GTS Duratek, Inc.

DECOMMISSIONING PLAN

The Twin Cities Army Ammunition Plant
Depleted Uranium Facilities
New Brighton, Minnesota

Revision 0

Submitted by

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GTS Duratek, Inc.

DECOMMISSIONING PLAN

for

The Twin Cities Army Ammunition Plant, Depleted Uranium Facilities New Brighton, Minnesota

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1.0 SUMMARY OF PLAN

1.1 Introduction

The Radiological Engineering and Field Services division of GTS Duratek, has prepared this decommissioning plan for the Twin Cities Army Ammunition Plant (TCAAP) operated by Alliant Techsystems, Inc. located in New Brighton, Minnesota. The TCAAP, under NRC Source Material License No. SUB-971 includes the Building 502 DU Room (Machining Room, Heat Treat Room, Waste Water Evaporator Room, Rod/Cutoff Room, Centrifugal Cast Room, Equipment Room, and Waste Handling/Punch Press Room), Building 502 Machine Shop and Assembly Area, Building 502 Chem Lab Area, and Building 576 DU Storage Areas.

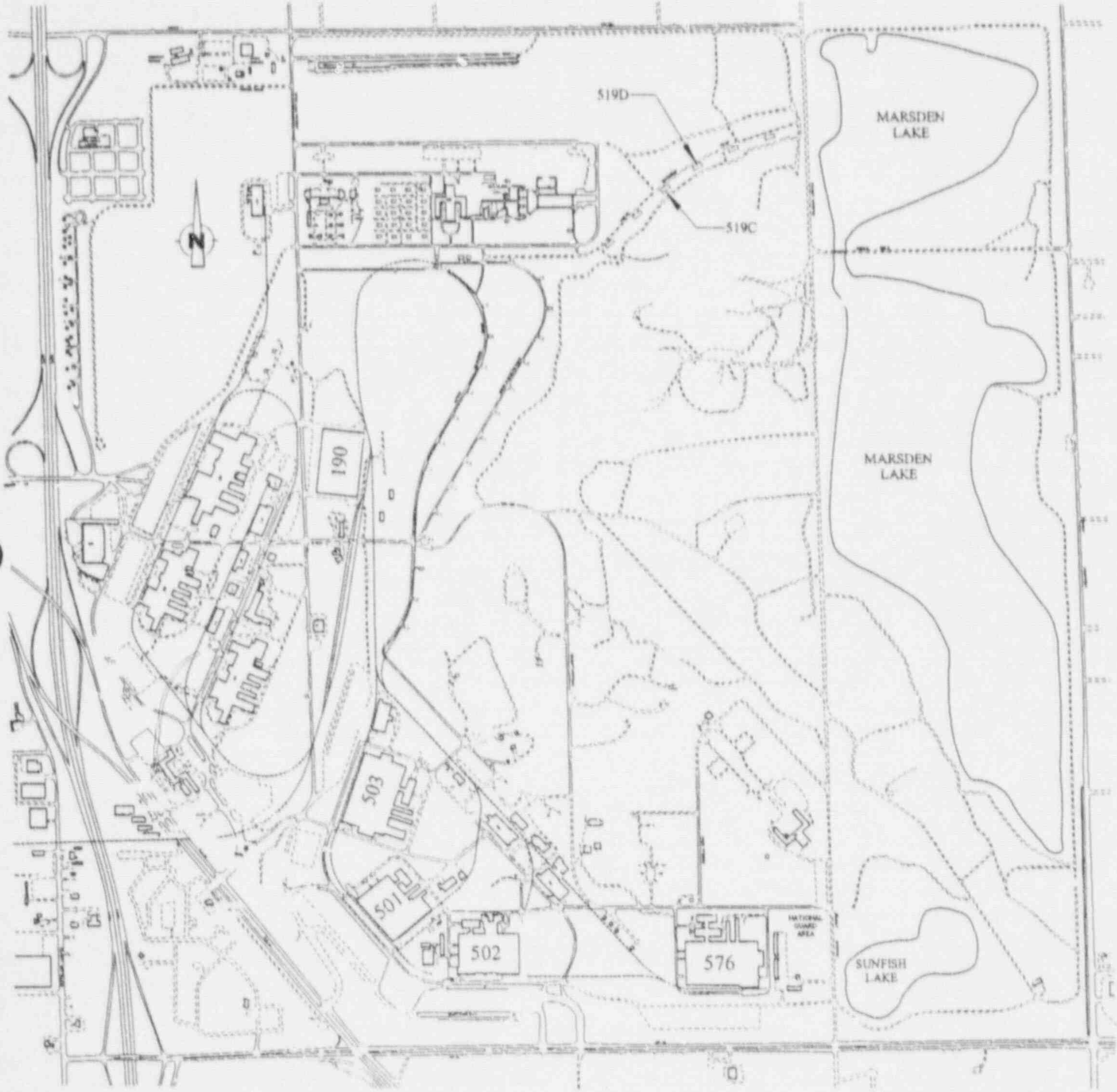
This decommissioning plan addresses the Twin Cities Army Ammunition Plant and its supporting facilities. Decommissioning, as described in the plan, will be accomplished by removal of all of the Building 502 facilities related to the DU operations. Contaminated soil will be excavated and packaged for disposal. The remaining contaminated equipment and structures will be decontaminated as required to be in accordance with the residual contamination limits for unrestricted release of materials and equipment in NRC, *Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material*, April 1993 (Ref 8.2.25).

1.2 Background

The Twin Cities Army Ammunition Plant, in Arden Hills, Minnesota, was used to produce munitions and ordnance materials containing depleted uranium (DU) for the U.S. Military. DU is used in munitions because, when alloyed, DU projectiles have the speed, mass and physical properties to perform exceptionally well against armored targets. DU is a byproduct of the fuel and weapons grade uranium refining. DU retains uranium's natural toxicological properties and approximately half of its radiological activity. It is therefore treated as a low-level radioactive material.

The Twin Cites Army Ammunition Plant is located northeast of Minneapolis in Arden Hills, Minnesota on Ramsey County Highway 96. This is a large site as shown in Figure 1-1, but only a small part of the site was involved with DU processing and storage. Building 502, Building 576 Warehouse Facility, Magazine Buildings 519 C and D and a Butler Building drum storage area were involved with DU processing and storage and are included in this decommissioning plan.

Figure 1-1
Twin Cities Arsenal



1.3 Decommissioning Objective

TCAAP decommissioning, as described in this plan, will be accomplished by means of dismantlement and decontamination (DECON). Equipment and materials for which decontamination is not feasible or cost effective, or which can not be recycled shall be packaged for disposal at a licensed burial facility. Residual contamination limits for unrestricted release of materials and equipment shall be in accordance with guidance provided by the NRC (Ref 8.2.25).

The dismantlement of the DU Room, for the purpose of removing TCAAP from the SUB-971 license includes removal of all DU Room structures. This decommissioning plan addresses the decontamination of the entire TCAAP facility and is applicable to those components and structures which will be removed prior to the removal of TCAAP from the SUB-971 license.

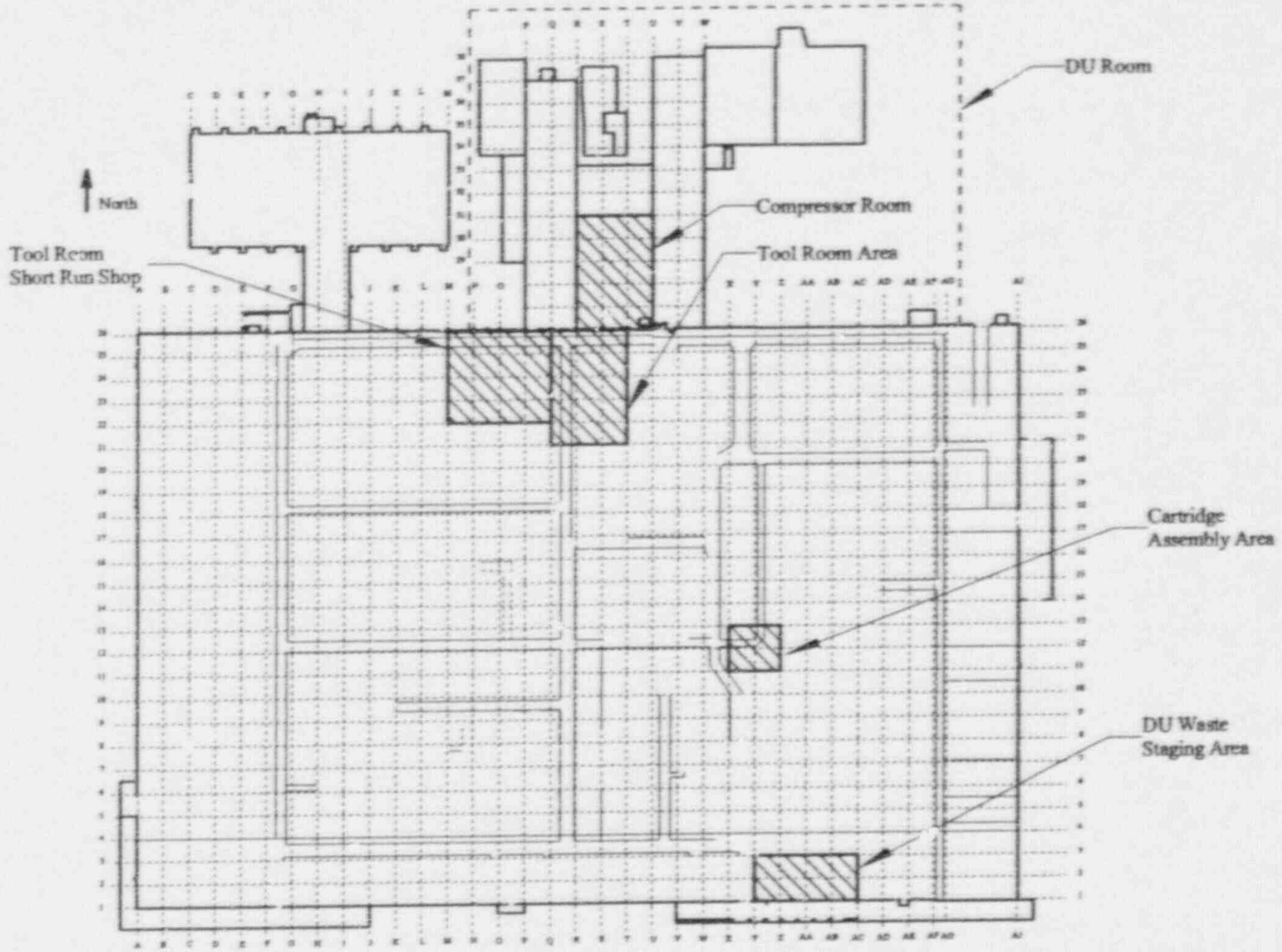
1.4 Building 502 Description

Building 502 was the only facility used for the fabrication of DU munitions at this site. The majority of this wood structure (south of column row 26 as shown in Figure 1-2) is used in the production of conventional (non-DU) munitions. The areas used in the production of DU munitions are the DU Room (which includes several appendage type structures at the north end of the building), the Tool Room Short Run Shop, the Cartridge Assembly Area, DU Waste Staging Area, and the Tool Room Area. A sketch of the first floor of Building 502 is shown in Figure 1-2.

1.4.1 Tool Room Short Run Shop

The Tool Room Shop was used to machine developmental DU penetrators and other unusual limited production penetrators. There is no current DU production in this shop, the shop was decontaminated, and the vent system disconnected after DU production stopped. No radiological data was available for this area. It was not surveyed because the floor has been tiled over since DU use. However, there is no reason to suspect significant contamination to be present. Because of the history of prior DU use in the area it is classified as an affected area. The tile will be removed as required and the area will be surveyed for release using the affected area criteria.

Figure 1-2
Building 502 First Floor



1.4.2 Cartridge Assembly Area

In the cartridge assembly area bare DU penetrators were automatically inserted into a shell body and a wind screen was placed over the penetrator. The DU production equipment and the walls around the area have been removed and the area decontaminated. There is residual floor contamination in this area that will require remediation followed by survey for release using the affected area criteria.

1.4.3 Cartridge Painting Area

In the cartridge painting area assembled cartridges are painted with a colored stripe prior to packaging for shipment. The production equipment is still in use, but the area never became contaminated and DU production has stopped. No radiological data was available for this area and there is no reason to suspect significant contamination to be present. However because of the history of prior DU use in the area it is classified as an affected area and will be surveyed for release using the affected area criteria.

