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POST-REMEDIAL ACTION REPORT

FOR THE

C. H. SCHNOOR SITE

SPRINGDALE, PENNSYLVANIA

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By

Bechtel National, Inc.

Oak Ridge, Tennessee

Bechtel Job No. 14501

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ACRONYMS

BNI	Bechtel National, Inc.
DAC	derived air concentration
DCG	derived concentration guide
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FIDLER	field instrument for the detection of low-energy radiation
FUSRAP	Formerly Utilized Sites Remedial Action Program
HEPA	high-efficiency particulate air
IVC	independent verification contractor
ORNL	Oak Ridge National Laboratory
PIC	pressurized ionization chamber

UNITS OF MEASURE

cm	centimeter
cpm	counts per minute
dpm	disintegrations per minute
ft	foot
g	gram
h	hour
kg	kilogram
lb	pound
L	liter
m	meter
μCi	microcurie
μR	microroentgen
ml	milliliter
mrem	millirem
pCi	picocurie
s	second
yd	yard
yr	year

1.0 INTRODUCTION

1.1 BACKGROUND

This report documents the expedited remedial action conducted at the C. H. Schnoor site in Springdale, Pennsylvania from August to October 1994 (Figure 1-1). An expedited remedial action is an efficient, cost-effective, and environmentally acceptable approach for cleaning up small sites; this approach complies with the requirements of the National Environmental Policy Act and the Comprehensive Environmental Response, Compensation, and Liability Act.

Remedial activities at the C. H. Schnoor site were performed as part of the U.S. Department of Energy's (DOE's) Formerly Utilized Sites Remedial Action Program (FUSRAP). FUSRAP was established to identify and clean up or otherwise control sites where residual radioactive contamination remains from the early years of the nation's atomic energy program or from commercial operations causing conditions that Congress has authorized DOE to remedy. FUSRAP was established in 1974 and currently includes 46 sites in 14 states. The C. H. Schnoor site was designated for remedial action under FUSRAP in 1992.

FUSRAP objectives for the C. H. Schnoor site were to

- remove or otherwise control contamination above current DOE guidelines, and
- achieve and maintain compliance with applicable criteria for the protection of human health and the environment.

Bechtel National, Inc. (BNI), the project management contractor, assisted DOE's Oak Ridge Operations Office in the planning, management, and implementation of the cleanup of the C. H. Schnoor site. DOE Headquarters uses Oak Ridge National Laboratory (ORNL) as an independent verification contractor (IVC) to provide independent assurance that the remedial action met the cleanup criteria.

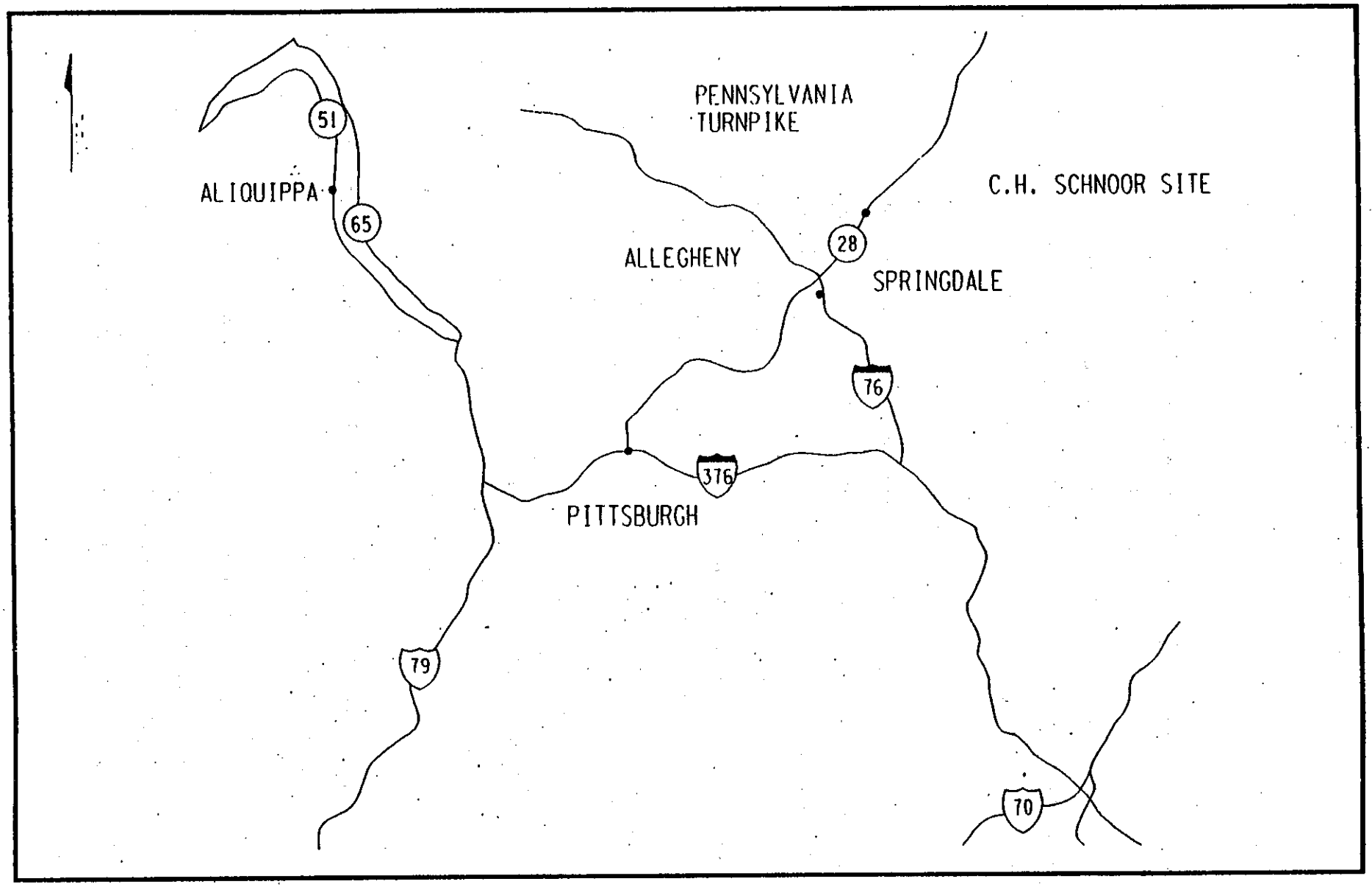

Figure 1-1
Location of the C.H. Schnoor Site

1.2 HISTORY

The C. H. Schnoor site is located at 644 Garfield Street in Springdale, Pennsylvania. During the mid-1940s, the property was owned by C. H. Schnoor and Company and was used to machine extruded uranium for the Hanford Pile Project, a project with the objective of producing an alternate charge for the Hanford Reactor. The uranium operation may have continued until the spring of 1951, when the building was sold to a manufacturer of toys and coat hangers. In 1967 the property was acquired by the Unity Railway Supply Company, which founded the Premier Manufacturing Company and used the site to manufacture journal lubricators for railroad cars. The current owner, Conviber Inc., uses the site for the fabrication of industrial drive and conveyor belts.

The original site consisted of a concrete block building and a loading dock. Over the years this building has been enlarged, and a new loading dock has been added. During the uranium machining period, materials were reportedly received through the Garfield street entrance and stored near the loading dock. Figure 1-2 is a plan view of the site.

1.3 EXTENT OF CONTAMINATION

In October 1980, a radiological scanning survey was conducted by DOE and Argonne National Laboratory. The resulting report documented elevated radiation levels over only a small area inside the building where uranium had been machined. Because much of the floor was inaccessible for surveying and because of the lack of definitive records documenting the use of the site, DOE directed that an additional, more comprehensive survey be performed. In 1989 and 1990, ORNL performed the survey (ORNL 1991); the results confirmed that radioactive contamination at levels above DOE guidelines existed beneath the belt-cutting room floor (as shown in Figure 1-3). No contamination was detected outside the building.

On October 11-13, 1993, a team from ORNL conducted an additional radiological survey of the interior of the concrete building, at the request of DOE (ORNL 1995). The purpose of this survey was to characterize the building thoroughly before remediation efforts began. Because of concerns that the concrete floors severely limited the success of typical

