other mammals, acute exposure, if large enough, can cause rapid development of radiation sickness, evidenced by gastrointestinal disorders, bacterial infections, hemorrhaging, anemia, loss of body fluids, and electrolyte imbalance. Delayed biological effects can include cataracts, temporary sterility, cancer, and genetic effects. Extremely high levels of acute radiation exposure can result in death within a few hours, days or weeks.

Risks of Health Effects

All people are chronically exposed to background levels of radiation present in the environment. Many people also receive additional chronic exposures and/or relatively small acute exposures. For populations receiving such exposures, the primary concern is that radiation could increase the risk of cancers or harmful genetic effects.

The probability of a radiation-caused cancer or genetic effect is related to the total amount of radiation accumulated by an individual. Based on current scientific evidence, any exposure to radiation can be harmful (or can increase the risk of cancer); however, at very low exposures, the estimated increases in risk are very small. For this reason, cancer rates in populations receiving very low doses of radiation may not show increases over the rates for unexposed populations.

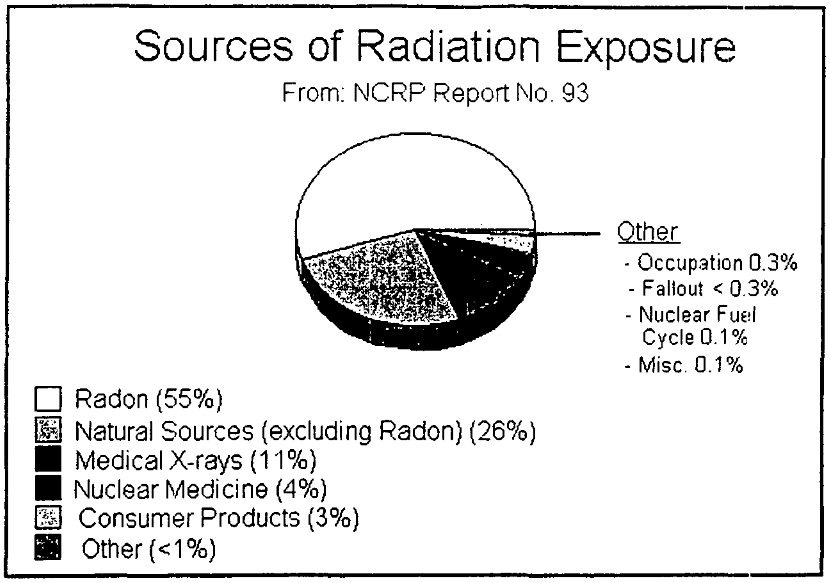
For information on effects at high levels of exposure, scientists largely depend on epidemiological data on survivors of the Japanese atomic bomb explosions and on people receiving large doses of radiation medically. These data demonstrate a higher incidence of cancer among exposed individuals and a greater probability of cancer as the level of exposure increases. In the absence of more direct information, that data is also used to estimate what the effects could be at lower exposures. Where questions arise, scientists try to extrapolate based on information obtained from laboratory experiments, but these extrapolations are acknowledged to be only estimates. For radon, scientists largely depend on data collected on underground miners. Professionals in the radiation protection field prudently assume that the chance of a fatal cancer from radiation exposure increases in proportion to the magnitude of the exposure and that the risk is as high for chronic exposure as it is for acute exposure. In other words, it is assumed that no radiation exposure is completely risk free.

Suggested Reading

The following books are possible sources for more in-depth information on the health effects of radiation exposure.

- Becker, F., Editor. Cancer - Volume I: Plenum Press -1975.
- Shapiro, J. Radiation Protection - Second Edition: Harvard University Press, 1981.
- Turner, J. Atoms, Radiation, and Radiation Protection: Pergamon Press, 1986.

- Ionizing Radiation Exposure of the Population of the United States- (NCRP Report No. 93): National Council on Radiation Protection and Measurements, 1987.