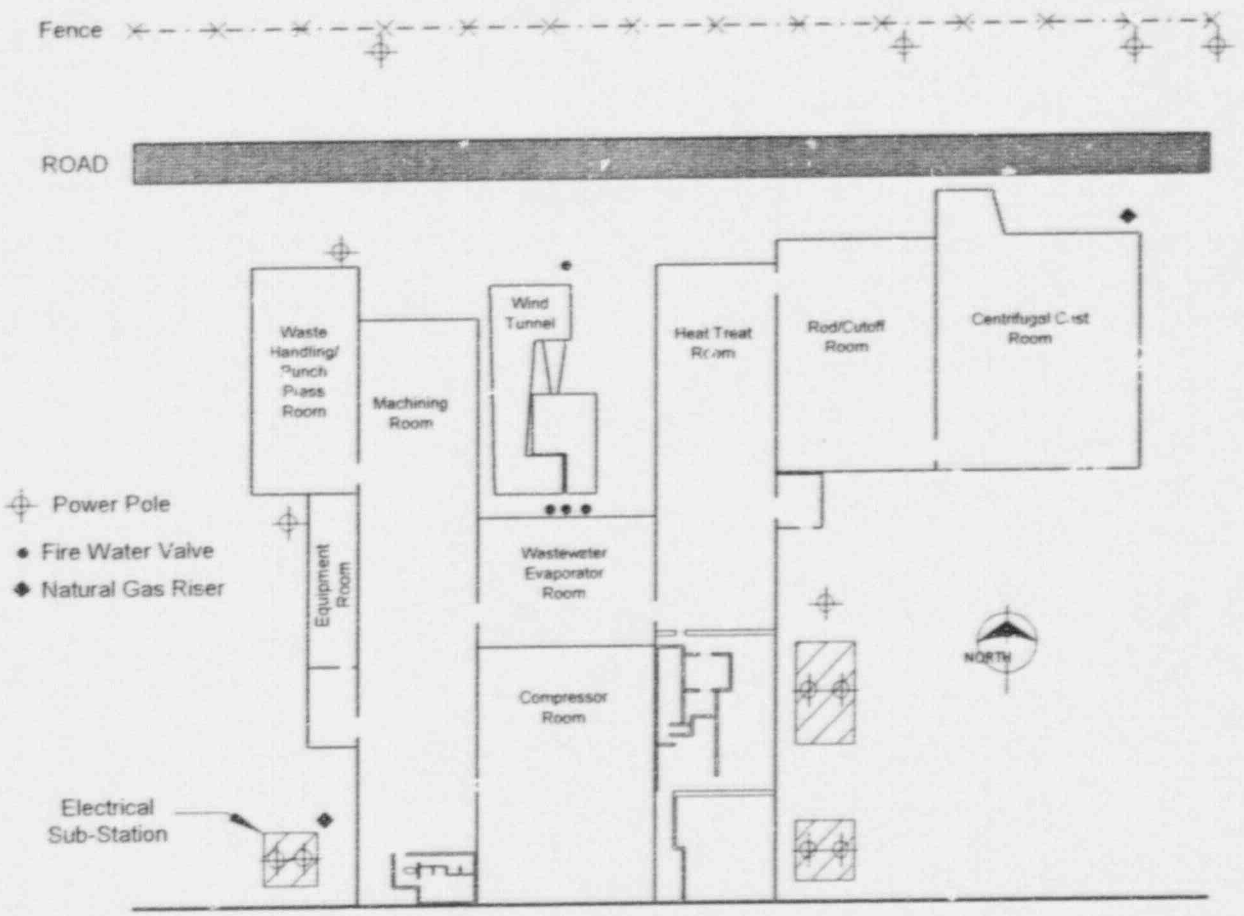
1.4.4 Tool Room Area

The Tool Room was partially flooded at one time as a result of a fire in the DU Room and fire suppression system sprinkler water running out into the Tool Room. The area was decontaminated immediately. No radiological data was available for this area and there is no reason to suspect significant contamination to be present. However because of the history of prior DU contamination in the area it is classified as an affected area and will be surveyed for release using the affected area criteria.

1.4.5 Building 502 DU Room

Production of DU penetrators for munitions originally began in one room of an addition on the north of building 502. Production expanded to take over two large wings, the east wing or machining room and the west wings or heat treating room, and five additional rooms, Waste-Water Evaporator Room, Rod/Cutoff Room, Centrifugal Cast Room, Equipment Room, and the Waste Handling/Punch Press Room. A sketch of the DU Room is shown in Figure 1-3.

Figure 1-3
DU Room



The individual DU rooms are discussed below.

1. Machining Room and Heat Treating Room

The first floor of these rooms are constructed with concrete floors, heavy timber framing, painted drywall on the walls and ceilings, wall insulation with foil backed fiberglass, wallboard covering the wood support beams, joists, and wall studs, and wood clapboard exterior siding covered with asbestos shingles. There are water closets and urinals in the bathroom facilities at the south end of the Machining Room which are connected to the sanitary sewer system. The second floor was used for offices and shops and has the same construction as the first floor except the floor is made from pine boards. In the office area over the Machining Room the pine floor boards are covered with commercial grade carpet. The roof is flat and covered with several layers of built-up construction including roofing felt, asbestos, asphalt, and gravel.

There are many miscellaneous pipes, conduit, conduit boxes, and fixtures in these areas. There is a 1,500 gallon oil holding tank under the concrete floor in the Heat Treating Room.

2. Waste-Water Evaporator, Rod/Cutoff, and Waste Handling/Punch Press Rooms

The first floors in these rooms are constructed with concrete floors, steel framing, sheet metal with a baked enamel coating on interior walls and ceilings, wall insulation with foil backed fiberglass, sheet metal siding covering steel support beams and joists, and sheet metal exterior siding. The roofs are sloped sheet metal. There is a dust collection bag house on the roof of the Waste Processing/Punch Press Room.

There are many miscellaneous pipes, conduit, conduit boxes, and fixtures in these areas.

3. Centrifugal Cast Room

This room is constructed with concrete floors, pre-cast concrete walls and ceilings. The roof is flat and covered with several layers of built-up construction including roofing felt, asbestos, asphalt, and gravel.

There are many miscellaneous pipes, conduit, conduit boxes, and fixtures in this area.

4. Equipment Room

This room is constructed with concrete floors, heavy timber framing, painted drywall on the walls and ceilings, wall insulation with foil backed fiberglass, wallboard covering the wood support beams, joists, and wall studs, and wood clapboard exterior siding covered with asbestos shingles. The roof is sloped and covered with roofing felt, asbestos, and asphalt.

There are two large HVAC units in that occupy most of this room. There are also some miscellaneous pipes, conduit, conduit boxes, and fixtures in this area.

1.5 Building 519 and 576 Descriptions

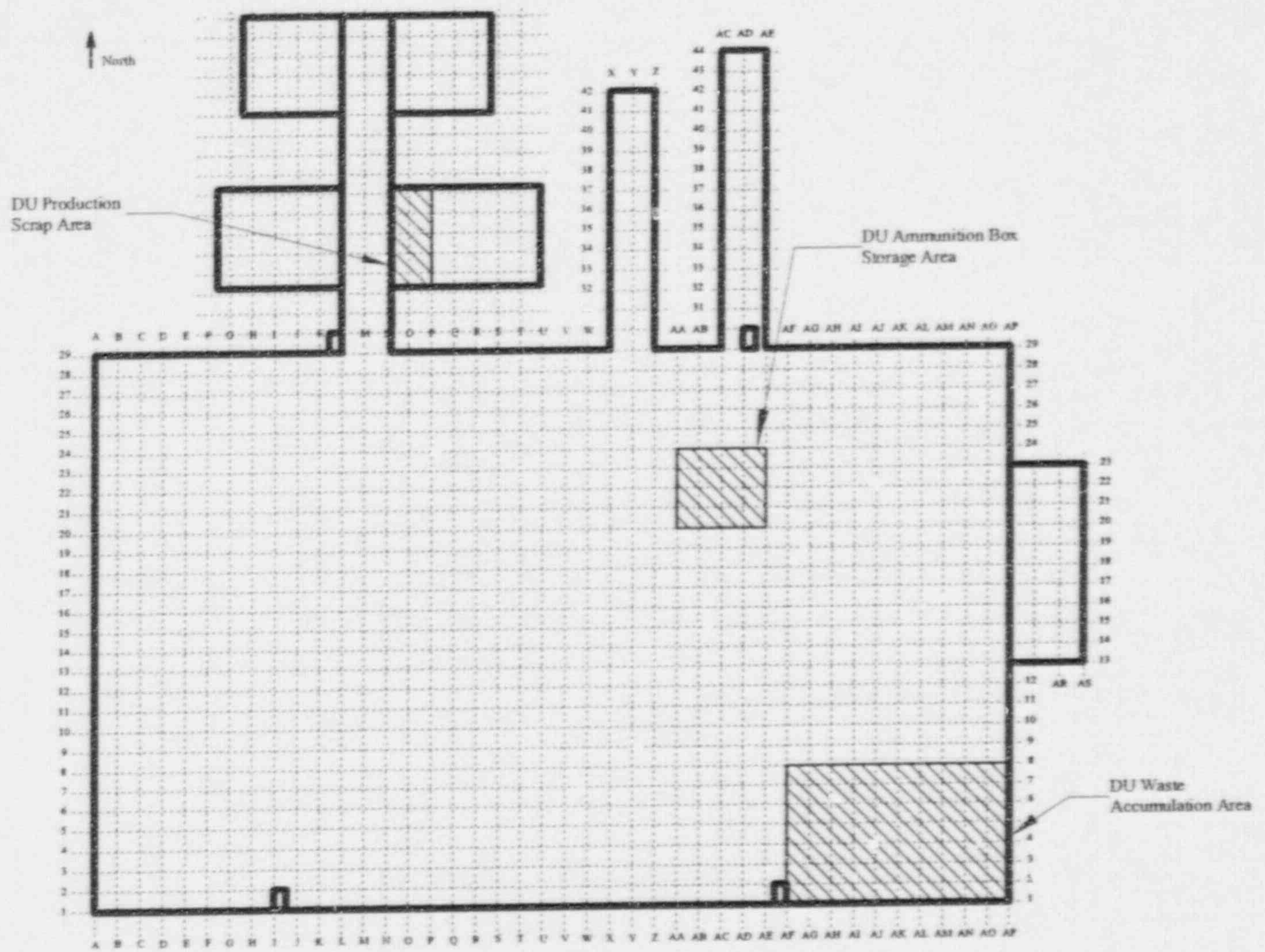
The 519 building is a series of wooden structures of measuring 108' by 33' by 12' tall used as munition storage magazines. Building 519C and 519D Storage Magazines were the only magazines used for DU munitions storage.

The 576 building was only used for DU munitions storage and DU waste storage. The majority of this wood structure is used as a conventional (non-DU) warehouse. A sketch of Building 576 is shown in Figure 1-4.

1.6 Decontamination Methods

Section 2.0 describes the structures and components at TCAAP and the demolition and decontamination methods to be utilized in the decommissioning. However, this does not preclude the evaluation and use of other methods which will achieve the decommissioning objectives. Decontamination of the TCAAP structures, components, equipment and various materials will require a variety of techniques. This will include aggressive techniques, such as heavy equipment demolition of structures, scabbling and grinding, and simple techniques, such as scrubbing and vacuuming.

Figure 1-4
Building 576



1.7 Waste Handling

Demolition, decontamination, and waste volume reduction processes and techniques shall be utilized which result in a cost effective project. The processes selected take into account the total project cost including costs for demolition, decontamination, surveying, volume reduction, and waste disposal. The processes selected minimize the volume of radioactive waste requiring disposal at a licensed burial facility in a cost effective manner. The Radioactive waste disposal cost is the key factor in determining whether a demolition, decontamination, or waste volume reduction processes is cost effective. The radioactive waste disposal rate for TCAAP is expected to be lower than for most radioactive waste generators in the country and as a result only low cost processes are utilized for decontamination and volume reduction. Unrestricted release material which is recyclable will be segregated from radioactive waste materials when it is cost effective.

It is not anticipated that there will be liquid waste generated at the TCAAP Site. The small quantities of water waste generated will be processed by natural evaporation and solidification. If a significant amount of water waste was required to be processed, mobile equipment would be provided by the contractor for this purpose. All processed liquid waste shall be sampled and analyzed to verify the adequacy of the processing operation and determination of the appropriate disposal mechanism.

Solid waste created during the decommissioning process will fall into three categories: low level radioactive waste, material to be decontaminated, and clean demolition debris. Contaminated material for which decontamination is not feasible or cost effective, will be characterized, loaded into disposal containers, weighed, staged on site, and shipped to Envirocare of Utah or other licensed facility for final disposition. Materials for which decontamination is feasible and cost effective such as large wood timbers, wood flooring, structural steel members, and concrete, will be decontaminated on site or at a licensed waste processing facility. The decontaminated material will be handled as other uncontaminated material. The radioactive materials generated during the decontamination operations will be handled as radioactive material. Uncontaminated construction debris will be kept separate from contaminated material. This material will be sampled and/or surveyed to verify that contamination levels are below the applicable release criteria. Demolition debris which does not exceed the release criteria will be disposed of at local landfills. Radioactive waste management and estimates of waste volume are discussed in Section 3.0.

Contaminated asbestos containing materials (pipe insulation and possibly some asbestos shingles), lead in paint, and PCB's in flourescent light fixture ballasts, have been identified as mixed, hazardous or toxic waste concerns have been identified. Waste generated from the removal of contaminated asbestos containing materials will be properly packaged and disposed of at a licensed facility. Items such as the crane in the Certrifugal Cast Room will be decontaminated or processed in a manner that will not disturb the lead paint. A continuous effort to identify and prevent the generation of mixed waste will be maintained throughout the decommissioning effort. Decontamination processes will be selected to preclude the generation of mixed or hazardous waste (listed or characteristic).

1.8 Estimated Decommissioning Cost, Available Funds and Schedule

The estimated cost for decommissioning the TCAAP facility is based on the removal and decontamination or disposal of contaminated materials, equipment and structural components in the facility. The estimated cost for the decommissioning of the entire TCAAP facility is * This cost does not include the funds for disposal of 62,331 cubic feet of radioactive waste. TCAAP maintains sufficient funds to accomplish the decommissioning objectives. Additional information on the decommissioning cost estimate is presented in Section 5.0.

The estimated duration of decommissioning activities is 15 months following mobilization of the decommissioning contractor's team and equipment. This includes preparation of the decommissioning report for submission to the NRC. The decommissioning schedule is further discussed in Section 2.2.3.

1.9 Quality Assurance

All decommissioning activities shall be conducted in accordance with a Quality Assurance (QA) Plan approved by Alliant Techsystems and the Army. Alliant Techsystems and the Army will provide oversight and monitoring of the decommissioning contractor's performance. This may include observations of ongoing work activities, inspections and audits and reviewing records (procurement, testing, audits, radioactive material packaging and shipping, etc.) Items of non-compliance or conditions adverse to quality shall be documented and presented to the decommissioning contractor for corrective action. The major components of the QA Plan are described in Section 7.0.

1.10 Final Radiation Survey

The last phase of the TCAAP decommissioning is the final radiation survey. This survey, discussed in greater detail in Section 4.0, is designed to confirm that the levels of fixed and removable radiological contamination have been reduced to levels in accordance with the residual contamination limits for unrestricted release of materials and equipment provided by the NRC (Ref 8.2.25).