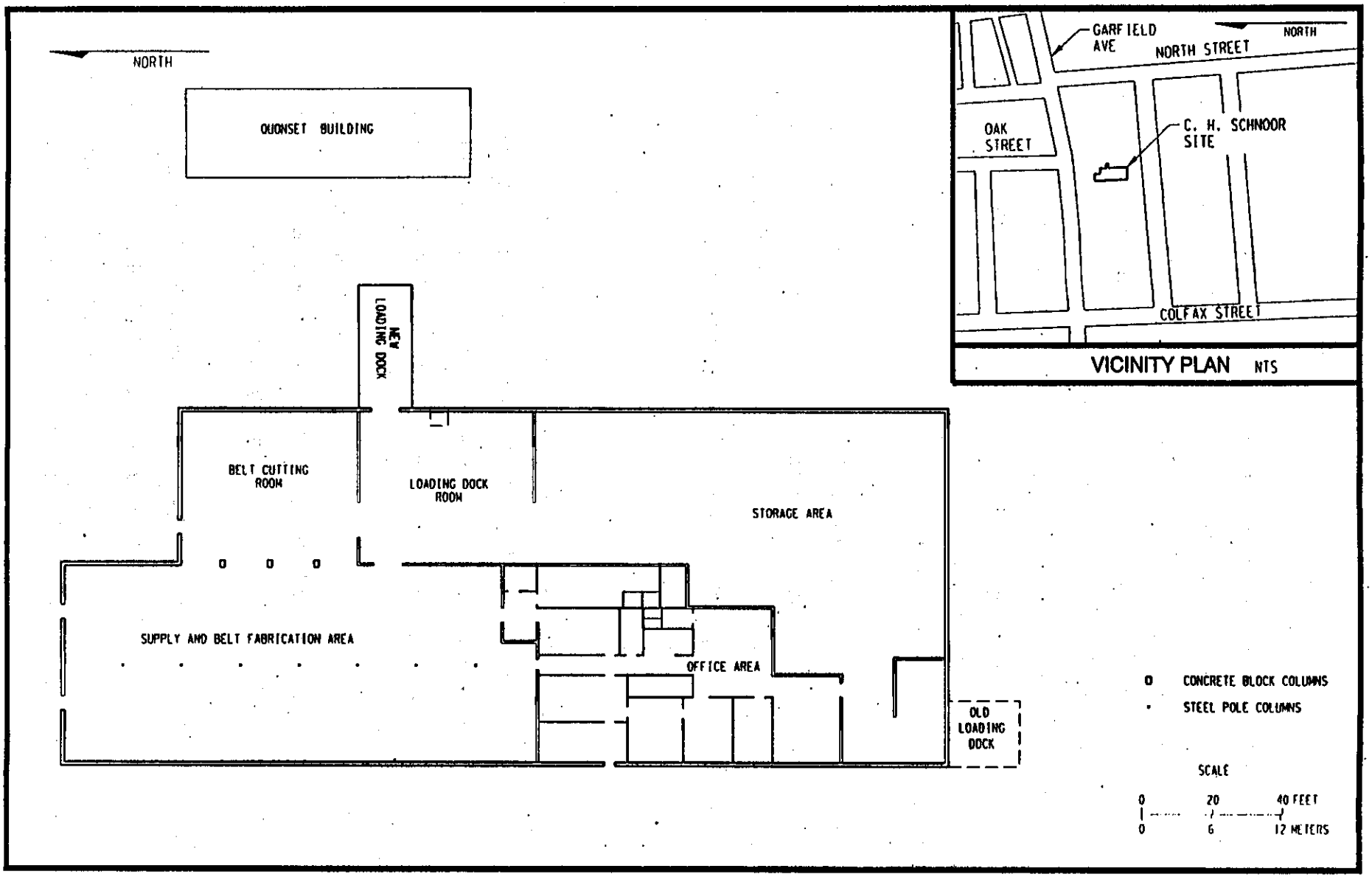

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Figure 1-2
Plan View of the C.H. Schnoor Site

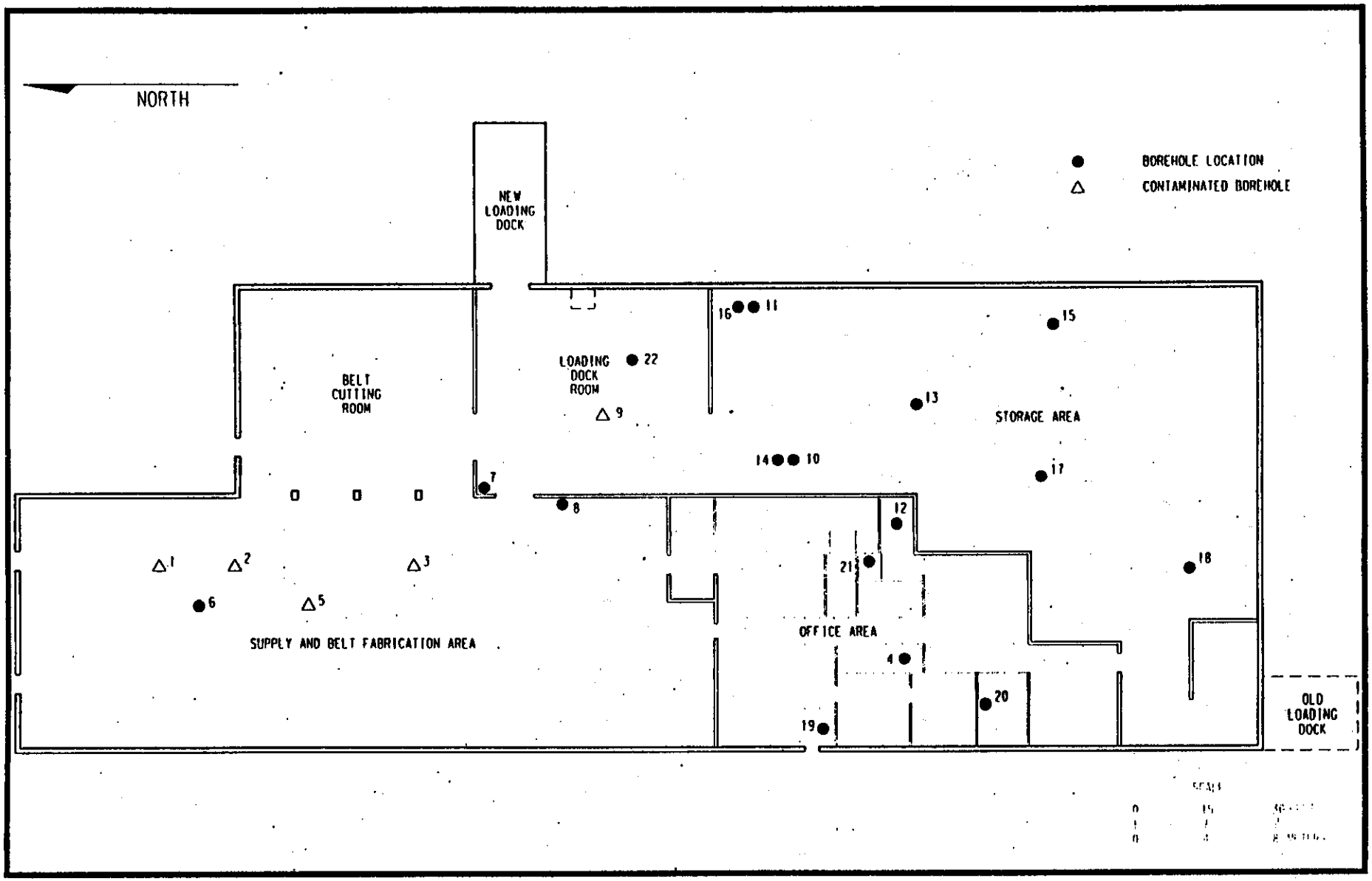

Figure 1-3
Boreholes Drilled During BNI Surveys

survey methods in adequately characterizing the contamination profile, an ORNL survey team returned to the site on November 14-17, 1993, with a different approach to characterizing subsurface contamination. Results of these supplementary radiological surveys showed contamination under the concrete in the northern half of the building (ORNL 1995). In addition, concrete that had been placed during the period of former Atomic Energy Commission activities in the area next to the new loading dock showed surface contamination.

BNI performed additional radiological surveys in October and December 1993 to supplement and refine existing survey information. ORNL was consulted during the design of the BNI surveys regarding the survey layout and strategy. Twenty-two additional boreholes were drilled and sampled during the October and December BNI surveys; these boreholes are shown in Figure 1-3. The BNI surveys detected radioactive contamination primarily in the belt-cutting and belt-fabrication areas of the building. Most of this contamination was in the soil beneath the concrete slab, and isolated areas of surface contamination were detected on a portion of the concrete floor adjacent to the belt-cutting room (also known as the loading dock room). During characterization and remedial action, no building drains were encountered that could have transported contamination outside the building.

2.0 REMEDIAL ACTION GUIDELINES

Radioactive contamination at the C. H. Schnoor site consisted primarily of natural uranium. Table 2-1 lists the DOE residual contamination guidelines for release of formerly contaminated properties for use without radiological restrictions. These guidelines were adopted by DOE based on their compatibility with U. S. Environmental Protection Agency (EPA) criteria for remedial action found in 40 CFR 192, "Uranium Mill Tailings Remedial Action Program" (DOE 1986); and DOE Order 5400.5, "Radiation Protection of the Public and the Environment" (DOE 1990).

For the remedial action at the site, soil samples were compared to a site-specific cleanup criterion of 100 pCi/g for total uranium averaged over any 15-cm- (6-in.-) thick layer below the surface. Because no generic cleanup guidelines for uranium applicable to remedial actions at FUSRAP sites are available, uranium guidelines are derived on a site-specific basis. A concentration of 50 pCi/g for uranium-238 was used as an indicator because the material at the Schnoor site was natural uranium. The average background concentration of uranium-238 in soil representative of the site was determined by analyzing three soil samples. These samples were collected from areas chosen based on their proximity to the site, relative independence from potential influence of the site, and representativeness of area land uses. The average concentration of uranium-238 in background samples was 2.37 pCi/g.

TABLE 2-1
SUMMARY OF RESIDUAL CONTAMINATION GUIDELINES

BASIC DOSE LIMITS

The basic limit for the annual radiation dose (excluding radon) received by an individual member of the general public is 100 mrem/yr. In implementing this limit, DOE applies as-low-as-reasonably achievable principles to set site-specific guidelines.