Any release of radioactive material is a potential source of radiation exposure to the population. In addition to exposure from external sources, radiation exposure can occur internally by ingesting, inhaling, injecting, or absorbing radioactive materials. Both external and internal sources may irradiate the whole body or a portion of the body. The amount of radiation exposure is usually expressed in a unit called millirem (mrem). In the United States, the average person is exposed to an effective dose equivalent of approximately 360 mrem (whole-body exposure) per year from all sources (NCRP Report No. 93).

Results of Exposure

Ionizing radiation affects people by depositing energy in body tissue, which can cause cell damage or cell death. In some cases there may be no effect. In other cases, the cell may survive but become abnormal, either temporarily or permanently, or an abnormal cell may become malignant. Large doses of radiation can cause extensive cellular damage and result in death. With smaller doses, the person or particular irradiated organ(s) may survive, but the cells are damaged, increasing the chance of cancer. The extent of the damage depends upon the total amount of energy absorbed, the time period and dose rate of exposure, and the particular organ(s) exposed.

Evidence of injury from low or moderate doses of radiation may not show up for months or even years. For leukemia, the minimum time period between the radiation exposure and the appearance of disease (latency period) is 2 years. For solid tumors, the latency period is more than 5 years. The types of effects and their probability of occurrence can depend on whether the exposure occurs over a large part of a person's lifespan (chronic) or during a very short portion of the lifespan (acute). It should be noted that all of the health effects of exposure to radiation can also occur in unexposed people due to other causes. Also, there is no detectable difference in appearance between radiation induced cancers and genetic effects and those due to other causes.

Chronic Exposure

Chronic exposure is continuous or intermittent exposure to low levels of radiation over a long period of time. Chronic exposure is considered to produce only effects that can be observed some time following initial exposure. These include genetic effects and other effects such as cancer, precancerous lesions, benign tumors, cataracts, skin changes, and congenital defects.

Acute Exposure

Acute exposure is exposure to a large, single dose of radiation, or a series of doses, for a short period of time. Large acute doses can result from accidental or emergency exposures or from special medical procedures (radiation therapy). In most cases, a large acute exposure to radiation can cause both immediate and delayed effects. For humans and other mammals, acute exposure, if large enough, can cause rapid development of radiation sickness, evidenced by gastrointestinal disorders, bacterial infections, hemorrhaging, anemia, loss of body fluids, and electrolyte imbalance. Delayed biological effects can include cataracts, temporary sterility, cancer, and genetic effects. Extremely high levels of acute radiation exposure can result in death within a few hours, days or weeks.

Risks of Health Effects

All people are chronically exposed to background levels of radiation present in the environment. Many people also receive additional chronic exposures and/or relatively small acute exposures. For populations receiving such exposures, the primary concern is that radiation could increase the risk of cancers or harmful genetic effects.

The probability of a radiation-caused cancer or genetic effect is related to the total amount of radiation accumulated by an individual. Based on current scientific evidence, any exposure to radiation can be harmful (or can increase the risk of cancer); however, at very low exposures, the estimated increases in risk are very small. For this reason, cancer rates in populations receiving very low doses of radiation may not show increases over the rates for unexposed populations.

For information on effects at high levels of exposure, scientists largely depend on epidemiological data on survivors of the Japanese atomic bomb explosions and on people receiving large doses of radiation medically. These data demonstrate a higher incidence of cancer among exposed individuals and a greater probability of cancer as the level of exposure increases. In the absence of more direct information, that data is also used to estimate what the effects could be at lower exposures. Where questions arise, scientists try to extrapolate based on information obtained from laboratory experiments, but these extrapolations are acknowledged to be only estimates. For radon, scientists largely depend on data collected on underground miners. Professionals in the radiation protection field prudently assume that the chance of a fatal cancer from radiation exposure increases in proportion to the magnitude of the exposure and that the risk is as high for chronic exposure as it is for acute exposure. In other words, it is assumed that no radiation exposure is completely risk free.

Suggested Reading

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