As noted previously, following decommissioning of TCAAP and termination of License No. SUB-971 for TCAAP Alliant Techsystems and the Army will continue operation at the TCAAP site with no licensed material on site. Alliant Techsystems and the Army will also operate other facilities under the SUB-971 license.

* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

2.0 CHOICE OF DECOMMISSIONING ALTERNATIVE AND DESCRIPTION OF ACTIVITIES

2.1 Decommissioning Alternative

Decommissioning, as described in this plan, will be accomplished by removal of most of the Building 502 DU Room for processing and packaging for disposal. Residual contamination limits for unrestricted release of materials and equipment will be in accordance with NRC, *Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Terminction of Licenses for Byproduct, Source, or Special Nuclear Material*, April 1993 (Ref 8.2.25). These limits are provided in Table 2-1. The soil release activity for depleted uranium is 35 pCi/gas as specified in Federal Register Vol. 46, No. 205 (Ref. 8.2.26).

2.2 Decommissioning Activities, Tasks and Schedules

The objective of the TCAAP decommissioning is the removal of all licensed radioactive material from the site and the termination of the 10 CFR 30 license. In order to accomplish this objective, the following activities will be performed:

- Demolish the DU Room in Building 502. This includes the Machining Room, the Rod/Cutoff Room, the Waste Handling/Punch Press Room, the Centrifugal Cast Room, the Equipment Room, the Waste-Water Evaporator Room, the Compressor Room, and the Heat Treating Room. In addition the wind tunnel structure, which was not used for any DU operations will be removed. Prepare the removed material for release or disposal; either decontaminate and release or package and dispose.

Table 2-1
Acceptable Surface Contamination Levels

Nuclide[a]	Average[b c f]	Maximum[b d f]	Removable[b e f]
U-nat, U-235, U-238, and associated decay products	5,000 dpmα/100cm²	15,000 dpmα/100cm²	1,000 dpmα/100cm²
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100cm²	300 dpm/100cm²	20 dpm/100cm²
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm/100cm²	3,000 dpm/100cm²	200 dpm/100cm²
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000 dpmβγ/100cm²	15,000 dpmβγ/100cm²	1,000 dpmβγ/100cm²

a. Where surface contamination by both alpha and beta-gamma emitting nuclides exist, the limits established for alpha and beta-gamma emitting nuclides should apply independently.
b. 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 observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.
c. Measurement of average contamination should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.
d. The maximum contamination level applies to an area of not more than 100 cm².
e. The amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.
f. The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

- Ship all radioactive waste off-site for disposal. Waste may be staged prior to shipping waste off-site for disposal.

- Perform a final site radiation survey to confirm that the facility residual activity levels meet the release criteria for unrestricted release of materials and equipment provided by the NRC (Reference 8.2.25). The areas to be surveyed include the Building 502 DU Room, Tool Room Area, Short Run Shop, Cartridge Assembly Area, Cartridge Painting Area, Chem. Lab Area, and Building 576 DU Storage Areas.

- Remove the TCAAP facilities from the 10 CFR 30, SUB-971 license.

The decommissioning activities described below are based on a complete characterization of the facilities, structures and/or components (Ref 8.4.1). This plan includes decontamination techniques which may be used, equipment and materials required, numbers of persons, schedule, special training requirements for workers, radiation protection and occupational safety and health practices to be utilized. Work plans will be prepared to address issues such as asbestos or other known hazards in the area of work. The final decommissioning methods will utilize the best, most economical means to minimize the amount of hazardous, mixed and radioactive waste requiring disposal in a licensed facility. From the standpoint of cost-effectiveness, contaminated equipment, materials, etc. may be decontaminated, allowing release for unrestricted use, or packaged for transport and disposal. This plan allows flexibility in the choice of decontamination procedure/technique and sequence.

2.2.1 Pre-Decommissioning Activities

1. Access Control

Access to the site will be through the normal Building 502 access control point. Initial access to the DU Room for a small crew can be established through the existing office and change room at the south end of the Heat Treating Room. A separate access to the DU room will be established from the exterior to minimize interference with ongoing production activities inside Building 502. In addition, temporary office and change facilities will be established outside in the DU Room area at a distance sufficient to not interfere with demolition of the DU Room. Equipment and material access to the DU Room will also be taken into account when locating these facilities. Figure 2-1 shows a possible arrangement for facilities and access routes for equipment and material.

2. Relocate Electrical Service to Compressor Room

The small compressors in the Compressor Room will be moved to a new location and the compressors will need to be repowered. The power to the Compressor Room passes through the second floor of the Heat Treatment Room and the switch gear is also located on in this area. The small compressors will need to be moved and power will need to be rerouted and new switch gear installed prior to starting the demolition. A new location for these compressors has not been established but some funds have been designated for this work. The compressors and service will need to be rerouted so as not to interfere with production in Building 502. The contractor will provide the new electrical service material and installation except for connecting the new service and disconnecting the old service. The service connections will be made by qualified personnel.

Figure 2-1
Facilities and Access Routes for Equipment and Materials

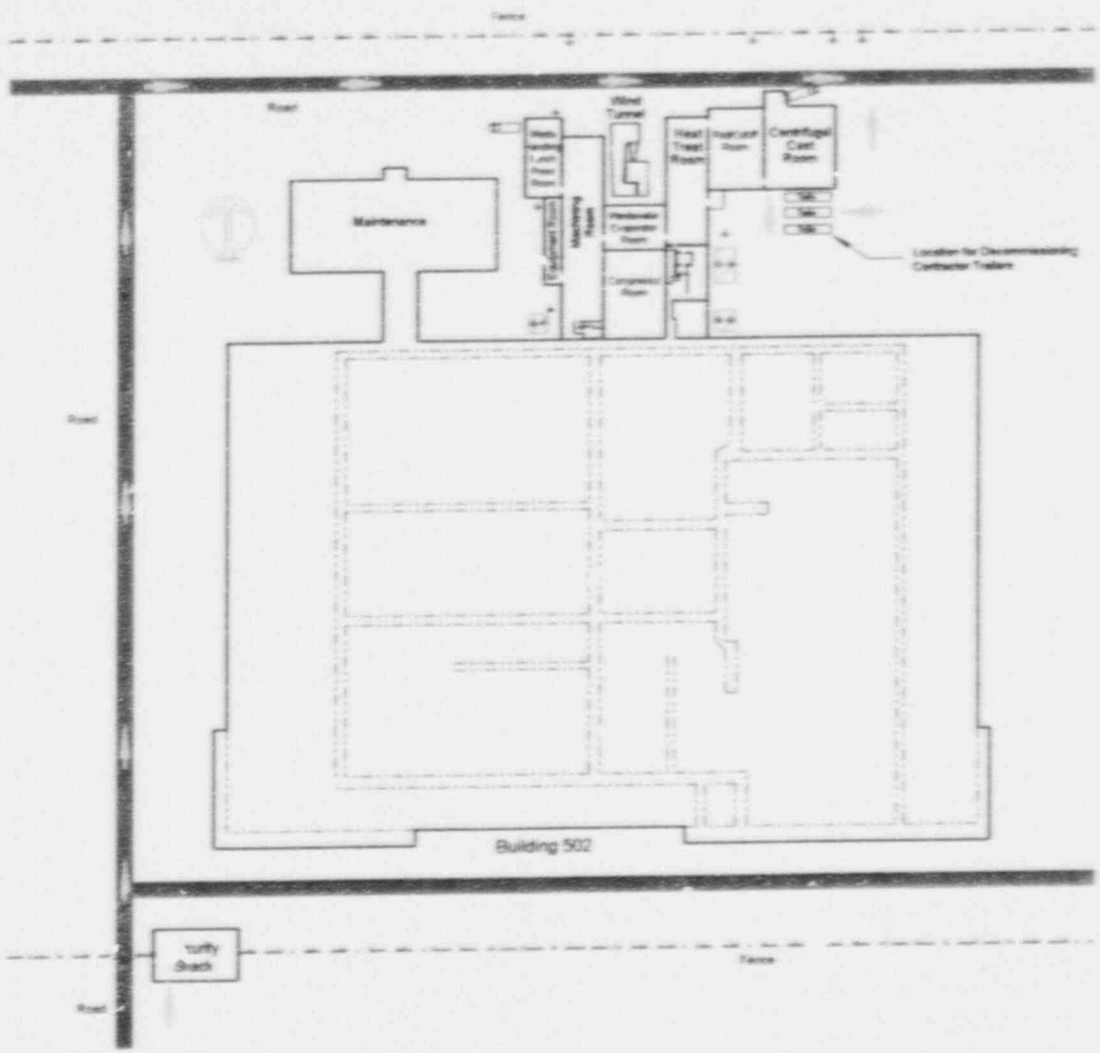
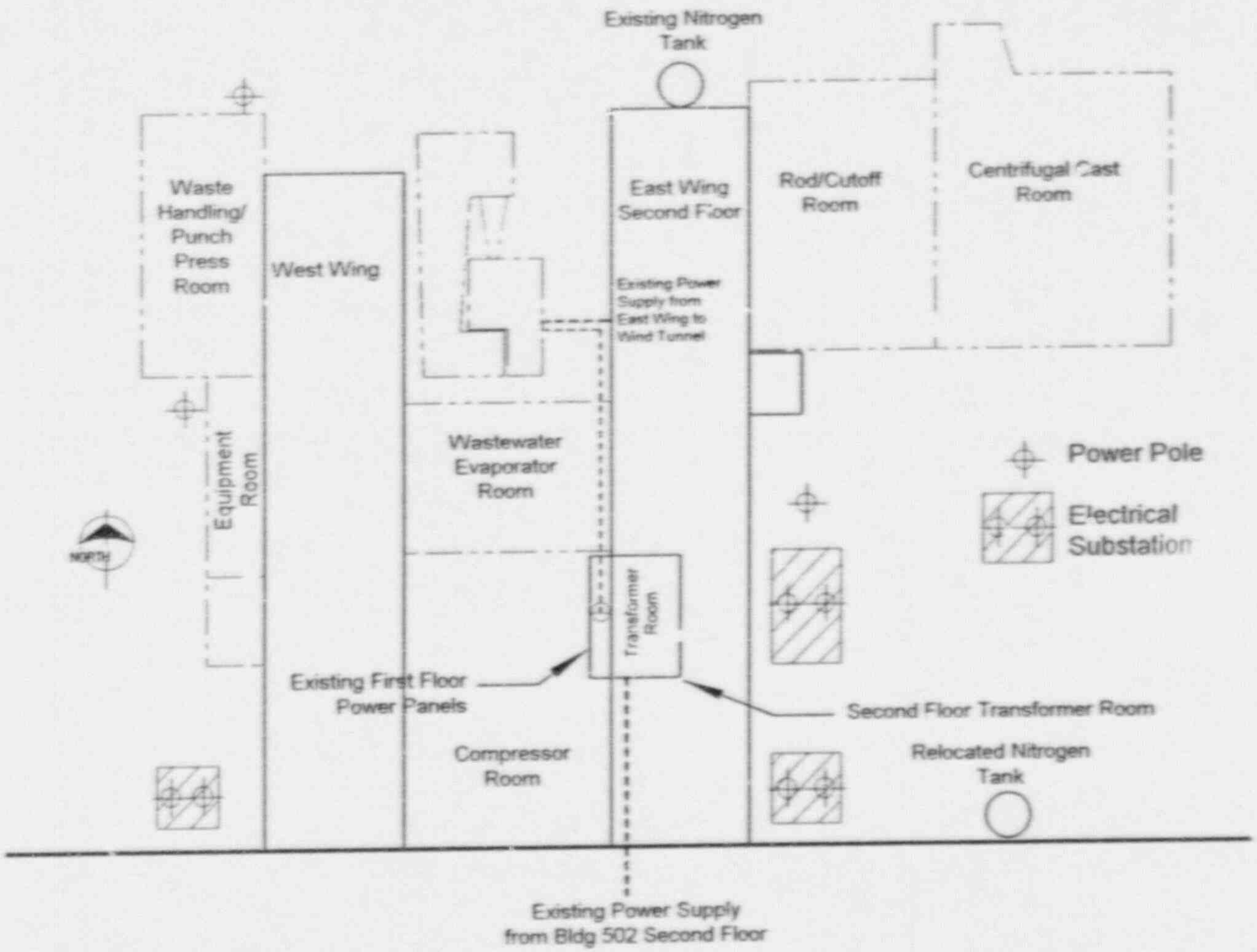


Figure 2-2
Existing Power Supply from Bldg 502 Second Floor



3. Relocate Electrical Service to Building 502

The electrical power to a portion of the Building 502 cartridge processing area, passes through the second floor of the Heat Treatment Room. The power will need to be rerouted and new switch gear installed prior to starting the demolition. TCAAP will reroute this service from another location prior to the start of demolition work.

4. Relocate Liquid Nitrogen Tank

A liquid nitrogen tank owned by PRAXAIR, Inc is located at the north end of the Heat Treatment Room. This tank supplies nitrogen to the heat treating area. The contractor will contact PRAXAIR, Inc to relocated or replace the tank without disrupting service to the heat treating area. A possible location for this tank is shown in Figure 2-2.

5. Relocate the Main Water Service Line in the Machining Room

The main water service to Building 502 comes up through the floor in the north east corner of the Machining Room and passes overhead to Building 502. This line will need to be rerouted without disturbing water service to Building 502. TCAAP will arrange for rerouting this service prior to the start of decommissioning.

6. Remove Sprinkler Water

Disconnect and remove sprinkler piping which comes through Sprinkler Riser #16 in the floor in the east center of the Machining Room. The sprinkler water riser and piping in the Centrifugal Cast Room will be removed. The sprinkler water piping in the Compressor Room and the Heat Treating Room will be removed.