SOIL GUIDELINES

Radionuclide	Soil Concentration (pCi/g) Above Background[a,b,c]
Radium-226 Radium-228 Thorium-230 Thorium-232	5 pCi/g when averaged over the first 15 cm of soil below the surface; 15 pCi/g when averaged over any 15-cm-thick soil layer below the surface layer.
Total Uranium	100 pCi/g when averaged over any 15-cm-thick soil layer.

STRUCTURE GUIDELINES

Airborne Radon Decay Products

Generic guidelines for concentrations of airborne radon decay products shall apply to existing occupied or habitable structures on private property that has no radiological restrictions on its use; structures that will be demolished or buried are excluded. The applicable generic guideline (40 CFR 192) is: In any occupied or habitable building, the objective of remedial action shall be, and reasonable effort shall be made to achieve, an annual average (or equivalent) radon decay product concentration (including background) not to exceed 0.02 WL[d]. In any case, the radon decay product concentration (including background) shall not exceed 0.03 WL. Remedial actions are not required in order to comply with this guideline when there is reasonable assurance that residual radioactive materials are not the cause.

External Gamma Radiation

The average level of gamma radiation inside a building or habitable structure on a site that has no radiological restrictions on its use shall not exceed the background level by more than 20 μR/h and will comply with the basic dose limits when an appropriate-use scenario is considered.

Indoor/Outdoor Structure Surface Contamination

Radionuclide[f]	Allowable Surface Residual Contamination[e] (dpm/100 cm²) Average[g,h]	Maximum[h,i]	Removable[h,j]
Transuranics, Ra-226, Ra-228, Th-230, Th-228 Pa-231, Ac-227, I-125, I-129[k]	100	300	20
Th-Natural, Th-232, Sr-90, Ra-223, Ra-224 U-232, I-126, I-131, I-133	1,000	3,000	200
U-Natural, U-235, U-238, and associated decay products	5,000 α	15,000 α	1,000 α
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above[l]	5,000 β - γ	15,000 β - γ	1,000 β - γ

TABLE 2-1
(CONTINUED)

[a]These guidelines take into account ingrowth of radium-226 from thorium-230 and of radium-228 from thorium-232, and assume secular equilibrium. If either thorium-230 and radium-226 or thorium-232 and radium-228 are both present, not in secular equilibrium, the guidelines apply to the higher concentration. If other mixtures of radionuclides occur, the concentrations of individual radionuclides shall be reduced so that (1) the dose for the mixtures will not exceed the basic dose limit, or (2) the sum of ratios of the soil concentration of each radionuclide to the allowable limit for that radionuclide will not exceed 1 ("unity").

[b]These guidelines represent allowable residual concentrations above background averaged across any 15-cm-thick layer to any depth and over any contiguous 100-m^2 surface area.

[c]If the average concentration in any surface or below-surface area less than or equal to 25 m^2 exceeds the authorized limit or guideline by a factor of $(100/A)^{1/2}$, where A is the area of the elevated region in square meters, limits for "hot spots" shall also be applicable. Procedures for calculating these hot spot limits, which depend on the extent of the elevated local concentrations, are given in the DOE Manual for Implementing Residual Radioactive Materials Guidelines, DOE/CH/8901. In addition, every reasonable effort shall be made to remove any source of radionuclide that exceeds 30 times the appropriate limit for soil, irrespective of the average concentration in the soil.

[d]A working level (WL) is any combination of short-lived radon decay products in 1 liter of air that will result in the ultimate emission of 1.3×10^5 MeV of potential alpha energy.

[e]As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute measured by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[f]Where surface contamination by both alpha- and beta-gamma-emitting radionuclides exists, the limits established for alpha- and beta-gamma-emitting radionuclides should apply independently.

[g]Measurements of average contamination should not be averaged over an area of more than 1 m^2. For objects of less surface area, the average should be derived for each such object.

[h]The average and maximum dose rates associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h and 1.0 mrad/h, respectively, at a depth of 1 cm.

[i]The maximum contamination level applies to an area of not more than 100 cm^2.

[j]The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping an area of that size with dry filter or soft absorbent paper, applying moderate pressure, and measuring the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area should be based on the actual area, and the entire surface should be wiped. It is not necessary to use wiping techniques to measure removable contamination levels if direct scan surveys indicate that total residual surface contamination levels are within the limits for removable contamination.

[k]Guidelines for these radionuclides are not given in DOE Order 5400.5; however, these guidelines are considered applicable until guidance is provided.

[l]This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched.

Source: DOE Order 5400.5 and 40 CFR 192

3.0 REMEDIAL ACTION

3.1 CLEANUP/DECONTAMINATION ACTIVITIES

Immediately before and during the remedial action, the ORNL radiological survey team performed surface surveys and drilled additional boreholes to assist in accurately defining the boundaries of contamination and to supplement existing information on the extent of contamination. Additional boreholes were drilled and sampled in the Quonset building, the new loading dock, the office area, and the western and southern sides of the supply and belt fabrication area. The ORNL team stationed a mobile gamma spectroscopy system onsite to provide preliminary soil results during the remedial action. The mobile laboratory provided real time data, which greatly assisted field crews to direct horizontal and vertical excavation zones, thus minimizing overexcavation. This system was used in conjunction with hand-held survey instruments such as the field instrument for the detection of low-energy radiation (FIDLER) and a Geiger-Mueller counter (HP-260) to direct the remedial action. The major instrumentation used is listed in Appendix A; survey and analytical procedures are described in Appendix B.

As remediation was completed, post-remedial action surveys were performed to ensure that decontamination efforts were successful in meeting DOE cleanup criteria. Exposure rate measurements were taken with a pressurized ionization chamber (PIC) to confirm that radiation levels were below the DOE guideline of 20 μR/h above background for building interiors and the dose limit of 100 mrem/yr to members of the general public (see Table 2-1). Soil samples were collected and analyzed to establish that contaminated soil had been removed to levels below the cleanup guidelines. Concentrations of direct alpha and beta/gamma and transferable alpha and beta/gamma contamination were also measured to ensure that surface decontamination efforts were successful. Uranium metal was machined at this facility, so radium-226 and radon-222 were not of concern because they had been removed during the processing of the uranium ores into uranium metal before the metal was brought to the site. Radon originates from radium-226 decay, so no measurements were taken for radon; however, radium-226 concentrations were measured to ensure that radon was not of concern.

Techniques used in the remedial action are summarized in Table 3-1. A summary of the remedial action is provided as Appendix C. After the remedial action, the owner performed restoration activities.

Volume reduction and waste minimization techniques employed during the remedial action included segregation, sampling, and surveying of the wastes produced. The following are specific examples of the waste volume reduction at the C. H. Schnoor site:

- Concrete removed from the building floor was surveyed and released to a sanitary landfill if it was below surface criteria. Concrete that was removed and above surface criteria was decontaminated onsite if this could be done with minimal labor, and the concrete was then released to the sanitary landfill. This method saved transportation and disposal costs.

- Concrete that could not be released to the landfill was shipped to the Aliquippa Forge site and crushed with a commercial rock crusher. After crushing, representative samples were obtained, and the material was determined to have an average uranium-238 concentration of 7.50 pCi/g; this level is well below the cleanup criterion of 50 pCi/g. By making it possible to reuse approximately 31 m^3 (41 yd^3) of concrete as fill material at the site, this method eliminated transportation and disposal costs. This beneficial reuse was approved by the Pennsylvania Department of Environmental Restoration. Appendix D includes a letter that provides state concurrence on the reuse of the material.

- Materials used in controlled areas, including disposable clothing such as coveralls and gloves, were surveyed and released as radiologically clean rather than being disposed of as radioactive trash if no contamination was detected. If large portions of the disposable protective clothing were contaminated, the clothing was disposed of with the soil being shipped to Envirocare. If only small areas of the clothing were contaminated, those areas were cut out and disposed of to minimize the generation of radioactive waste.

Table 3-1

Decontamination Techniques Used at the C. H. Schnoor Site

Type	Description
HEPA vacuuming	High-efficiency particulate air- (HEPA-) filtered vacuum cleaners were used to remove loose contamination. They were also used in conjunction with other techniques (grinding, pneumatic scalers, etc.) to eliminate the air contamination associated with these techniques.
Wire brushing/grinding/ pneumatic scalers (needle guns)	Small areas on concrete columns and floors were wire brushed to remove loose contamination. When wire brushing did not remove the contamination, a power hand grinder or a needle gun was used to remove the surface layer of more adherent contamination. Lead anchor bolts from the loading dock room were decontaminated with wire brushes (a method that eliminated potential mixed waste).
Mechanical shot blasting	A commercially available shot-blast system with self-contained dust collection, the VacuBlast™, was used to clean the concrete floor in the loading dock room. A metallic abrasive material was used on the work surface, and incremental layers of contaminated material were then removed.
Cutting with a gasoline-powered concrete saw	A gasoline-powered concrete saw with a diamond tip blade was used to prepare sections of the floor slab for removal.
Jackhammering	Conventional jackhammers were used on small areas and to break individual pieces of excavated concrete. Bobcats and track excavators equipped with hoe-ram attachments were used to remove chunks of concrete from the building.
Excavation	Contaminated concrete and soil were removed from within the building with a track excavator, truck loader, bobcats, a forklift, picks, and shovels.
Commercial rock crushing	Surface-contaminated concrete chunks were crushed with a commercial rock crusher and reused as fill after analyses had confirmed that the material contained no contamination above guidelines.

- Use of the ORNL onsite gamma spectroscopy instrument resulted in better definition of excavation limits and minimizing overexcavation and downtime for equipment operators.