7. Temporary Utilities

Temporary lighting and power will be installed to the office and change trailers in accordance with applicable requirements, as well as local safety codes. In addition telephone and fire systems will be provided and maintained for the duration of decommissioning activities.

2.2.2 Decommissioning Activities

1. Removal of Hazardous Materials

a. General

The DU Room construction began in the 1940 period and, as in most older facilities, construction materials included asbestos insulation on pipes, asbestos shingles, lead in paint, and PCB's in oils.

b. Polychlorinated Biphenyls (PCB's)

Polychlorinated biphenyls are most certainly present in the ballasts of the fluorescent light fixtures used throughout the DU Room. The ballasts will be removed from the fluorescent light fixtures, decontaminated, and surveyed to insure that they meet the NRC decommissioning criteria (See section 4.2), packaged in special shipping containers, and shipped to Alliant Techsystem's normal PCB disposal contractor.

c. Fluorescent Lamps

The fluorescent lamps in the light fixtures contain small quantities of mercury. The lamps will be removed, decontaminated, and surveyed to insure that they meet the NRC decommissioning criteria (See section 4.2), packaged in special shipping containers, and shipped to Alliant Techsystem's normal fluorescent lamp disposal contractor.

d. Asbestos Abatement

Asbestos containing materials should be removed and packaged for disposal prior to any decommissioning activities in areas where these materials exist, provided these activities can be conducted safely. Asbestos shingles have been installed on most of the exterior walls of the DU Room, in floor tiles in the DU Room, and in insulation on some of the piping and ventilation systems. The exterior asbestos shingles and insulated piping from the second floor area are not contaminated, based upon DU Room roof and exterior survey results in the characterization report (Ref 8.4.1). The asbestos materials can be removed using normal asbestos control techniques using a licensed asbestos abatement contractor. Contaminated asbestos materials from the remainder of the DU Room will be set aside from the normal contaminated construction waste for shipping to Envirocare of Utah for disposal. Additional asbestos materials discovered in the course of decontamination activities should be abated by the asbestos contractor, as needed.

e. Freon

Alliant Techsystems will remove the freon from all the HVAC units located outside of the DU Room and on the roof of the DU Room.

f. Lead and Chromium Paint

There is lead in most of the wall and ceiling paint of the DU Room as reported in Appendix D-2. This lead does not create a mixed waste problem for waste disposal because the lead is contained within the paint and TCLP testing on samples 15, 16A, and 16B indicated acceptable levels of lead, less than 5 mg/liter (Appendix D-2). The yellow paint containing lead and chromium on the crane in the Centrifugal Cast Room can be handled by decontaminating the crane by hand wiping and then removing the clean paint using a qualified lead removal contractor, or by shipping the metal offsite for processing by metal melting.

2. General

There were occasional DU fires in many DU Room areas because of the tendency for small particles of uranium metal to ignite spontaneously in air. In addition many areas of the DU Room were cleaned frequently by washing them down with water to remove dust and small particles from processing equipment and floors. As a consequence all materials in the ground floor areas of the various DU Room areas are contaminated. Very little of this material can be decontaminated economically. A decontamination process analysis for the DU Room area (see Appendix C) indicated that the only materials that can be decontaminated cost effectively were concrete surfaces, metal building structural; steel, and possibly wood framing and flooring depending upon the demolition methods used.

A decommissioning scenario is proposed that provides for demolishing and removal of structures as indicated in the decommissioning objectives listed in section 2.2. Details of decontamination methods, removal methods, and work sequencing will be up to the decommissioning contractor and the TCAAP Facility Manager. As a result, decontamination methods, removal methods, and work sequencing are expected to diverge from the decommissioning scenario presented in this plan. The decommissioning objectives listed in section 2.2 will not change.

The Centrifugal Cast Room will be prepared to allow its use throughout the rest of the project as a waste processing area and waste staging area. The metal buildings will then be demolished, then the Equipment Room, and next the two story east and west wings of the DU Room along with the Compressor Room and ending with the Centrifugal Cast Room. This will allow all of the asbestos shingle-covered walls of the east and west wings to be uncovered prior to their demolition and provide improved access to the two story east and west wing structures.

3. Demolition of the East and West Wings of the DU Room

The west wing of the DU room is known as the Machining Room and the east wing of the DU Room is known as the Heat Treat Room (see Figure 1-3). The exterior surfaces of these two story buildings are covered with asbestos shingles. Large wood timbers are used to support these structures and they are built on 8-inch thick concrete floor slabs. The walls are fabricated using 2 x 6 wood studs with foil backed fiberglass insulation. The walls on the first and second floors and the ceilings on the first floor have ½-inch drywall on the inside surface. The ceilings on the second floor are primarily constructed of ½-inch drywall but also may have suspended acoustic tile, or nothing at all. The floors on the second level are constructed from 2-inch thick pine and in some locations the wood flooring is covered with carpet. Some of the piping is insulated with asbestos containing materials (see Appendix D).

The Machining Room is 36' x 175'6" x 23'8" tall with bathroom facilities at the south end of the room. The Heat Treat Room is 36' x 191'6" x 23'8" tall with heat treating facilities located at the south end of the room on the first floor (columns 26 to 28). The heat treating facilities are currently in use and they will need to be relocated inside building 502 and reinstalled prior to the demolition of this room. The heat treating facilities are not contaminated.

The decommissioning plan for these structures entails demolition of the buildings and all components within the structures. The approach to the demolition is driven by the contamination levels on the inside walls and floors, the ductwork and the remaining conduit and piping. To preclude the spread of contamination beyond the building perimeter, the structure will be dismantled from inside to outside maintaining the integrity of the roof and walls until the maximum quantity of radioactive waste is removed from the building footprint. Radioactive waste will be staged in the centrifugal cast room prior to disposal.

The general sequence of remediation will be to remove the outside HVAC cooling units. These units will be surveyed and released for reuse or sale, or if contaminated, they will be size reduced and packaged for disposal as radioactive waste. The roof mounted, HEPA exhaust systems will then be sprayed internally with a fixative due to the high level of contamination within these systems. The HEPA exhaust systems will then be removed and a temporary cover installed on the roof to maintain the integrity of the building from the outside elements. The first floor interior equipment, conduit, piping, and supporting hardware will be stripped from the structure and moved to the waste sizing and packaging area. The first floor areas will then be vacuumed to remove any loose contamination and the floor will be coated with a fixing agent to adhere any remaining loose contamination. The first floor interior wall and ceiling surfaces will be removed including insulation. These walls and ceilings are primarily dry wall construction but also include suspended acoustic tile ceilings. The debris will be volume reduced to the extent feasible with consideration to cost effectiveness and packaged for disposal as radioactive waste. Then the concrete floor slab will be decontaminated using surface removal equipment. The removed surface concrete will be packaged for disposal as radioactive waste. The 8-in thick concrete floors will then be sectioned and removed without compromising the building structure. The bottom and side surfaces of the concrete may also require decontamination. If clean, the concrete will be released for disposal at a local landfill. Soil beneath the removed concrete floor that requires removal will be excavated and packaged for disposal.

The second floor areas are not contaminated and will be surveyed for unrestricted release using the NRC decommissioning criteria (See section 4.2). After surveying, the internal wall and ceiling materials on the second floor can be removed at anytime during the demolition process and released for disposal at a local landfill. The building roofs are flat and covered with several layers of built-up construction material, including upper layers of roofing felt, asbestos, and gravel. The asbestos containing materials will need to be disposed of at a landfill that is licensed for acceptance of asbestos materials. The electrical substation and natural gas supply piping outside at the southwest corner of the Machining Room will need to be protected from demolition activities to preclude damage to these services. The roof's structure will be removed, surveyed, and disposed of at appropriate landfills. There are roof drains that pass from the center of the roofs through the first and second floor areas to drains under the floor slabs. A temporary protection system for inclement weather may need to be provided for the first floor of the east and west wings during the demolition to protect the first floor area after the roof and second floors have been removed. The remainder of the buildings will then be demolished. The building exterior material contains asbestos and will be packaged for disposal at an appropriate landfill that is licensed for acceptance of asbestos materials. Finally, the foundation, remaining concrete and any remaining contaminated soil will be excavated and packaged for disposal.

Floor and roof drains within these rooms will be covered during activities that may result in migration of contamination into the drainage system.

4. Demolition of the Metal Sided Rooms

The Waste Handling/Punch Press Room, the Waste Water Evaporator Room, and the Rod/Cutoff Room are all constructed with steel columns and sheet metal siding and roofs. Figure 1-3 shows the location of these rooms. The exterior surfaces of these buildings are covered with steel sheet metal with a baked enamel coating. They are one story rooms with 8-inch thick concrete floors. Steel columns are used to support the structures and form the walls. The interior walls and ceilings are insulated with fiberglass, and covered with steel sheet metal with a baked enamel coating. The exception is the Waste Handling Punch Press Room where the ceiling is insulated with plastic backed fiberglass which also provides the interior ceiling surface.

The Waste Handling/Punch Press Room is 32' x 68' x 15'10" tall with a small HVAC baghouse located on the roof. The Waste Water Evaporator Room is 38' x 52' x 13' tall. The Rod/Cutoff Room is 48'6"x 71' x 16'4" tall.

The decommissioning plan for these structures entails demolition of the buildings and all components within the structures. The south masonry wall in the Waste Water Evaporator Room is a structural wall in common with the Compressor Room. This wall will be removed during the Compressor Room demolition The approach to the demolition is driven by the contamination levels on the inside walls and floors, the ductwork and the remaining conduit and piping. To preclude the spread of contamination beyond the building perimeter, the structure will be dismantled from inside to outside maintaining the integrity of the roof and walls until the maximum quantity of radioactive waste is removed from the building footprint.

The general sequence of remediation will be to remove the outside HVAC cooling units. These units will be surveyed and released for reuse or sale, or if contaminated, they will be size reduced and packaged for disposal as radioactive waste. The roof mounted, HEPA exhaust systems will then be sprayed internally with a fixative due to the high level of contamination within these systems. The HEPA exhaust systems will then be removed and a temporary cover installed on the roof to maintain the integrity of the building from the outside elements. The interior equipment, conduit, piping, and supporting hardware will be stripped from the structure and moved to the waste sizing and packaging area. The room will then be vacuumed to remove any loose contamination and the floor will be coated with a fixing agent to adhere any remaining loose contamination. At this time the interior metal liner and insulation will be removed. The debris will be volume reduced to the extent feasible with consideration to cost effectiveness and packaged for disposal as radioactive waste. Then the concrete floor slab will be decontaminated using surface removal equipment. The removed surface concrete will be packaged for disposal as radioactive waste. The 8-inch thick concrete floors will then be sectioned and removed to the maximum extent feasible without compromising the building structure. The bottom surfaces of the concrete may also require decontamination. If radiologically clean, the concrete will be released for disposal at a local landfill. Soil beneath the removed concrete floor that requires removal will be excavated to the maximum extent feasible and packaged for disposal. The roof, outside metal walls and structural steel will then be removed, surveyed, decontaminated if economical, and packaged for resale or disposal at a local landfill. Finally, the foundation, remaining concrete and any remaining contaminated soil will be excavated and packaged for disposal.

Floor drains within these rooms will be covered during activities that may result in migration of contamination into the drainage system.

5. Equipment Room

The Equipment Room, located as shown in Figure 1-3, is located to the center west of the Machining Room. The exterior surface of the building is covered with asbestos shingles. This is a one story room with a 8-inch thick concrete floor. The east wall of this room is a common wall shared with the Machining Room. The walls are fabricated using 2 x 4 wood studs with foil backed fiberglass insulation, and painted ½-inch drywall on the inside surface. The ceiling is also constructed of painted ½-inch drywall. The roof is sloping and covered with fiberglass shingles. Some of the piping is insulated with asbestos containing materials (see Appendix D.) This room contains two large HVAC fan units that fill the northern two-thirds of the room. The Equipment Room is 16' x 71' x 13' tall.

The decommissioning plan for this structure entails demolition of the building and all components within the structure. The approach to the demolition is driven by the contamination levels on the inside walls and floors, the ductwork and the remaining conduit and piping. To preclude the spread of contamination beyond the building perimeter, the structure will be dismantled from inside to outside maintaining the integrity of the roof and walls until the maximum quantity of radioactive waste is removed from the building footprint.

The general sequence of remediation will be to remove the outside HVAC cooling units. These units will be surveyed and released for reuse or sale, or if contaminated, they will be size reduced and packaged for disposal as radioactive waste. The interior equipment, conduit, piping, and supporting hardware will be stripped from the structure and moved to the waste sizing and packaging area. The common wall with the Machining Room will be demolished to allow the two large HVAC units to be moved into the Machining Room. The HVAC units will be cut up to reduce their volume and meet the burial site criteria. The room will then be vacuumed to remove any loose contamination and the floor will be coated with a fixing agent to adhere any remaining loose contamination. The interior wall and ceiling surfaces will be removed including insulation. These walls and ceilings are dry wall construction. The debris will be volume reduced to the extent feasible with consideration to cost effectiveness and packaged for disposal as radioactive waste. Then the concrete floor slab will be decontaminated using surface removal equipment. The removed surface concrete will be packaged for disposal as radioactive waste. The 8-in thick concrete floors will then be sectioned and removed to the maximum extent feasible without compromising the building structure. The bottom surfaces of the concrete may also require decontamination. If clean, the concrete will be released for disposal at a local landfill. Soil beneath the removed concrete floor that requires removal will be excavated to the maximum extent feasible and packaged for disposal. The remainder of the building will then be demolished. The building exterior material contains asbestos and will be packaged for disposal at an appropriate landfill that is licensed for acceptance of asbestos materials. Finally, the foundation, remaining concrete and any remaining contaminated soil will be excavated and packaged for disposal.

Floor drains within these rooms will be covered during activities that may result in migration of contamination into the drainage system.

6. Compressor Room

The Compressor Room is located between the east and west wings of the DU Room (see figure 1-3). The east and west walls of this room are provided by exterior wall surfaces of the east and west wings of the DU Room and the south wall is provided by the exterior block wall surface of Building 502. The north wall is a masonry wall 12 inches thick. Large wood timbers are used to support the roof of this structure which is built on an 8-inch thick concrete floor slab.

The Compressor Room is 53' - 10" by 76'-9" by 22' tall. The small compressors and an accumulator tank in the room are currently in use and they will need to be relocated inside building 502 and reinstalled prior to the demolition of this room.

The decommissioning plan for this structure entails demolition of the room and all components remaining within the structure including the large compressors. This building is not contaminated except in the large compressor flywheel pits.

The general sequence of demolition will be to first remove the roof mounted exhaust systems, and then install temporary covers over these openings to maintain the integrity of the building from the outside elements. The compressors, conduit, piping, and supporting hardware will be stripped from the structure and moved to a waste staging area. All or parts of the large compressors are expected to have a significant salvage value and they should be handled appropriately to insure that they remain in good condition. These items will be surveyed for free release. Then the concrete pits for the large compressor flywheels will be decontaminated using surface removal equipment. The removed surface concrete will be packaged for disposal as radioactive waste.

The building roof is flat and covered with several layers of built-up construction material, including upper layers of roofing felt, asbestos, and gravel. The asbestos containing materials will need to be disposed of at a landfill that is licensed for acceptance of asbestos materials. The roof's structure will be removed, surveyed, and disposed of at appropriate landfills. The remainder of the building will then be demolished and disposed of at a local landfill. The 8 inch thick concrete floors will then be sectioned and removed. Finally, the remaining concrete foundation will be surveyed and released for disposal at a local landfill.

7. Centrifugal Cast Room

The Centrifugal Cast Room, located as shown in Figure 1-3, is the eastern most structure in the DU Room. The building walls are 10-inch insulated precast concrete. The roof/ceiling is made up from 32-inch precast concrete double tees covered with asbestos free, insulated, built-up roofing materials. This is a one story room with a 8-inch thick concrete floor. Some of the piping is insulated with asbestos containing materials (see Appendix D). There is a 775 cubic foot concrete sump with liner under the floor which contains an estimated 3,000 gallons of DU-contaminated wash water. It is anticipated that the sump will be emptied by the decommissioning container at the start of decommissioning. The Centrifugal Cast Room is 63' x 71' x 23'6" tall.

The decommissioning plan for this structure entails demolition of the building and all components within the structure. However, consideration should be given to preparation of the Centrifugal Cast Room to allow its use as throughout most of the rest of the project as a personnel access area, waste processing area, and waste staging area. The Centrifugal Cast Room will be demolished after the rest of the DU Room has been demolished. The approach to the demolition is driven by the contamination levels on the inside walls and floors, the ductwork and the remaining conduit and piping. To preclude the spread of contamination beyond the building perimeter, and to minimize the generation of radioactive waste, the structure interior will be decontaminated prior to demolition.

The general sequence of remediation will be to remove the roof mounted HVAC cooling units. These units will be surveyed and released for reuse or sale, or if contaminated, they will be size reduced and packaged for disposal as radioactive waste. The interior equipment, conduit, piping, and supporting hardware will be stripped from the structure and volume reduced and packaged for disposal as radioactive waste. The room will then be vacuumed to remove any loose contamination and the floor will be coated with a fixing agent to adhere any remaining loose contamination. Due to recent construction of this building, the concrete floor in this area is in excellent condition and covered with epoxy paint. It is anticipated that removal of less than 1/4" of concrete will remove all activity from the floor surface. The 775 cubic foot sump walls and floor should be able to be decontaminated relatively easily because of the lining present on the sump surfaces. Decontamination by hand scrubbing with detergents should be sufficient. The building walls and ceilings are painted precast concrete which are in excellent condition. The interior wall and ceiling surfaces are contaminated but remediation using pressure washing, vacuuming and wiping surfaces or other non-destructive methods should be sufficient. Any secondary waste, such as waste water from pressure washing and wipedown rags, will be processed and disposed of as radioactive waste. The exterior walls are not expected to be contaminated because of the impermeability of the wall materials. The building will now be demolished and the debris surveyed and released for disposal at a local landfill. The 8-in thick concrete floors will then be sectioned and removed. The bottom surfaces of the concrete may also require decontamination. If clean, the concrete will be surveyed and released for disposal at a local landfill. Finally, the foundation and any contaminated soil will be excavated and packaged for disposal.

Floor drains within these rooms will be covered during activities that may result in migration of contamination into the drainage system.

8. Building 502 Incidental Use Areas

There are four areas inside Building 502 where there was incidental use of DU as shown in Figure 1-2. These areas include the Cartridge Assembly Area, the Tool Room Short Run Shop, and the Waste Staging Area. The areas on the first floor of Building 502 that exhibited elevated activity levels during the characterization surveys (Ref 8.4.1) are shown in Figure 2-3. In addition there are some areas on the second floor of Building 502 that exhibited elevated activity levels during the characterization surveys as shown in Figure 2-4. These areas will be surveyed for unrestricted release using the criteria provided by the NRC (Ref 8.2.25). If contamination is found in the area, it will be decontaminated using nondestructive methods, unless other methods are authorized by Alliant Techsystems, and released using the NRC decommissioning criteria (See section 4.2).

Figure 2-3
Elevated Activity Levels Bldg. 502 First Floor

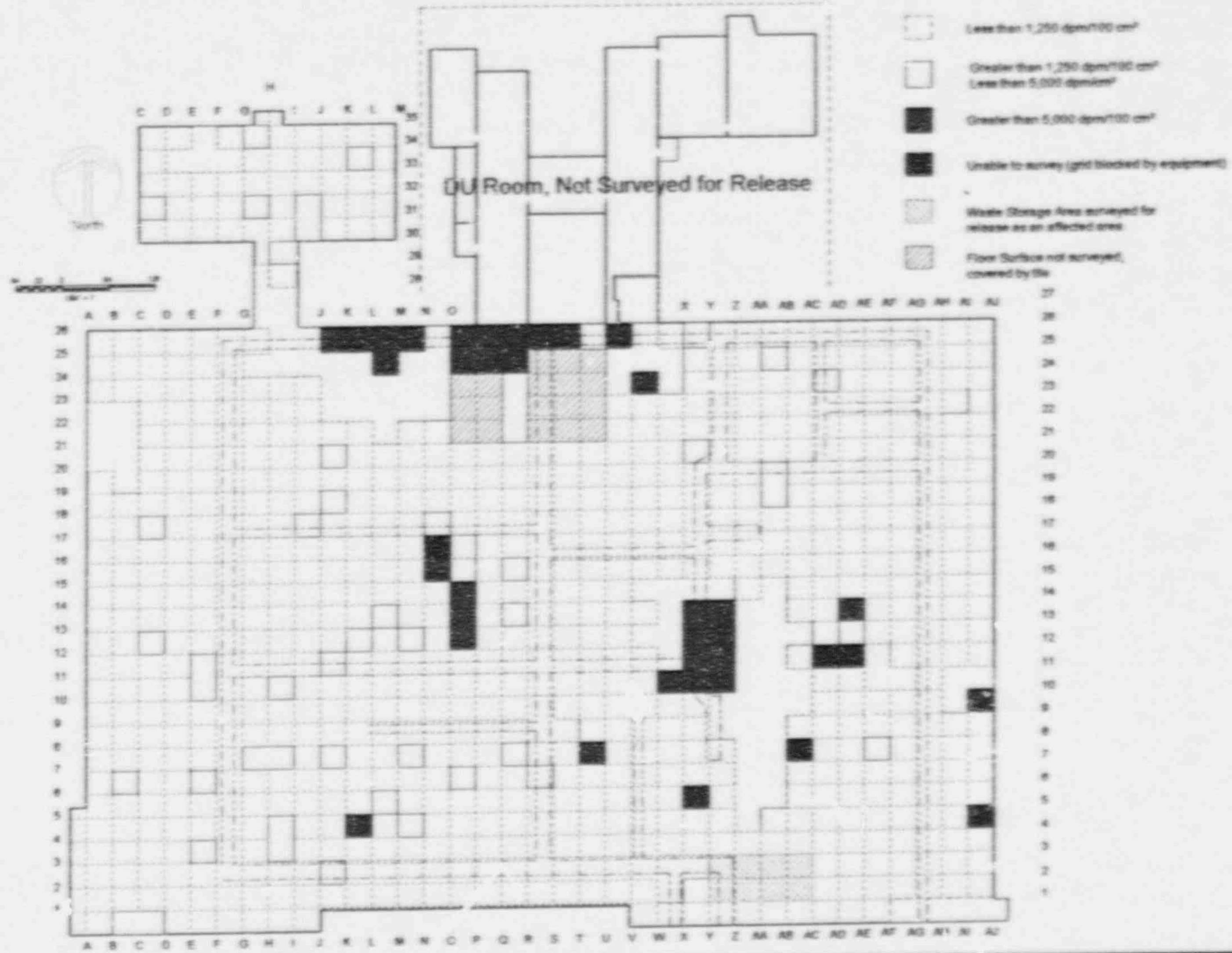
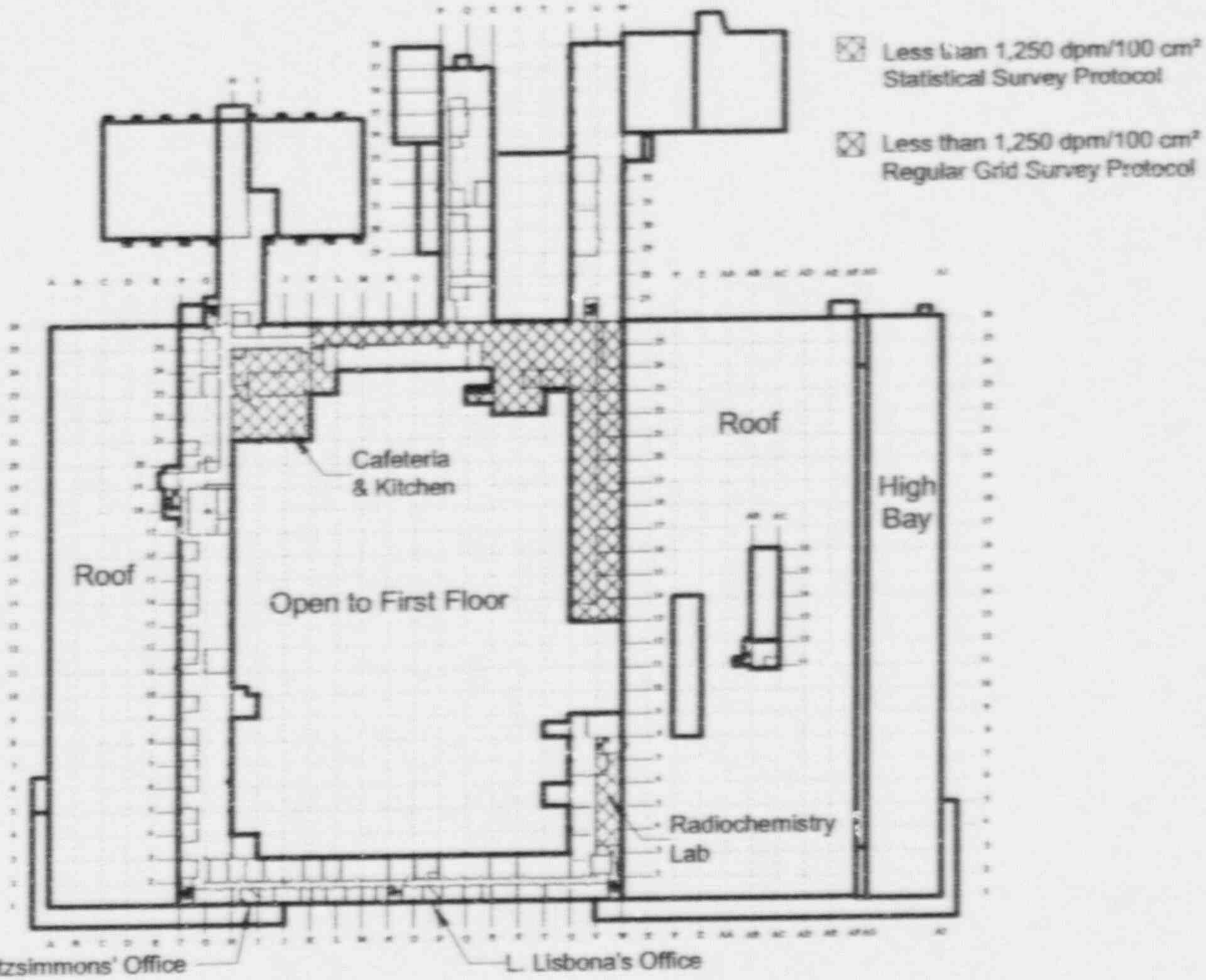


Figure 2-4
Elevated Activity Levels - Bldg. 502 Second Floor



7. Bldg. 519C and 519D Storage Magazines

The Building 519C and 519D Storage Magazines have been surveyed for unrestricted release using the criteria provided by the NRC (Ref 8.2.25). Contamination was not found in these magazines (Ref 8.4.1). Survey results for the storage magazines will need to be provided to the NRC for release of this area.

8. Bldg 576 Incidental Use Areas

There are three areas inside Building 576 where there was incidental use of DU as shown in Figure 1-4. These areas include the DU Ammunition Box Storage Area, the DU Waste Storage Area, and the DU Waste Area, Southeast. These areas were surveyed for unrestricted release using the criteria provided by the NRC (Ref 8.2.25). Contamination was not found in these areas (Ref 8.4.1). Survey results for Building 576 will need to be provided to the NRC for release of this area.

9. Bldg. 502 Roof

The Building 502 Roof was surveyed for unrestricted release using the criteria provided by the NRC (Ref 8.2.25). Contamination was not found in the area (Ref 8.4.1). Survey results for the Building 502 Roof will need to be provided to the NRC for release of this area.