- Decontamination of lead anchor bolt pourings allowed the release of 13.5 kg (30 lb) for clean recycle.

The remedial action lasted approximately 6 weeks, from August to October 1994. All remediation efforts were confined to the interior of the main building at the C. H. Schnoor site. Designation and characterization surveys revealed contamination beneath the concrete floor, primarily in the belt cutting and the supply and belt fabrication areas of the building and in a small area in the loading dock room (Figure 1-2). Surface contamination was detected on the floor in the loading dock room and on the base of two of the cement block columns after contaminated soil had been removed from around them.

A section of the wall between two pilasters in the northern end of the building was removed so that equipment could enter the building to begin the remedial action. A concrete saw was used to cut joints in the concrete along the walls and at the perimeter of the contaminated area as determined from characterization data. Joints were cut along the walls to prevent damage to the cement block walls during concrete removal because the exact construction techniques used to erect the building were unknown. After removal of the concrete began, it was found that use of the concrete saw could be discontinued because no damage would occur to the walls, and any additional concrete removal would extend to control joints rather than cutting joints. The concrete was removed to a control joint because a "key-way" type of construction joint was used in the floor; this type of joint would be difficult to reconstruct, and the concrete saw was very labor intensive for the amount of additional concrete that would need to be removed. Concrete was removed from this wall for construction purposes; no contamination was present on the wall.

Equipment fitted with hoe-ram attachments was used to break the concrete floor into approximately 1.2-m by 2.4-m (4-ft by 8-ft) pieces, which were radiologically surveyed. Uncontaminated concrete was placed in a dumpster for disposal at a sanitary landfill and

concrete that could not be decontaminated without excessive labor was placed in a tent constructed onsite to protect it from the weather; it was then shipped to the Aliquippa Forge site, crushed by a commercial rock crusher, and sampled. The average uranium-238 content was determined to be 7.50 pCi/g, which is within the background range for natural radioactivity found in concrete materials, and is well below the site cleanup guideline of 50 pCi/g. This material was used as backfill at the C. H. Schnoor site after approval from the Pennsylvania Department of Environmental Restoration. A total of 74.5 m^3 (97.4 yd^3) of concrete was removed from the building, of which 43.3 m^3 (56.6 yd^3) was shipped to the sanitary landfill and 31.2 m^3 (40.8 yd^3) was crushed and reused as backfill.

A track excavator, bobcats fitted with buckets, and picks and shovels were used to excavate the contaminated soil from inside the building. The soil was placed in the bucket of the truck loader, which was positioned at the opening in the northern end of the building and loaded into intermodal containers for shipment. This method of soil handling eliminated the need for equipment to enter and leave the controlled area, which would have required equipment surveys to be performed each time. The exterior transfer and loading areas were situated to prevent contamination of the grounds. Figure 3-1 shows the areas of excavation inside the building. The average depth of excavation was approximately 0.6 m (2 ft). Two small areas excavated to a depth of approximately 1.2 m (3.9 ft) represent a total area of 26 m^2 (280 ft^2) (shown in Figure 3-1). A total of 476 m^3 (626 yd^3) of soil and debris was excavated from the building. This material was shipped in 37 intermodal containers for disposal by Envirocare of Utah, a licensed disposal facility in Clive, Utah.

In addition to excavation, surface decontamination was performed in the loading dock room and on the base of two cement block columns. The VacuBlast™ unit was used to remove most of the surface contamination in the loading dock room, and the grinder and needle gun were used for smaller areas. A total of approximately 85 m^2 (915 ft^2) of surface area was decontaminated in the loading dock room (see Figure 3-1). The two cement block columns at the northern end of the room and the footer between them, determined to contain surface contamination, were decontaminated with the grinder and needle gun. Waste from this effort was also placed in intermodal containers and shipped to Envirocare for disposal.

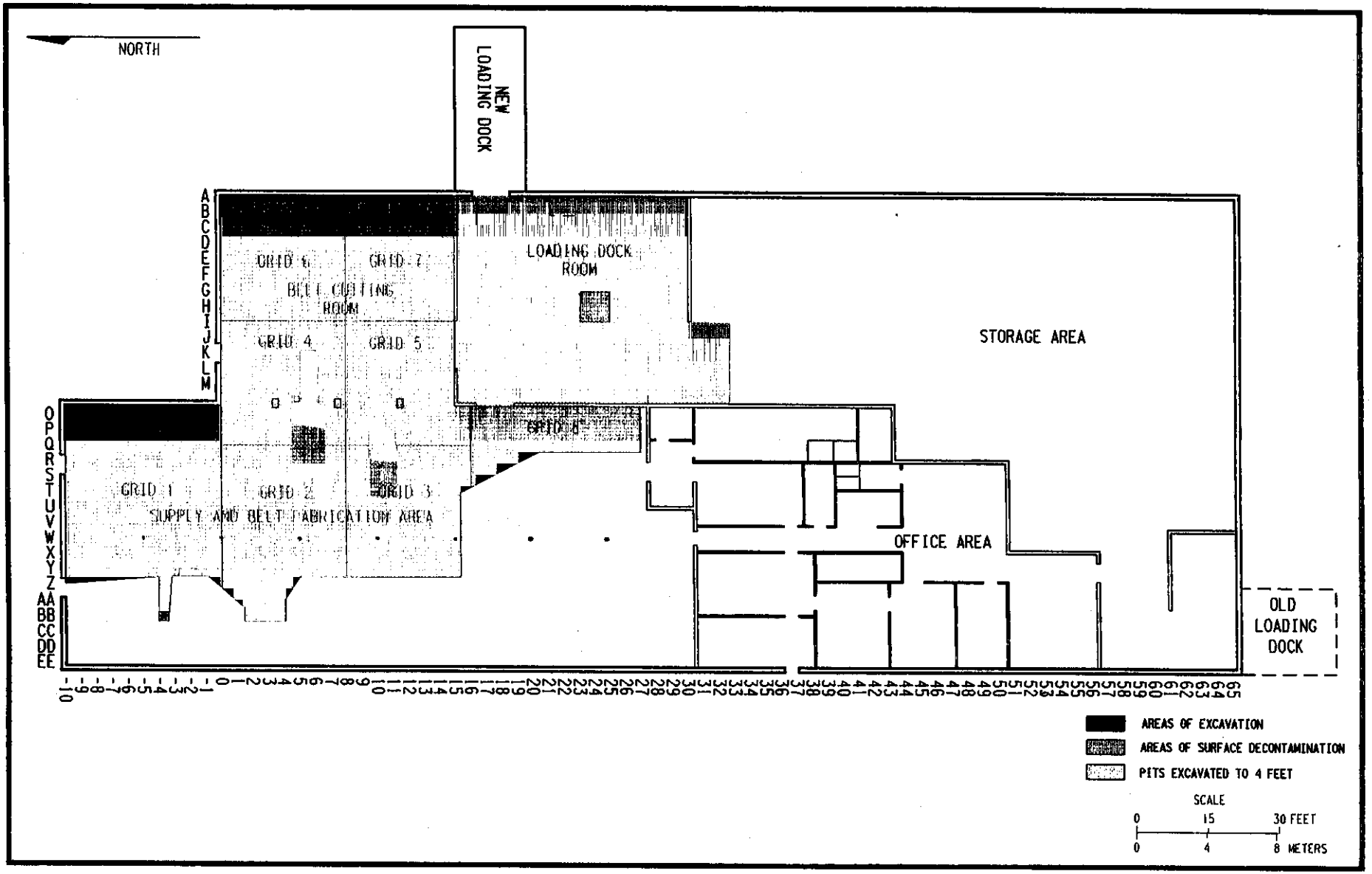

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Figure 3-1
Excavation and Surface Decontamination Areas

The final cost of the remedial action was $1,764,000; Table 3-2 is a breakdown of the costs.

3.2 CONTAMINATION CONTROL DURING REMEDIAL ACTION

During the remedial action, engineering and administrative controls (such as dust control and hazardous work permits) and personal protective equipment were used to protect remediation workers and members of the public from exposure to radiation in excess of applicable standards.

All personnel working in contaminated areas were required to wear disposable coveralls, safety glasses, rubber boots, hard hats, hearing protection, and gloves. If conditions warranted, additional protective clothing and equipment such as face shields were used. Site conditions did not necessitate the use of personnel respiratory protection.

Workers leaving radiologically restricted work areas were scanned at the control point by a health physics technician with an alpha and/or beta-gamma detector to ensure that they were not contaminated and to prevent the spread of contamination.

The primary exposure pathways during remedial action for persons onsite and offsite were inhalation and ingestion of radioactively contaminated airborne dust from mechanical decontamination and excavation activities. HEPA filtration units and the Vacublast™ decontamination system were used to control the spread of dust and minimize the potential for contaminants to become airborne. In addition, water was sprayed to control dust during soil removal and transport. All equipment used in the controlled area was surveyed before being released from the site.

During remediation, particulate air monitoring devices were placed in the areas being remediated. Monitoring locations were selected to provide data for the worst-case scenario. Concentrations of uranium-238 ranging from 2.6×10^{-14} to 3.3×10^{-13} μCi/ml (0.000026 to 0.00033 pCi/L) were conservatively derived by collecting air particulate samples daily from lapel air samplers worn by workers. After the gross activity per volume of air that passed

Table 3-2

Costs of the Remedial Action at the C. H. Schnoor Site

Description	Amount
Remedial Action Operations	$1,181,000
Waste Transportation and Disposal	514,000
Final Engineering Reports	69,000
TOTAL	$1,764,000

through the filter was determined, the source of all activity on the filter was assumed to be uranium-238. These derived air concentrations (DACs) were then compared with the applicable DOE guideline, which is a DAC of 2.0×10^{-11} μCi/ml (0.02 pCi/ml) for occupational exposures to airborne uranium-238 (DOE Order 5480.11).