10. Bldg. 502 and DU Room Ground Areas

The Building 502 ground areas were surveyed for unrestricted release using the criteria provided by the NRC (Ref 8.2.25). Contamination was not found in the area (Ref 8.4.1). Survey results for the Building 502 ground areas will needs to be provided to the NRC for release of this area.

The DU Room ground areas were also surveyed and contamination in excess of the NRC decommissioning criteria (see section 4.2) was found in three locations (Ref 8.4.1). The DU Room ground area will need to be re-surveyed after demolition of the DU Room. This area will be surveyed for unrestricted release using the NRC decommissioning criteria.

11. Bldg. 502 Sewers, Drains and Related Soils

The Building 502 sewers, drains and related soils, shown in Figure 2-5, were surveyed for unrestricted release using the criteria provided by the NRC (Ref 8.2.25). Contamination was found in some drains near the DU Room. All drains under the DU Room will be removed including extensions of these drains designated for removal as shown in Figure 2-5. One drain running North-South under Building 502 is contaminated near the DU Room. It will be decontaminated using nondestructive methods, unless other methods are authorized by Alliant Techsystems, and released using the NRC decommissioning criteria (See section 4.2

2.2.3 Decommissioning Schedule

Major TCAAP decommissioning tasks and the time estimate to complete each task are shown in Figure 2-6. The estimated duration of contracted decommissioning activities is ten (10) months following mobilization of the decommissioning contractor's team and equipment. This includes completion of the final survey and preparation of the decommissioning report for submission to the NRC. The total decommissioning duration from submission of decommissioning plan to the NRC for approval until release of license at this site is estimated to be 15 months. It should be noted that several tasks may be performed concurrently. Although the task listing is a logical progression of decommissioning activities, tasks may be performed in an alternate sequence in an effort to improve efficiency, productivity, and/or provide the most economical result.

2.3 Decommissioning Organization and Responsibilities

2.3.1 Alliant Techsystems

As the licensee, Alliant Techsystems, Inc. maintains responsibility for the overall decommissioning project and has final authority in all project activities. The Alliant Techsystems representative for decommissioning is the Project Director. The Project Director has the responsibility and authority to manage the decommissioning of the TCAAP, as well as administration of the decommissioning contract. The Project Director

Figure 2-5
Building 502 Sewers, Drains and Related Soils

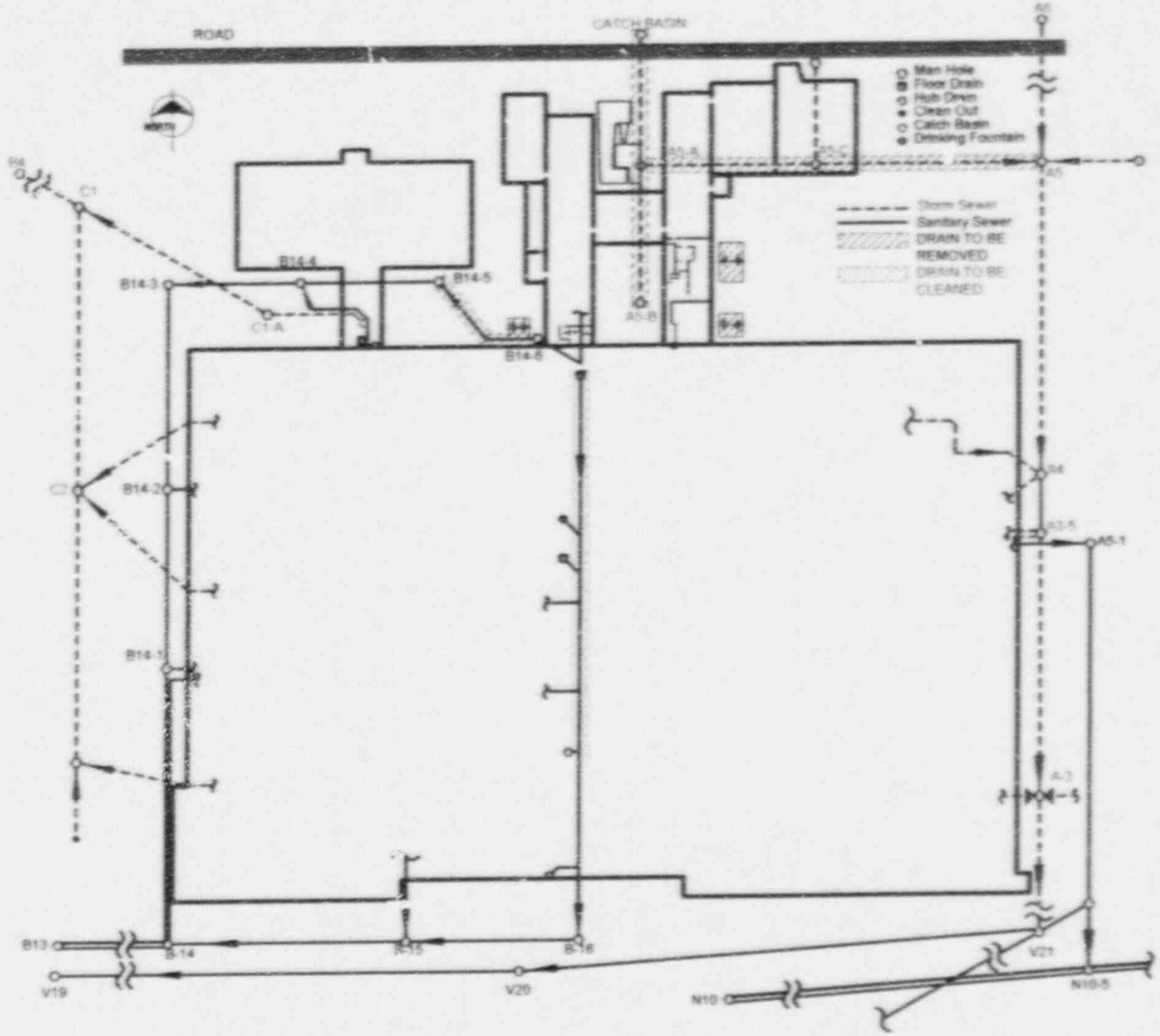


Figure 2-6
Decommissioning Schedule

Page 1 of 2 Months 9/24/97

Work Activity	Days	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Submit Decommissioning Plan to NRC for Approval	31d	1 – 31
Develop Plans & Procedures	15d	31 – 45
Mobilize Crew & Prepare Site	12d	45 – 56
Remove Equipment & Piping	27d	52 – 78
Set Up Waste Staging Area in Centrifugal Cast Room	19d	60 – 78
Construct Load Bearing Walls in Heat Treat Room	14d	78 – 91
Decontaminate Concrete Floors	60d	78 – 137
Demolish Equipment Room	18d	91 – 108
Remove Oak Planking from Second Floor Areas	15d	91 – 105
Remove Pine Flooring from Second Floor Areas	15d	95 – 109
Demolish Waste Handling/Punch Press Room	20d	108 – 127
Demolish Machining Room Second Floor	15d	109 – 123
Demolish Machining Room First Floor	21d	127 – 147
Decontaminate Wood and Metal	111 d	96 – 206
Demolish Wastewater Evaporator Room	14d	147 – 160

Figure 2-6
Decommissioning Schedule (continued)

Page 2 of 2 Months 9/24/97

Work Activity	Days	Months (1–15)
Demolish Compressor Room	14d	160 – 173
Demolish Heat Treating Room Second Floor	31d	114 – 144
Demolish Heat Treating Room First Floor	26d	173 – 198
Demolish Rod/Cutoff Room	23d	198 – 220
Ship All Radioactive Waste Out of Centrigual Casting Room	137 d	103 – 239
Decontaminate Centrifugal Casting Room	34d	221 – 254
Remove Contaminated Soil	22d	254 – 275
Perform Final Survey & Sampling	21d	275 – 295
Demobilize Decommissioning Contractor	21d	295 – 315
Prepare Final Report	45d	315 – 359
NRC Comfirmatory Survey Completed	30d	359 – 388
Backfill and Landscape Excavated Areas	30d	388 – 417
TCAAP Removed from License	45d	388 – 432

has the authority to stop or suspend the work based on personal knowledge, input from the Alliant Techsystems, Twin Cities Army Ammunition Plant (TCAAP), or contractor staff, or assessment of contractor compliance with the requirements of the Decommissioning Plan.

2.3.2 Decommissioning Contractor

Decommissioning of the TCAAP will be performed by a qualified contractor under a contract administered by Alliant Techsystems. The decommissioning contractor's Project Manager will have contractual and regulatory responsibility for all aspects of the project performed by the contractors organization. The contractor Project Manager will report directly to the Alliant Techsystems Project Director and/or designated members of the Alliant Techsystems staff.

The TCAAP decommissioning project organization, is shown in Figure 2-7.

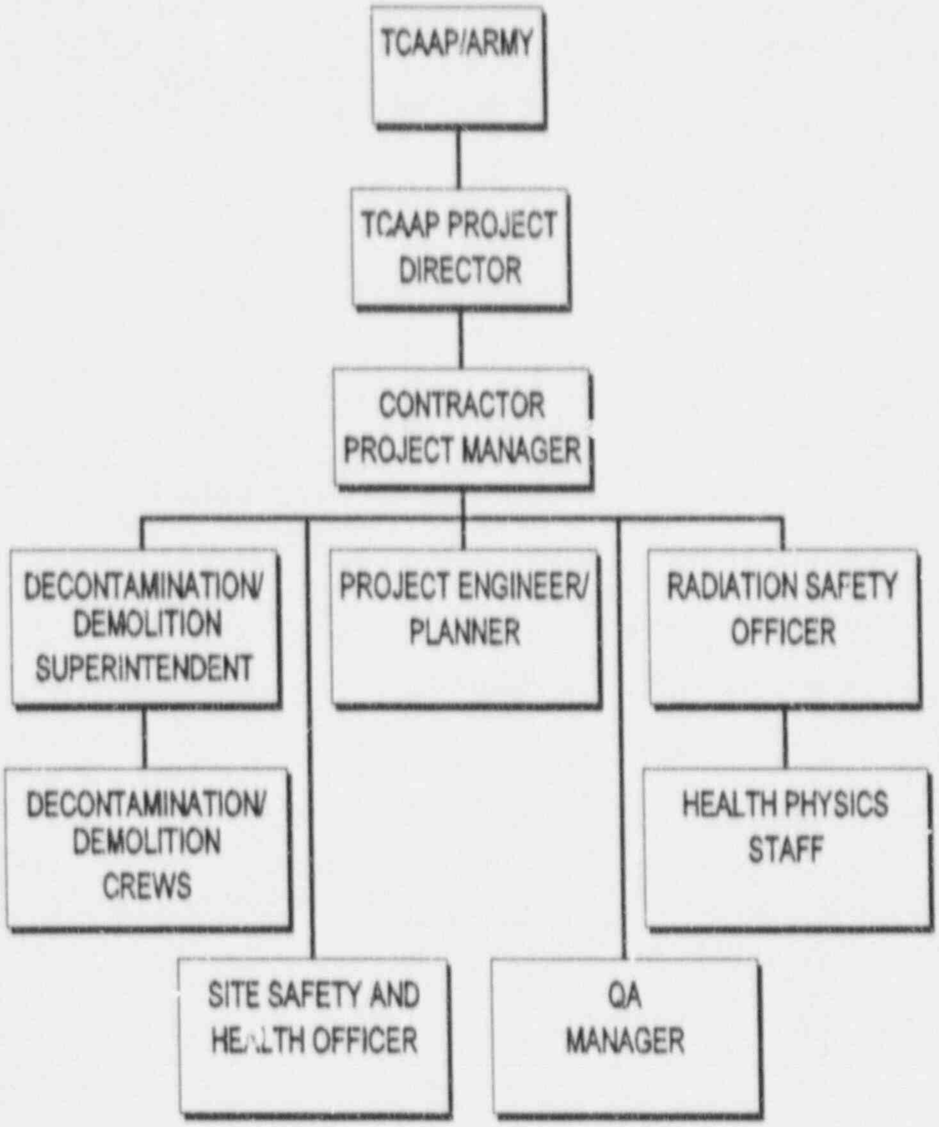


Figure 2-7
Decommissioning Project Organization

2.3.3 Position Descriptions

a. Contractor Project Manager

The principal function of the Project Manager is to represent the Contractor with respect to all client matters and implement and manage project execution in accordance with:

- Contract Documents.
- Project Scope.
- Project Procedures.
- Project Budget.
- Project Schedule.
- Corporate Policies and Procedures.

The primary responsibilities of the Project Manager include:

- Implement and manage all elements of the Contractor and contract-specific procedures.

- Develop the Plan of Execution, including:

  (1) Project Organization.
  (2) Personnel Requirements.
  (3) Project Procedures.
  (4) Project Policies.
  (5) Special Requirements.
  (6) Subcontracting.

- Approve all disbursements from project funds.

- Direct, coordinate and control the following:

  (1) Project Budget.
  (2) Scheduling.
  (3) Activities Statements.
  (4) Project Estimates.
  (5) Cost and Progress Reports.
  (6) Engineering.
  (7) Construction Planning.
  (8) Construction/Remediation Work.
  (9) Correspondence.

(10) Project Completion.
(11) Administrative Activities.
(12) Procurement.

- Conduct regular staff meetings to coordinate task force performance and to establish project management controls and procedures.
- Establish planning cost control.
- Report project progress and contract status to the TCAAP Project Director.
- Provide the necessary project leadership to promote maximum productivity at minimum cost.
- Prepare general project information for inclusion in the project reporting system.

The Project Manager reports directly to the Alliant Techsystems Project Director. Key project team personnel reporting to the Project Manager include the following personnel:

- Project Engineer/Planner.
- Health Physics Supervisor.
- Site Safety and Health Officer.
- Administration.