Area air particulate sampling was also performed adjacent to areas being remediated to ensure that no member of the general public was exposed to radioactivity above DOE guidelines (DOE Order 5400.5). This guideline was established to protect members of the general public and the environment from undue risk from radiation. An Eberline RAS-1 high-volume monitor and a low-volume lapel monitor were used, and the filters were collected daily and counted after 4 days to allow for radon decay. The limits in DOE Order 5400.5 are derived concentration guides (DCGs); a DCG is the concentration of a particular radionuclide that would provide an effective dose equivalent of 100 mrem/yr, the DOE basic dose limit, to an individual continuously exposed to the radionuclide by one pathway for an entire year. Concentrations of uranium-238 measured by area particulate monitors ranged from 1.3×10^{-15} to 5.1×10^{-14} μCi/ml (0.0000013 to 0.000051 pCi/L). The DCG is 2.0×10^{-12} μCi/ml (0.002 pCi/L) for uranium-238.

4.0 POST-REMEDIAL ACTION MEASUREMENTS

After each portion of the property was decontaminated, a radiological survey of that area was conducted to confirm that all radioactive contamination above the cleanup criteria (Table 2-1) had been removed. Initial post-remediation surveys were conducted by ThermoAnalytical on behalf of BNI. Survey techniques used during post-remediation and verification surveys included direct (nontransferable) surface contamination measurements, transferable contamination measurements, walkover gamma scans, external gamma radiation exposure rate measurements, and soil sampling. ORNL, as the IVC, performed independent verification surveys of the remediated areas using similar or identical survey techniques. The IVC survey data will be issued in a separate report by ORNL.

4.1 SURFACE RADIATION SCANS IN EXCAVATED AREAS

As excavation was completed, walkover surveys were conducted to determine whether all the soil radioactively contaminated in excess of DOE remedial action guidelines had been removed. Final walkover surveys were performed with both the FIDLER and the HP-260. The walkover surveys provided immediate feedback so that additional excavation could be performed if residual contamination exceeded remedial action guidelines and the objective of maintaining exposures as low as reasonably achievable (ALARA) could be met. These same surveys were performed on the vertical face of the excavation outlined in Figure 3-1. These surveys are used only to obtain an approximate indication of contamination by correlating instrument readouts with soil concentrations; decisions concerning the final release of areas are based on the results of soil sampling and analyses for uranium-238 by gamma spectroscopy.

4.2 GAMMA RADIATION EXPOSURE RATE MEASUREMENTS

Gamma radiation exposure rates were measured with a PIC at 26 locations at a height of 1 m (3 ft) above the ground surface in each remediated area to obtain measurements in μR/h. Exposure rates ranged from 8.60 to 12.20 μR/h, including a background of

8.50 μR/h; locations are shown in Figure 4-1. All results were below the DOE guideline of 20 μR/h above background for building interiors. Results are presented in Table 4-1.

4.3 DIRECT AND TRANSFERABLE CONTAMINATION MEASUREMENTS

Direct-contact beta-gamma measurements were obtained with Geiger-Mueller counters (HP-210 or HP-260), and direct-contact alpha measurements were obtained with alpha scintillation detectors (AC-3). Direct measurements were obtained by placing the probe on the surface to be surveyed and allowing pulses to accumulate for at least 30 s on the scaler that was attached to the probes. These measurements were converted, with appropriate calibration and conversion factors, to dpm/100 cm^2 and compared to the DOE guidelines.

In the loading dock room, five readings were taken for each square meter of floor area. This conventional approach was used because the beta-gamma and alpha measurements were consistently below guidelines outlined in Table 2-1. The beta-gamma measurements, at the base of the two cement block columns and footing between them, were taken with a slightly different approach because they contained small areas of elevated surface contamination. After discussions with the IVC, it was decided that a weighted average would be applied to each 1-m^2 (10.8-ft^2) area rather than taking five systematic readings per square meter. This procedure was preferable because of the irregular and nonuniform shape of the surfaces. The process involved surveying the entire 1-m^2 (10.8-ft^2) area, recording the measurement and the area represented by each measurement, and then averaging the measurements by weighting them according to the area they represented. This method provided an accurate representation of the average surface contamination for each 1-m^2 (10.8-ft^2) area. These results were then compared to the applicable guidelines for allowable average surface contamination.

Transferable alpha and beta-gamma contamination was determined by wiping a 100-cm^2 (15.5-$in.^2$) area with a filter and measuring alpha emissions from the filter with an alpha scintillation counter (SAC-4) and Geiger-Mueller counters (HP-210 or HP-260), respectively. Transferable contamination was measured, at a minimum, at any location that exhibited direct

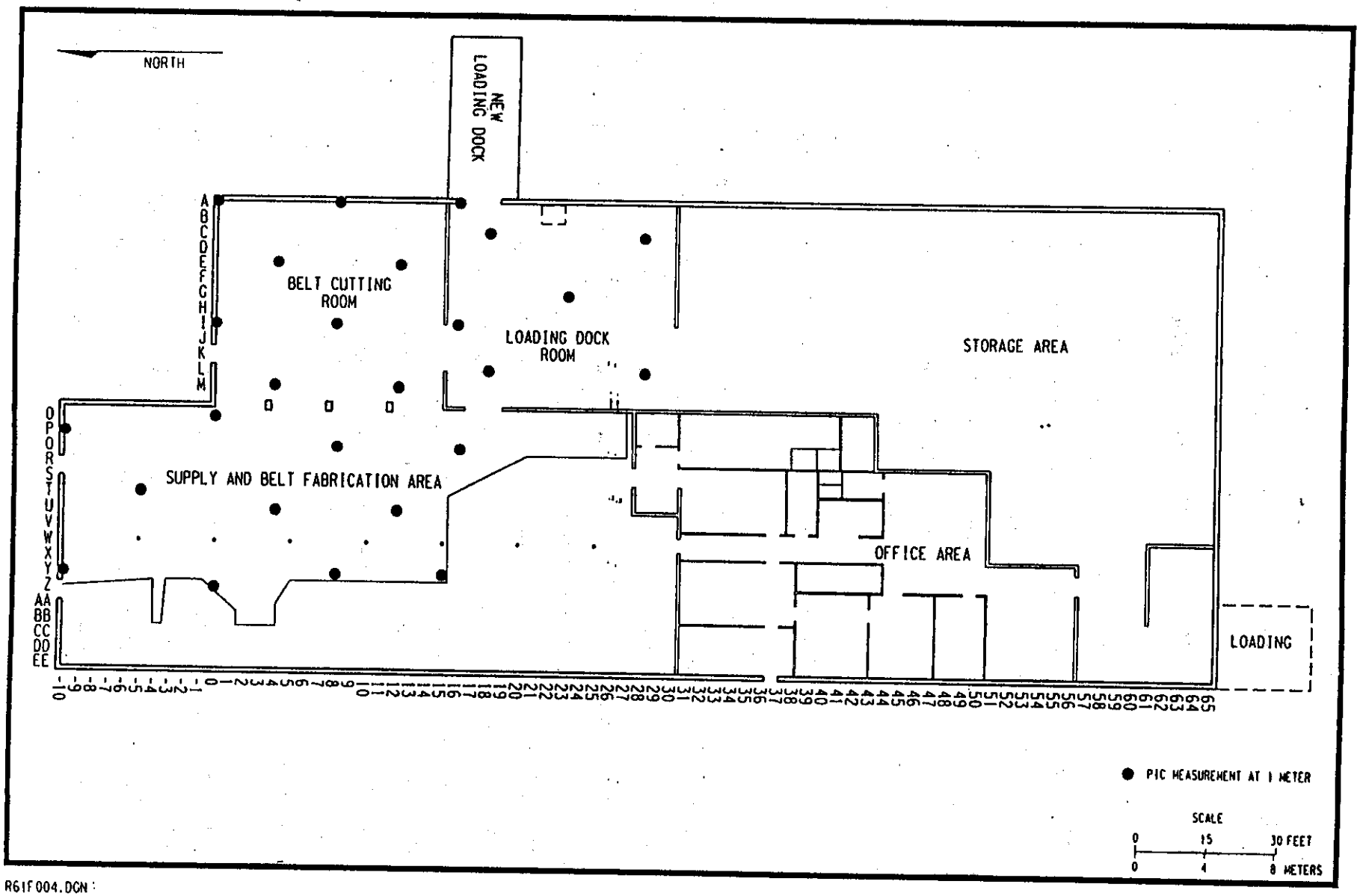

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Figure 4-1
PIC Measurement Locations

Table 4-1

Post-Remedial Action Gamma Radiation Exposure Rates

Grid	Coordinates[a]	Exposure Rate (μR/h)[b,c]
Y	-10	11.65
P	-10	11.86
T	-5	12.20
O	0	10.29
U	4	10.84
Z	0	11.13
Y	8	10.26
U	12	10.54
Q	8	10.59
Y	15	10.21
Q	16	9.61
M	12	11.52
I	16	10.44
I	8	10.44
M	4	10.67
I	0	10.67
E	4	10.51
A	8	10.99
E	12	10.44
A	16	10.99
A	0	10.83
C	18	10.00
L	18	8.60
C	28	10.00
L	28	10.00
G	23	8.60

[a]Locations are shown in Figure 4-1.