The Project Manager holds authority over all team personnel and receives staff assistance and consultation from other functional and support divisions.

b. Project Engineer/Planner

The Project Engineer reports directly to the Project Manager. The principal function of the Project Engineer is to direct, coordinate and control all technical and administrative matters that are associated with the review of design specifications and as-built facility drawings.

The Primary responsibilities of the Project Engineer include:

- Coordinate assistance of senior discipline engineers, as requested.
- Verify as-built facility drawings provided by others.

- Assist with preparation of required overlays for coordination purposes.
- Provide input to remediation schedule and cost estimate.
- Initiate engineering correspondence and maintain the engineering files.
- Report engineering progress and cost to the Project Manager.
- Prepare engineering data to be included in the project monitor report.

c. Decontamination/Demolition Supervisor

The Decontamination/Demolition Supervisor reports directly to the Contractor Project Manager. The principal function of the Decontamination/Demolition Supervisor is to coordinate, schedule, and oversee field work with decontamination/demolition crew foremen.

The primary responsibilities of the Decontamination/Demolition Supervisor include:

- Coordinate craft labor, subcontractors and equipment utilization.
- Labor relations.
- Supervise decontamination/demolition crew foremen and subcontract performance.
- Provide review of drawings and specifications.
- Provide input to decommissioning schedule and cost estimate.

d. Radiation Safety Officer (RSO)

The principal function of the Radiation Safety Officer (RSO) is the development and oversight of the Radiation Protection Program.

The primary responsibilities of the RSO include:

- Develop, implement and verify compliance with the radiation protection program.
- Ensure that all required monitoring is performed at the work site and surrounding areas.

- Ensure that occupational monitoring is provided for workers who may come in contact with radiologically contaminated material.
- Reviewing planned site activities and implementing radiation protection procedures to ensure safe performance and completion of the work.
- Review worker and activity exposure to ensure decommissioning activities are conducted in accordance with the ALARA policy.
- Review and approve Radiation Work Permits.
- Waste management, including inventory, processing, packaging, classification, storage, transportation and disposal.
- Interface with site and local emergency response services.

e. Site Safety and Health Officer (SSHO)

The principal functions of the Site Safety and Health Officer (SSHO) is the development and oversight of Safety Programs.

The primary responsibilities of the SSHO include:

- Develop, implement and verify compliance with the safety program.
- Ensure that all required monitoring is performed at the work site and surrounding areas.
- Ensure that occupational monitoring is provided for workers who may come in contact with chemically contaminated material.
- Reviewing planned site activities and implementing safety, health and radiation protection procedures to ensure safe performance and completion of the work.
- Review and approve Hazardous Work Permits, Confined Space Entry Permits, etc.
- Hazardous waste management, including inventory, processing, packaging, classification, storage, transportation and disposal.
- Interface with site and local emergency response services.

f. Quality Assurance Engineer

The primary responsibilities of the Quality Assurance Engineer include:

- Overviews of project management's development, implementation, and maintenance of procedures.
- Coordinate and assisting project management in the preparation of procedures.
- Assure that an adequate training program for quality personnel is developed, implemented, and maintained to support the performance of verification functions.
- Assure that subcontractors establish a QA program applicable to their scope of work or utilize the TCAAP QA Program.
- Perform audits, surveillance, and inspections of activities affecting quality in order to evaluate effectiveness and compliance with requirements (if necessary, stopping unsatisfactory work, or controlling the further processing, delivery, or installation of nonconforming materials).
- Provide interpretation of QA program requirements.

1. Job Position Qualification Requirements

a. Contractor Project Manager

The Contractor Project Manager should have a baccalaureate or higher degree in an engineering or scientific field. The Project Manager should have ten years of nuclear facility experience, of which three years should be nuclear facility decommissioning experience. A minimum of four years of the remaining seven years of experience may be fulfilled by academic training on a one-for-one time basis.

b. Decontamination/Demolition Supervisor

The Decontamination/Demolition Supervisor should have seven years of management experience, a minimum of one year of which should be nuclear facility experience. A maximum of two years of the remaining six years of nuclear facility experience may be fulfilled by satisfactory completion of academic or related technical training on a one-for-one time basis. The individual should further have nondestructive testing familiarity, craft knowledge, and an understanding of electrical, and piping codes.

c. Radiation Safety Officer (RSO)

The RSO will remain on-site, as required, and should have experience in applied radiation protection at nuclear facilities dealing with radiation protection problems and programs similar to those at the TCAAP. The individual should have technical competence to establish radiation protection programs and the supervisory capability to direct the health physics staff required to implement the radiation protection program. The individual should have at least three years experience in applied radiation protection work in a nuclear facility dealing with radiological problems similar to those encountered at the TCAAP. In addition, the RSO should provide technical direction and ensure the conduct of appropriate evaluations to verify that the site program is implemented.

d. Site Safety and Health Officer (SSHO)

The SSHO will remain on-site, as required, and should be knowledgeable and have experience in the applicable safety standards and regulations and programs similar to those at the TCAAP. The individual should have technical competence to establish safety programs and the supervisory capability to implement the safety program. The individual should have at least three years of this experience in safety and health work in a facility dealing with decontamination and demolition problems similar to those encountered at the TCAAP. In addition, the SSHO should provide technical direction and ensure the conduct of appropriate evaluations to verify that the site safety program is implemented.

e. Quality Assurance Engineer

The QA Engineer should have three years of experience in the field of quality assurance, preferably at a nuclear facility. At least one year of this three years of experience should be nuclear facility experience in the overall implementation of the quality assurance program. (This experience should be obtained within the quality assurance organization.) A minimum of one year of this three-year experience should be related technical or academic training.

f. Health Physics Technician

Health Physics Technicians should have three years of working experience in their specialty of which one year should be related technical training. Technicians should possess a high degree of manual dexterity and ability and should be capable of learning and applying basic skills. Health Physics Technicians meeting the requirements of ANSI 3.1 (Ref 8.1.4) qualify for this work.

2.3.4 Contractor Radiation, Safety and Health Regulations

The Contractor will comply with all applicable federal, state, and local radiation, safety and health regulations. Additional guides, guidelines, consensus standards and technical reports have been prepared to assist in complying with applicable regulations.

1. Regulations

Federal regulations that are applicable to decommissioning (research reactors) appear in the Code of Federal Regulations (CFR). While all the federal government regulations are contained in the CFR, different titles are associated with various government agencies, commissions, and administrations. Some of the regulations under the titles have immediate applications in decommissioning, and some have application by implication of related subject matter.

2. Code of Federal Regulations

10 CFR Part 19	Notices, Instructions, and Reports to Workers; Inspections
10 CFR Part 20	Standards for Protection Against Radiation
10 CFR Part 30	Rules of General Applicability to Domestic Licensing of By-product Material
29 CFR Part 1904	Recording and Reporting Occupatic al Injuries and Illnesses
29 CFR Part 1910	General Industry Standards
29 CFR Part 1926	Construction Industry Standards
10 CFR Part 61	Licensing Requirements for Land Disposal of Radioactive Waste
10 CFR Part 71	Packaging of Radioactive Material for Transport and Transportation of Radioactive Material under Certain Conditions
10 CFR Part 140	Financial Protection Requirements and Indemnity Agreements
49 CFR Parts 171-180	Department of Transportation Hazardous Material Regulations
40 CFR Part 61	National Emission Standards for Hazardous Air Pollutants
40 CFR Part 141	National Primary Drinking Water Regulations
40 CFR Part 260	Hazardous Waste Management System General
40 CFR Part 261	Identification and Listing of Hazardous Wastes

40 CFR Part 262 Standards Applicable to Transporters of Hazardous Waste

40 CFR 268 EPA Land Disposal Restrictions

3. Guides

Regulatory bodies such as the NRC and the EPA, prepare regulatory guides that suggest agency-approved methodology and solutions to problems. While compliance with them is not a legal requirement, they generally provide the most effective method of obtaining approval for a particular course of action. The NRC Regulatory Guides that may be relevant and appropriate to this project are as follows:

NRC Regulatory Guide Number	Title
1.8	Personnel Qualification and Training
1.16	Reporting of Operating Information
3.65	Standard Format and Content of Decommissioning Plans for Licenses Under 10 CFR 30, 40, and 70
8.2	Guide for Administrative Practices in Radiation Monitoring
8.6	Standard Test Procedures for Geiger-Muller Counters
8.7	Occupational Radiation Exposure Records Systems
8.8	Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be As-Low-As-Reasonably-Achievable.
8.9	Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program
8.10	Operating Philosophy for Maintaining Occupational Radiation Exposure As-Low-As-Reasonably-Achievable

8.15Acceptable Program for Respiratory Protection

4. Standards

A number of institutions or technical societies publish standards which do not carry the force of a law, but do represent the formal statement of technical opinion of the bodies issuing them.

ANSI N13.13	Control of Radioactive Surface Contamination of Material, Equipment, and Facilities to be Released for Uncontrolled Use (Draft)
ANSI Z88.2	Practices for Respiratory Protection 1980
ANSI N13.1	Cuide to Sampling Airborne Radioactive Materials in Nuclear Facilities
ANSI N323	Radiation Protection Instrumentation Test and Calibration 1977
ASTM E 1167	Standard Guide for Radiation Protection Program for Decommissioning Operations
ASTM E 1281	Standard Guide for Nuclear Facility Decommissioning Plans

5. Guidelines and Technical Reports

Guidelines published by the NRC can be found in NUREG documents, Branch Technical Position papers, Inspection and Enforcement Branch notices, and other external or internal documents.

NUREG/CR-1754	"Technology, Safety, and Costs of Decommissioning Reference Non-Fuel Cycle Nuclear Facilities"
NUREG-0586	"Draft Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities"
NRC Guideline	"Guidance and Discussion of Requirements for an Application to Terminate a Non-power Reactor Facility Operating License"

NUREG/CR-2241	"Technology and Cost of Termination Surveys Associated with Decommissioning of Nuclear Facilities"
NUREG/CR-5512	"Residual Radioactive Contamination from Decommissioning, Technical Basis for Translating Contamination Levels to Annual Total Effective Dose Equivalent"
NUREG/CR-5849	"Manual for Conducting Radiological Surveys in Support of License Termination," Draft Report for Comment

3.0 RADIATION PROTECTION AND RADWASTE PROGRAM

A radiological characterization of the TCAAP facility was conducted to identify and characterize the extent of radioactive contamination in buildings and outdoor areas which were known to have housed operations involving radioactive materials. This characterization was conducted in June and July of 1997 and the results are reported in *Characterization Study Report for the TCAAP Depleted Uranium Facilities*, New Brighton, Minnesota, August 1997, GTS Duratek. This characterization data was used to help determine the requirements for the radiation protection, training, and radioactive waste management programs.

3.1 Radiation Protection Program

The radiation protection program will ensure that all radiological activities conducted during the Twin Cities Army Ammunition Plant decommissioning project will comply with regulatory requirements by performing program operations according to procedural guidelines. The program further ensures that radiological hazards will be monitored and evaluated on a routine basis to maintain radiation exposures and the release of radioactive materials to unrestricted areas as far below specified limits as reasonably achievable.

The radiation protection program should be integrated into all decommissioning project work activities, and each element of the program will be specifically defined and implemented using a three-tiered document structure. Implementation of the program in accordance with the following documents will ensure that the administrative guidelines and State and Federal regulations are not exceeded:

- Health and Safety Plan which includes radiation protection
- Radiation protection implementing procedures

The highest tiered document of the program is the Health and Safety Plan (HASP). The HASP is written to function as a program overview by describing the essential elements of the program. The HASP provides definitions for the radiation protection organization, responsibilities, authorities and qualifications, administrative policies, program objectives and standards to implement the radiation protection program.

The HASP also provides the policy statements for respiratory protection and the ALARA elements of the program. These policy statements are presented in the highest tiered document to enforce the commitment of management to incorporate these program principles and philosophy into all decommissioning project work activities. This commitment will ensure that the occupational radiation exposures for individual and collective doses, external and internal radiation exposures and the releases of radioactive effluents are ALARA.

The implementing procedures provide step-by-step guidance for performing specific tasks and methods used to maintain a radiologically safe working environment. Implementing procedures specify the types of instrumentation and the methods to be employed when performing surveys and obtaining samples. Examples of typical implementing procedures for surveillance include:

- Radiation, contamination and airborne radioactive material surveys;
- Identification and posting of radiation, contamination and airborne radioactivity areas;
- Access controls for radiation, contamination and airborne radioactivity areas;
- Protective clothing selection, issue, donning and removal;
- Protective clothing collection, cleaning, survey and reissue;
- Personnel contamination monitoring and decontamination;
- Radiological protection incidents and reports; and
- Radiation protection surveillance, evaluation and assessment programs.

The following sections describe major elements of the program, in addition to those previously discussed.

3.1.1 Radiological Surveillance and Work Area Controls

Additional elements of the radiation protection program include radiological evaluations (radiation, contamination, airborne surveys), RWP preparation, area postings and implementation of radiological controls.

1. Radiological Surveys

   Radiological surveys will be performed to monitor the radiological environment, identify radiation sources which may be encountered at TCAAP, and meet the requirements of 10CFR20. These surveys should identify and measure external radiation, airborne radioactivity and surface contamination, including gamma, beta, and alpha radiation.

Results will be documented on survey forms or recorded in logs. This information should be available to personnel entering the radiological area. The information on the survey form may include a sketch or map of the area, contact and general area dose rates, contamination levels, identification of specific hazards such as hot spots, and the location of radiological boundaries.

A supervisory review should be performed on all surveys to ensure that they are appropriate and adequate, and that all information is properly recorded. The supervisor reviewing the survey should ensure that the results are consistent with those anticipated and, if not, should determine the reason for the variance.

Survey frequencies should be based on the hazard which may be encountered, the potential for changing radiological conditions, and the frequency of occupation. Surveys should be performed to provide positive verification that radioactive materials are being adequately controlled and are not spreading to uncontrolled areas.