[b]All measurements include a background reading of 8.5 μR/h.

[c]DOE guideline is 20 μR/h, as shown in Table 2-1.

alpha or beta-gamma contamination above the guideline for removable contamination (1,000 dpm/cm^2).

Direct and transferable radiation measurements did not exceed applicable DOE guidelines (Table 2-1) at any of the post-remedial action measurement locations. Direct alpha and beta-gamma measurements for the loading dock area ranged from less than 8 to 225 dpm/100 cm^2 and less than 437 to 7,339 dpm/100 cm^2, respectively; transferable alpha and beta-gamma measurements ranged from less than 4 to 9 dpm/100 cm^2 and less than 30 to 40 dpm/100 cm^2, respectively. Average direct beta-gamma results for the columns and the footing were all below 2,867 dpm/100 cm^2, which is well below the DOE guideline of 5,000 dpm/100 cm^2. Direct alpha measurements for the columns and the footing ranged from less than 17 to 203 dpm/100 cm^2; transferable alpha and beta-gamma measurements ranged from less than 4 to 16 dpm/100 cm^2 and less than 31 to 43 dpm/100 cm^2, respectively. Results for the cement block columns, the footing, and the loading dock room are presented in Table 4-2.

4.4 SOIL SAMPLING

Composite post-remedial soil samples were taken from the excavated areas and analyzed to determine the radionuclide concentrations in the remaining soil before the excavation was backfilled. Composite samples were collected to provide samples representative of a maximum area of 100 m^2 (1,076 ft^2). Twenty-five evenly spaced plugs per 100 m^2 (1,076 ft^2) were composited for each composite sample. For areas less than 100 m^2 (1,076 ft^2), the number of plugs for each composite sample was reduced proportionally to the reduction in area. Three composite samples were also collected from the vertical face of the excavation. The depth of the excavation averaged approximately 0.6 m (2 ft) and was divided into 0.15-m (6-in.) intervals for sampling (see Figure 4-2). Because the top 0.15 m (6 in.) was concrete that had been found clean in previous surface surveys, only the bottom three intervals were sampled. A composite sample was obtained for each interval by collecting a plug every 2 m (6.6 ft) over the entire length of the vertical face and compositing the plugs (see Figure 4-2). This technique resulted in approximately

Table 4-2

Summary of Post-Remedial Action Radiological Survey Results for the C. H. Schnoor Site

		Direct Surface Contamination[a]				Transferable Contamination[a]			
		Alpha		Beta/Gamma		Alpha		Beta/Gamma	
Location	Area	Sample Activity Range (dpm/100 cm²)	Number of Measurements	Average Activity (dpm/100 cm²)	Number of Measurements	Sample Activity Range (dpm/100 cm²)	Number of Measurements	Sample Activity Range (dpm/100 cm²)	Number of Measurements
Center Column									
	North Face	37-138	6	2,095	7	<4	1	<31	1
	South Face	37-138	6	993	6	<4	1	43	1
	East Face	<32-120	6	2,509	10	<4	1	<31	1
	West Face	<17-46	6	1,820	6	<6	1	<31	1
North Column									
	North Face	<32-92	6	2,840	4	<6	1	<31	1
	South Face	<32-203	6	1,323	4	<4	1	<31	1
	East Face	<17-175	6	855	4	<6	1	<31	1
	West Face	28-129	6	2,288	3	4	1	<31	1
Concrete Footing									
	North 1 m²	28-175	6	2,702	8	16	1	<31	1
	Center 1 m²	<17-101	6	2,151	7	7	1	<31	1
	South 1 m²	<32-157	6	2,867	9	7	1	<31	1
Loading Dock Room		<8-225		<437-7,339		<4-9		<30-40	

[a]Guidelines are illustrated in Table 2-1.

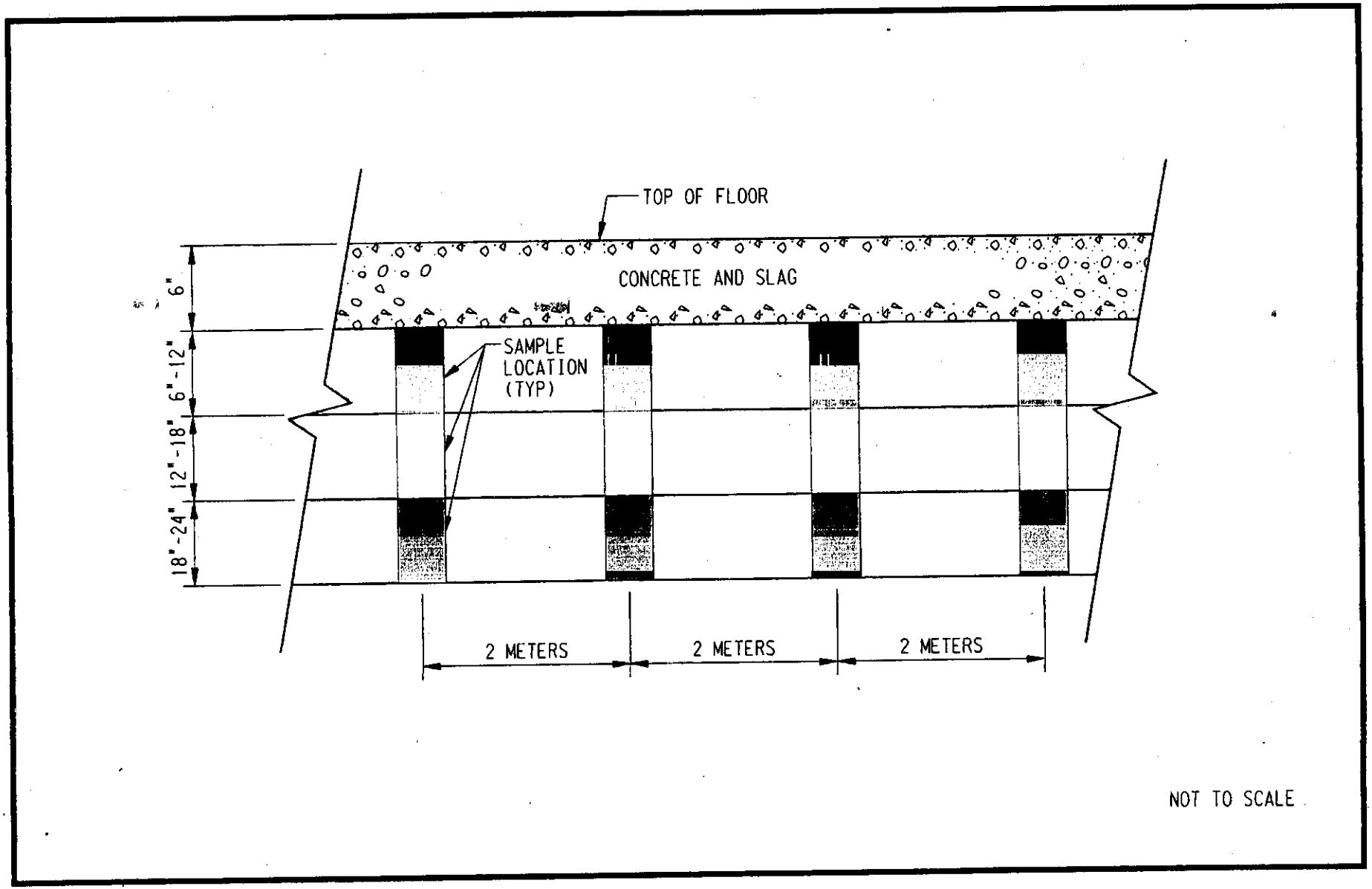

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Figure 4-2
Typical Section of Vertical Face of Excavation

25 plugs being composited for each interval. Results for the composite soil samples are presented in Table 4-3; all results are below the site-specific uranium guideline.

Two samples were also collected from hot spots that were detected during the final verification walkover surveys. One spot was in the bottom of the south pit, and the other was at the base of the central cement column (see Figure 3-1). DOE Order 5400.5 (see Table 2-1, Note c) allows for the development of hot spot limits for surface and below-surface areas of 25 m^2 (269 ft^2) or less provided that the average radionuclide concentration for the 100-m^2 (1,076-ft^2) area is below the DOE guideline. The hot spot result can exceed the soil guideline by a factor of $(100/A)^{0.5}$, where A is the area (m^2) of the region where concentrations are elevated. For areas less than 1 m^2 (10.8 ft^2), such as these two hot spots, protocol requires that an area of 1 m^2 (10.8 ft^2) be used for calculating the hot spot limit. Using 1 m^2 (10.8 ft^2) in the calculation results in a multiplication factor of 10, which means that the "hot spot" limit is 500 pCi/g for uranium-238. The uranium-238 results for the two hot spots were 169.0 and 267.0 pCi/g (Table 4-3).

Table 4-3

Soil Verification Samples

Sample Location[a]	Concentration (pCi/g ± 2 sigma)[a]		
	Uranium-238[b]	Radium-226	Thorium-232
Grid #1	6.60 ± 3.40	1.20 ± 0.34	0.88 ± 0.33
Grid #2	<3.50	1.30 ± 0.35	1.10 ± 0.39
Grid #3	<5.00	1.10 ± 0.32	1.00 ± 0.35
Grid #4	4.80 ± 2.70	0.76 ± 0.23	0.84 ± 0.23
Grid #5	<4.10	1.30 ± 0.32	0.96 ± 0.37
Grid #6	19.80 ± 12.70	1.50 ± 0.36	0.81 ± 0.42
Grid #7	1.70 ± 2.30	1.60 ± 0.48	1.30 ± 0.45
Grid #8	<5.40	1.40 ± 0.37	0.83 ± 0.30
Wall Face (0.5-1.0 ft)	11.60 ± 7.30	<0.27	0.71 ± 0.22
Wall Face (1.0-1.5 ft)	26.60 ± 16.50	<0.37	1.40 ± 0.38
Wall Face (1.5-2.0 ft)	29.40 ± 18.10	<0.29	1.20 ± 0.44
North Pit	19.10 ± 11.80	<0.24	0.65 ± 0.19
South Pit	19.20 ± 3.20	<0.28	0.69 ± 0.22
Loading Dock	1.50 ± 1.60	1.30 ± 0.21	1.50 ± 0.24
Hot Spots[c]			
South Pit	169.00 ± 103.00	<0.32	0.67 ± 0.20
Base of Central Column	267.00 ± 162.00	<0.42	0.65 ± 0.22

[a]Locations are shown in Figure 3-1.
[b]DOE guideline is 100 pCi/g for total uranium (see Table 2-1).
[c]See Table 2-1, Note c.

5.0 POST-REMEDIAL ACTION STATUS

Analytical results for post-remedial action surveys indicate that the levels of radioactivity in the remediated areas meet applicable DOE cleanup guidelines. The IVC has reviewed the post-remedial action surveys and results and determined that the measurements obtained verify that the remediated areas comply with the established DOE guidelines for the site. No areas of contamination above DOE guidelines remain at the site.

The IVC is responsible for preparing a plan outlining the procedures used in conducting verification activities. These procedures specify a verification process requiring two methods of review (Types A and B). The IVC conducted both types, in full conformance to the approved verification plan.

Type A verification consisted of reviewing the post-remedial action survey results and collecting and analyzing additional samples as required. In performing the Type B verification review, the IVC conducted a survey of the site that included direct measurements, review of the post-remedial action survey methods and results, sampling, and laboratory analysis of separate soil samples.

After completing the verification study, the IVC will report its findings and recommendations to DOE Headquarters and the DOE Oak Ridge Operations Office. Appendix D includes a copy of the IVC's verification letter to DOE. DOE will review the report to verify that the remedial action was successful, and a certification docket will then be prepared. The certification docket officially certifies that the site has been successfully remediated to established criteria. The issuance of the certification docket will be documented through publication of a notice in the *Federal Register*.

REFERENCES

Department of Energy (DOE), 1986. "Uranium Mill Tailings Remedial Action Program."

DOE, 1990. "Radiation Protection of the Public and the Environment," DOE Order 5400.5, Washington, D.C. (June).

Oak Ridge National Laboratory (ORNL), 1991. *Results of the Radiological Survey at Conviber Inc., 644 Garfield Street, Springdale, Pennsylvania (CVP001)*, ORNL/RASA-89/18, Oak Ridge, Tenn.

ORNL, 1995. *Results of the Supplementary Radiological Survey at Conviber Inc. (formerly C. H. Schnoor and Company) 644 Garfield Street, Springdale, Pennsylvania (CVP001)*. ORNL/RASA-94/3, Oak Ridge, Tenn. (February).

GLOSSARY

Alpha-emitting - See **Radiation**.

Ambient Background Radiation - Ambient background radiation refers to naturally occurring radiation emitted from either cosmic (e.g., from the sun) or terrestrial (i.e., from the earth) sources. Exposure to this type of radiation is unavoidable, and its level varies greatly depending on geographic location. For example, New Jersey typically receives 100 millirem per year (mrem/yr), Colorado receives about 115 mrem/yr, and some areas in South America receive up to 7000 mrem/yr. Naturally occurring terrestrial radionuclides include uranium, radium, potassium, and thorium (see **Radionuclide**). The dose levels do not include the concentrations of naturally occurring radon inside buildings.

Beta-gamma-emitting - See **Radiation**.

Centimeter - A centimeter (cm) is a metric unit of measurement for length; 1 inch is equal to 2.54 cm; 1 foot is equal to approximately 30 cm.

Contamination - The term "contamination" is used generally to mean a concentration of one or more radioactive materials that exceeds naturally occurring levels. Contamination may or may not exceed the DOE cleanup guidelines.

Disintegrations per minute - Disintegrations per minute (dpm) is the measurement indicating the amount of radiation being released from a substance per minute.

Dose - As used in this report, dose is actually dose equivalent and is used to relate absorbed dose (mrad) to an effect on the body. Dose is measured in mrem. For comparison, a dose of 500,000 mrem to the whole body within a short time causes death in 50 percent of the people who receive it; a dose of 5,000,000 mrem may be delivered to a cancerous tumor during radiation treatment; normal background radiation at or near sea level results in an

annual dose of about 100 mrem; DOE radiation protection standards limit the dose that may be received by members of the general public to 100 mrem/yr above background levels; living in a brick house typically results in a dose of about 75 mrem/yr above the background level.

Exposure Rate - Exposure rate is the rate at which radiation imparts energy to the air. Exposure is typically measured in microroentgens (μR), and exposure rate is typically expressed as μR/h. The dose to the whole body can be approximated by multiplying the exposure rate by the number of hours of exposure. For example, if an individual were exposed to gamma radiation at a rate of 20 μR/h for 168 h/week (continuous exposure) for 52 weeks/yr, the whole-body dose would be approximately 175 mrem/yr.

Gamma Radiation - See **Radiation**.

Meter - A meter (m) is a metric unit of length; 1 m is equal to approximately 39 inches.

Microroentgen - A microroentgen (μR) is a unit used to measure radiation exposure. For further information, see **Exposure Rate**.

Millirem - The millirem (mrem) is the unit used to measure radiation dose to man. The DOE dose limit is 100 mrem above background radiation levels within any one-year period for members of the general public. Naturally occurring radioactive substances in the ground result in a yearly exposure of about 100 mrem to each member of the population. To date, no difference can be detected between the health of population groups exposed to 100 mrem/yr above background and the health of groups who are not exposed.

Natural Background Radiation - Natural background radiation refers to radiation emitted from the naturally occurring radionuclides found in manmade materials. The concentrations of the radionuclide, and thus the radiation, will vary widely because of variations in the composition of the materials.

Radiation - There are three primary types of radiation: alpha, beta, and gamma. Alpha radiation travels less than an inch in air before it stops, and it cannot penetrate the outer layers of human skin. Beta radiation can penetrate the outer layers of skin but cannot reach the internal organs. Gamma radiation, the most penetrating type, can usually reach the internal organs.

Radionuclide - Radioactive elements are also referred to as radionuclides. For example, uranium-235 is a radionuclide, uranium-238 is another, thorium-232 is another, and so on.

Remedial Action - Remedial action is a general term used to mean "cleanup of contamination that exceeds DOE guidelines." It refers to any action required so that a property may be certified as being in compliance with guidelines and may therefore be released for future use. Remedial action also includes restoring remediated properties to their original conditions as far as possible.

Uranium - Uranium is a naturally occurring radioactive element. The principal use of refined uranium is for the production of fuel for nuclear reactors. Uranium in its natural form is not suitable for use as a fuel source.

APPENDIX A Major Instrumentation

Appendix A

Major Instrumentation

Instruments

Eberline Scaler/Ratemeter
ESP-1
(Eberline, Santa Fe, NM)

Eberline Scaler/Ratemeter
ESP-2
(Eberline, Santa Fe, NM)

Detectors

Eberline GM Detector
Model HP-210
Effective Area, 15.5 cm^2
(Eberline, Santa Fe, NM)

Eberline GM Detector
Model HP-260
Effective Area, 15.5 cm^2
(Eberline, Santa Fe, NM)

Alpha Scintillation Probe
Model AC-3-7
Effective Area, 59 cm^2
(Eberline, Santa Fe, NM)

Scintillation Alpha Counter
Model SAC-4
(Eberline, Santa Fe, NM)

Scintillation Alpha Counter
Ludlum 2000
(Ludlum Measurements, Inc., Sweetwater, TX)

Reuter-Stokes Pressurized Ion Chamber
Model RSS-111
(Reuter-Stokes, Cleveland, OH)

APPENDIX B Survey and Analytical Procedures

APPENDIX B

Survey and Analytical Procedures

SURVEY PROCEDURES

Surface Scans

Surface scans were performed by passing small-area (15.5 cm^2 or 100 cm^2), hand-held detectors slowly over the surface; the distance between the probe and the surface was maintained at a minimum—nominally about 1 cm. Combinations of detectors and instruments used for the scans were:

Beta-Gamma — pancake GM detector with ratemeter-scaler
Alpha — scintillation detector with ratemeter-scaler

Direct Surface Activity Measurements

Measurements of total beta-gamma activity levels were performed using GM detectors with portable ratemeter-scalers. Measurements of alpha activity level were performed using scintillation detectors with portable ratemeter-scalers.

Count rates (cpm), which were integrated over 1 minute in a static position, were converted to activity levels (dpm/100 cm^2) by subtracting detector background rates and dividing the net count rate by the detector efficiency and the area correction factor of the detector.

The detector background rates ranged from 29 to 33 cpm for beta-gamma and 2 to 3 cpm for alpha. Detector efficiency factors ranged from 0.15 to 0.19 for beta-gamma and 0.17 to 0.18 for alpha. The effective window was 15.5 cm^2 for beta-gamma detectors and 59 cm^2 for alpha detectors.

Removable Activity Measurements

Removable activity levels were determined using numbered filter paper disks. Moderate pressure was applied to the smear with two or three fingers, and approximately 100 cm^2 of the surface was wiped. Smears were placed in labeled envelopes with the location and other pertinent information recorded. Smears were analyzed onsite using the SAC-4 detector.

Count rates (cpm), which were integrated over 1 minute in a static position, were converted to activity levels (dpm/100 cm^2) by subtracting detector background rates and dividing by the detector efficiency.

The detector background rates ranged from 0.1 to 0.32 cpm; efficiency factors ranged from 0.33 to 0.37.

Gamma Exposure Rate Measurements

Measurements of gamma exposure rates were performed at 1 m above the surface, using a pressurized ionization chamber, for 4.25 to 6.25 minutes.

UNCERTAINTIES AND DETECTION LIMITS

The detection limit, referred to as critical level (L_c), was determined as follows:

$$1.65 * \frac{\sqrt{\dfrac{\text{Background cpm}}{\text{Background count time}}} * \sqrt{\dfrac{1 + \text{Background count time}}{\text{Sample count time}}}}{(\text{Detector efficiency}) * (\text{Detector Area})}$$

When the measured activity was determined to be less than the L_c of the measurement procedure, the result was reported with a "less than" sign. Because of variations in background levels, measurement efficiencies, and contributions from other radionuclides in samples, the detection limits differ from sample to sample and instrument to instrument.

CALIBRATION AND QUALITY ASSURANCE

Analytical and field survey activities were conducted in accordance with procedures from the following documents:

- TMA/Eberline, Health Physics Operational Procedures Manual (November 1993).
- TMA/Eberline, Quality Assurance Manual, Revision 8 (December 1993).

The procedures contained in these manuals were developed to meet the requirements of DOE Order 5700.6C, ASME NQA-1 for Quality Assurance, and federal and state rules and regulations and contain measures to assess processes during their performance.

Calibration of all field and analytical instrumentation was based on standards/sources, traceable to National Institute of Standards and Technology and American National Standard Institute, when such standard/sources were available; when they were not available, standards of an industry-recognized organization were used. Calibration of pressurized ionization chambers was performed by the manufacturer.

Quality control procedures include

- daily instrument background and check-source measurements to confirm that equipment operation is within acceptable statistical fluctuations;
- participation in EPA and Environmental Measurements Laboratory quality assurance programs;
- training and certification of all individuals performing procedures; and
- periodic internal and external audits.

APPENDIX C Remedial Action Summary

REMEDIAL ACTION SUMMARY

WBS 122

SITE C.H. Schnoor

OWNER Frank Pucciarelli

ADDRESS 644 Garfield Street

CITY, STATE Springdale, Pennsylvania

REMEDIATION AUTHORITY

- [x] NEPA/CERCLA
- [ ] SUPERFUND
- [ ] RCRA

ACTION	DATE	RESPONSIBLE ENTITY	DOCUMENT
DESIGNATION	1992	DOE	Designation Summary
CHARACTERIZATION	1989 & 1990	ORNL	Characterization Report
CHARACTERIZATION	1993	BNI	Technical Bulletin
FINAL RA	1994	BNI	Post Remedial Action Report

TOTAL VOLUME 683 yd^3

To Remain In Situ NA
Volume Reduction NA
Net Disposal 683 yd^3

Documentation Used: PRAR

TYPE OF WASTE FOR NET DISPOSAL:

REGULATORY	VOLUME	DISPOSAL SITE
[x] Low Level Radiological Waste	626 yd^3	Envirocare
[ ] 11(E)2		
[ ] MIXED		
[ ] CHEMICAL		
[x] Clean Waste	57 yd^3	Sanitary Landfill

PHYSICAL		
[x] BUILDING RUBBLE	57 yd^3	Sanitary Landfill
[x] SOIL	626 yd^3	Envirocare
[ ] LIQUID		
[ ] OTHER		

TREATMENT TECHNOLOGIES APPLIED AT THE SITE:

APPENDIX D Supporting Correspondence

122223

94-605

Department of Energy

Oak Ridge Operations
P.O. Box 2001
Oak Ridge, Tennessee 37831—

Oct 24 8 44 AM '94

OCT 14 1994

Mr. James G. Yusko, CHP
Regional Manager
Department of Environmental Resources
Commonwealth of Pennsylvania
400 Waterfront Drive
Pittsburgh, Pennsylvania 15222-4745

Dear Mr. Yusko:

C.H. SCHNOOR SITE - DISPOSITION OF CRUSHED CONCRETE DEBRIS RESULTING FROM THE CLEANUP

As was previously discussed during our telephone conversation on September 26, 1994, approximately 50 cubic yards of concrete rubble from the C. H. Schnoor Site remediation project was processed into a soil-like material using the Department of Energy's rock crusher, and placed back into the excavation area as beneficial reuse/fill material on October 11, 1994. Final results from the analysis of representative samples of the material revealed an average concentration of residual uranium of 7.5 pCi/g ^{238}U -- less than a fifth of the 50 pCi/g ^{238}U cleanup criteria for the surrounding soils remaining in place at the site.

Based upon preliminary results from the independent verification contractor, we have completed remediation activities at the site. Our current plans are to complete demobilization activities by the middle of October. Restoration activities are to be completed by the site owner at his request.

For purposes of documenting our previous conversations regarding the beneficial reuse of the crushed concrete and the state's awareness of DOE's progress and plans, I would appreciate your acknowledging this letter below and returning a copy to me.

If you have any questions or comments regarding this project please feel free to contact me at (615) 576-9441. I will be contacting you in the near future regarding final ve..fication results and site walkover. Again, thank you with your assistance with this project.

Sincerely

James D. Kopotic

James D. Kopotic, Site Manager
Former Sites Restoration Division

ACKNOWLEDGEMENT:

10.18.94

James G. Yusko, CHP
Regional Manager
Department of Environmental Resources

RECEIVED
OCT 17 1994
RADIATION PROTECTION

OAK RIDGE NATIONAL LABORATORY
MANAGED BY MARTIN MARIETTA ENERGY SYSTEMS, INC
FOR THE U.S. DEPARTMENT OF ENERGY

POST OFFICE BOX 2008
OAK RIDGE TENNESSEE 37831

April 21, 1995

Dr. W. Alexander Williams
Designation and Certification Manager
EM-421
Department of Energy
Cloverleaf Building
19901 Germantown Road
Germantown, Maryland 20874-1290

Dear Dr. Williams:

Independent Verification Survey of the Former C. H. Schnoor Site, Springdale, Pennsylvania

The Measurement Applications and Development Group of the Oak Ridge National Laboratory served as the Independent Verification Contractor for the remedial action work at the former C. H. Schnoor site in Springdale, Pennsylvania. The Measurement Applications and Development group conducted the initial designation radiological survey work and later supplemented the designation survey data with core sampling and detailed radiological mapping of the facility. As the Independent Verification Contractor, our work was closely coordinated with Bechtel National Incorporated, the remediation contractor. While still maintaining independence from the remediation efforts, the Oak Ridge National Laboratory and Bechtel National Incorporated teams were able to coordinate efforts and share resources to ensure the site met the Department of Energy guidelines for unrestricted use.

Because of the nature of the subsurface uranium contamination at the site, we felt an aggressive surveying and sampling campaign was necessary in order to validate the data collected by Bechtel National Incorporated. Oak Ridge National Laboratory staff also reviewed the Bechtel National Incorporated post remediation survey data as it became available and concur that it accurately represents the radiological condition of the site. During the remediation when discrepancies between our survey data and Bechtel National Incorporated survey data occurred, the personnel onsite worked to arrive at some mutually agreed understanding. In many cases, the as low as reasonably achievable concept influenced remediation efforts beyond the established Department of Energy guidelines.

After reviewing the radiological survey data provided by Bechtel National Incorporated and analyzing our samples and direct radiation measurements, we believe the site meets the Department of Energy guidelines and should not have any radiological restrictions. The Oak Ridge National Laboratory's formal report is in preparation and the draft should be sent to you soon. Please call me if you have any questions.

Sincerely,

Michael E. Murray
Measurement Applications
and Development Group

MEM:ec

c: R. D. Foley
J. D. Kopotic, DOE-ORO
G. L. Palau, BNI

2.7 VERIFICATION STATEMENT, INTERIM VERIFICATION LETTERS TO PROPERTY OWNERS, AND VERIFICATION REPORTS

This section includes documents related to the successful decontamination of the subject property.

	Page
Letter from Michael E. Murray, Measurement Applications and Development Group, ORNL, to W. Alexander Williams, Designation and Certification Manager (DOE-HQ), "Independent Verification Survey of the Former C. H. Schnoor Site, Springdale, Pennsylvania," BNI CCN 129144, Oak Ridge, Tenn., April 21, 1995.	II-196
ORNL. *Results of the Independent Radiological Verification Survey at the Former C. H. Schnoor and Company Site, 644 Garfield Street, Springdale, Pennsylvania (CVP001)*, ORNL/RASA-95-1, Oak Ridge, Tenn., September 1995.	II-197