2. Radiation Work Permits

A Radiation Work Permit (RWP) should be used for the administrative control of personnel entering or working in areas that have, radiological hazards present. Work techniques should be specified in such a manner that the exposure for all personnel, individually and collectively, are maintained ALARA. RWPs should not replace work procedures, but should act as a supplement to procedures. Radiation work practices should be considered when procedures are developed for work which will take place in a radiologically controlled area.

Project RWPs should describe the job to be performed, define protective clothing and equipment to be used, and personnel monitoring requirements. RWPs should also specify any special instructions or cautions pertinent to radiation hazards in the area including listing the radiological hazards present, area dose rates and the presence and intensity of hot spots, loose surface contamination, and other hazards as appropriate. The radiation protection organization should ensure that radiation, contamination, and airborne surveys are performed as required to define and document the radiological conditions for each job.

RWPs for jobs with low dose commitments should be approved at the technician or supervisory level while RWPs for jobs with significant radiological hazards should be approved by the RSO. Examples of topics covered by the implementing procedure for Radiation Work Permits are:

- Requirements, classifications and scope for RWPs;
- Initiating, preparing and using RWPs;
- Extending expiration dates of an RWP; and
- Terminating RWPs.

3. Area Controls

Areas at TCAAP which present a radiological hazard should be posted in such a manner that personnel are made aware of the presence and extent of the hazards in the area. Areas will be posted based on the hazard evaluation and will be in accordance with 10CFR20 regulations. Access restrictions and entry requirements for areas will be based on the degree of hazard present.

3.1.2. Facilities and Equipment

Sufficient facilities, equipment, and instrumentation will be available to permit the radiation protection staff to function efficiently. The facilities, and types and quantities of instruments provided should be adequate to meet activity needs for the duration of the project. Radiation protection facilities may include the following:

- Sample analysis;
- Bioassay;
- Instrument issue, storage and calibration area;
- Access and egress control areas;
- Protective equipment cleaning, storage and issue areas;
- Personnel change areas; and
- Personnel, equipment and materials decontamination area(s).

Radiation protection equipment may include sample counting equipment, portable survey instruments, protective equipment, and consumables such as smears and decontamination supplies.

Areas will be provided for the storage, repair, calibration, and issuance of the project's instrumentation. The operation, repair and calibration of instrumentation will be performed in accordance with ANSI standards and manufacturers' recommendations as detailed in procedures. These procedures describe the proper techniques and the limitations for the specific piece of equipment. Examples of topics for instrumentation procedures are:

- Radiation protection instrumentation and equipment program;
- Calibration, repair, control, issue, and use of radiation protection instruments; and
- Use, control and accountability of radioactive sources.

3.1.3. Exposure Control

Exposure control includes both the monitoring and regulation of radiation exposure. Internal monitoring for radiation exposure will be performed during this project. External exposure need not be monitored. The levels of contamination and measured dose rates in the area do not warrant the issue of external radiation dose monitoring equipment. The dose to any individual from external sources of radiation are not expected to exceed 10 percent of the applicable occupational dose limits specified in 10CFR20.1502.

Internal monitoring will initially be required of project personnel assigned to the site. Urine samples will be collected prior to being assigned on-site responsibilities, in the first month following the end of a calendar year and at the completion of on site work. Samples will be analyzed by a qualified vendor service.

If based on project experience it can be demonstrated that individuals will not exceed 10 percent of the applicable occupational dose limit additional workers assigned to the project will not require internal monitoring. In addition, if it can be demonstrated that individuals currently participating in the internal monitoring program will not exceed 10 percent of the applicable occupational dose limit, they may terminate their participation of the end of the calendar year once the required bioassay sample has been provided.

It is will be contractor policy that detectable contamination on personnel be maintained ALARA. In keeping with the spirit of this policy, efforts will be made to keep personnel contamination levels at or near zero. Personnel monitoring for beta-gamma contamination will be performed with a hand held pancake type detector. The system alarm set point will be set to provide a detection limit of 5,000 dpm/100 cm^2.

3.1.4. Respiratory Protection Program

The respiratory protection program will be established in accordance with 10CFR20.1702, ANSI Z88.2, NRC Regulatory Guide 8.15, NUREG-0041, "Manual of Respiratory Protection Against Airborne Radioactivity Materials" and 29CFR1910.134.

Elements of the respiratory protection program include:

- Training programs;
- Medical evaluations;
- Fit testing and equipment and personnel evaluations;
- Respiratory protection maintenance and issue records;
- Complying with air quality standards for supplied breathing air systems; and
- Bioassay.

1. Program Administration

   The Health Physics Supervisor (HPS) or designee will provide administrative control of the respiratory protection program. This includes:

   - Overall program development, technical direction, and the evaluation of program effectiveness;
   - Interfacing with project management to provide technical guidance for the control of airborne radiological contaminants;
   - Approving procedures, training materials and directives relative to the program; and
   - Routinely conducting overviews of the program for compliance with policy, procedures and regulations.

2. Respirator User Qualification

   A. Medical Evaluation

      All respirator users will be screened and/or examined to establish physical and psychological capabilities necessary to perform tasks using a respirator.

B. Training

Personnel who will use respiratory protection shall complete respiratory protection training every year (12 calendar months). This training should be approved by the HPS and will consist of a written lesson guide, handout and exam.

C. Respirator Fit Testing

Personnel should be quantitatively fit tested prior to the first use of respirators requiring a face piece-to-face seal and on an annual basis. An interim qualitative fit test procedure may be implemented when quantitative testing is unavailable.

3. Respiratory Protection Equipment Description and Selection

The requirement for and selection of respiratory protection equipment for radiological purposes should normally be determined and approved as part of the RWP process. Project supervisors will be requested to monitor personnel compliance with RWP requirements. Only NIOSH certified respiratory protection equipment will be used unless NRC approval is given for a specific respirator use/application. Routine and emergency issuance of respirators will be performed in accordance with applicable radiation protection procedures.

4. Equipment Inspection and Maintenance

Requirements and techniques for inspection and maintenance of respiratory protection equipment will be performed in accordance with procedures which implement manufacturers' and regulatory requirements.

Respirators will be cleaned, sanitized, inspected and maintained in accordance with approved procedures. Respirator repairs shall be performed by qualified personnel with parts designed for the respirator. Parts shall not be substituted from a different brand or type of respirator. Respirators ready for use shall be stored to protect against dust, sunlight, heat, extreme cold, excessive moisture, and damaging chemicals.

3.1.5. Radioactive Materials Control Program

Radioactive material control will be implemented through procedures. The radioactive materials control program should be effective in preventing the spread of radioactive materials. Surveys will be conducted on all personnel, equipment, or material leaving radiologically controlled areas to ensure that radioactive material is not released to off-site areas. Some equipment, such as radiation protection survey instruments, may be conditionally released from the RCA provided they are in the custody of radiation protection personnel or the equipment is being moved from one RCA directly to another. Examples of radioactive materials control procedures include:

- Packaging and storage of solid and liquid radioactive materials;
- Radioactive contamination limits;
- Personnel contamination monitoring;
- Contaminated area controls;
- Contaminated equipment and material identification and control;
- Radioactive source control; and
- Use of containment devices, tents and glove bags.

1. Radioactive Material Storage

   Radioactive material should be stored in specially designated areas. These areas may contain reusable equipment and tools, waste awaiting processing, wastes or other materials prepared for shipment, or equipment and tools awaiting decontamination or reuse. Controls for these storage areas are described in procedures. Procedures describe posting requirements, access controls, survey requirements and controls placed on the movement of equipment/materials to and from the storage area.

2. Contamination Control Program

The contamination control program is designed to reduce and minimize contaminated areas, tools, and components within the project, prevent the spread of radioactive contamination and maintain releases of radioactive materials ALARA. Major components of this program include the identification, posting and control of contaminated areas, decontamination of tools, equipment and areas, engineering controls, and monitoring. Procedures provide guidance for identifying the extent of contaminated areas, reducing contaminated areas, and decontamination of components, tools, equipment and material.

3. Byproduct Material Control

Byproduct materials include radioactive sources used by the organization for instrument calibration and functional testing. Procedures specify the requirements for the overall control and accountability of byproduct materials including material receipt, leak testing, accountability, safe handling, and disposal

3.1.6. Ensuring that Occupational Radiation Exposures are As Low As Reasonably Achievable (ALARA)

All remediation activities should be planned and conducted in accordance with the ALARA principles. All contractors shall place the highest priority on conducting the TCAAP remediation project safely and maintaining exposures to ionizing radiation ALARA. The levels of contamination and measured dose rates in the area do not warrant the issue of external radiation dose monitoring equipment because the dose to any individual from external sources of radiation are not expected to exceed 10 percent of the applicable occupational dose limits specified in 10CFR20.1502.

The primary objective of the TCAAP ALARA plan is to minimize the internal exposure of workers, visitors and the general public to ionizing radiation to the maximum extent practicable, with social, technical and economic factors taken into consideration.

1. Management Commitment

Management will provide full support and commitment to reducing individual and collective exposures and ensuring appropriate controls to minimize the potential for release of radioactive material to the environment.

All project personnel will be made aware of management's commitment and instructed on their responsibility to execute project activities in accordance with the ALARA principles. This commitment will be documented and regularly affirmed through training programs.

2. Radiological Work Planning

TCAAP remediation activities inside the restricted area (radiological work) shall be conducted in accordance with specific radiation protection procedures to control workers' exposure and the spread of radioactive material. The following considerations may be factored into all work plans:

A. Determine needed tools, parts, equipment, etc. before the work begins and organize work to minimize decontamination requirements;

B. Coordinate efforts of different groups, such as decontamination, demolition, radiation protection, so work can proceed in a systematic and efficient manner;

C. Minimize the number of workers assigned to contaminated areas;

D. Coordinate work by area so that work, such as scaffold installation and removal, is not duplicated for multiple tasks to be performed in contaminated areas.

3.2 Asbestos Protection Program

The TCAAP facility includes building products that contain asbestos. These building products will be removed during building demolition activities and may release respirable fibers depending on it's degree of friability. It can cause disabling respiratory disease and various types of cancers if the fibers are inhaled. Employees exposed to asbestos in the workplace or work operation are subject to the requirements in 29CFR1910, 1001 and CFR part 1926.1101.

Personnel who are not asbestos trained workers will not be allowed to enter into regulated areas wherever airborne concentrations of asbestos and/or potential asbestos containing material exist. Asbestos containing materials that are to be disposed of must be placed in approved leak-tight containers. The following guidelines will be adhered to when working around asbestos:

- Only licensed asbestos workers with appropriate training on its proper handling and storage will be allowed to work with asbestos.
- Warning signs shall be provided and displayed at each regulated asbestos area. In addition, warning signs shall be posted at all approaches to regulated areas so that an employee may read the signs and take necessary protective steps before entering the area.
- Warning labels shall be affixed to all raw materials, mixtures, scrap, waste, debris, and other products containing asbestos fibers, or to their containers.

3.3 Training

This section presents the training requirements for workers involved with decommissioning activities at TCAAP. All decommissioning workers at TCAAP will be required to receive training appropriate to their activities. Decontamination workers are workers involved with the actual decontamination of areas contaminated with radioactive materials. They will be required to receive all training indicated in this subsection. Administrative personnel assigned to do a limited task in a nonhazardous area may receive a limited amount of training.

The goals of the training program include:

- Instructing each worker of the general hazards of the site.
- Instructing each worker of the specific hazards of the activity they will perform.

- Indicating to each worker the protective measures for each activity.

- Compliance with regulations.

The elements of the training program include:

- Participation of workers in off-site training courses.

- Initial instruction of each worker on the specific hazards of the TCAAP site when they start working on the site.

- Periodic briefings (i.e., daily, weekly) to reinforce safety training and to discuss new types of activities.

The requirements that the training program must meet include:

- All decontamination workers will be trained in accordance with OSHA regulation 29CFR1910.12, Hazardous Waste Operation. In general, workers will be required to receive 40 hours of training and 24 hours of supervised on-the-job training. Reduced training time may be permissible for personnel who perform limited activities in low-hazard areas as prescribed in the regulation. Supervisory safety personnel will receive an additional 8 hours of supervisory safety training as required by 29CFR1910.120.

- General Employee Training (GET) and associated testing shall be required for all workers entering a radiation control area. Documentation of training shall be by appropriate Environmental Health and Safety (EH&S) form, currently "Training Record Sheet."

  Personnel having received substantial radiation safety training within the past year may, upon demonstration of their knowledge to the satisfaction of the RSO, be exempt from general employee training. Personnel exempt from the GET and Respiratory protection (radiation protection) training must document the most recent training which meets or exceeds these requirements. Regardless of previous training, all workers will be required to take and pass the GET and radiation protection test before they will be allowed in a radioactive work environment. Workers who do not pass the test will be required to attend the training course until they pass or are determined not qualified to perform the assigned tasks.

- Individuals performing asbestos sampling shall have completed the Asbestos Hazardous Emergency Response Act (AHERA) training course for asbestos inspectors.

- All personnel working with radioactive materials or working in the vicinity of radioactive materials will be trained in accordance with the NRC regulation 10CFR19.12.

- All decontamination workers will be required to receive respiratory protection training in accordance with 20CFR1910.134, ANSI Z-88.2, NRC Regulatory Guide 8.15, and NRC NUREG-0041.

- All decontamination workers will be required to receive hearing conservation training in accordance with 29CFR1910.95.

- All workers will receive hazard communication training in accordance with 29CFR1926.59. This training will include a discussion of radiation risks as contained in NRC Regulatory Guides 8.13 and 8.29.

TCAAP will audit worker qualifications and training. Workers who do not have adequate radiation training will be required to receive training prior to working on the site.

3.4 Radioactive Waste Management

This section addresses the technologies, equipment, and procedures to be implemented for the management of radioactive waste during the project. These technical approaches are based upon site characterization data, experience, and economic evaluations. These approaches address facets of planning, decontamination, packaging, storage, transportation, volume reduction or beneficial reuse, and final disposition of the waste materials while minimizing secondary wastes.

In developing the radioactive waste management program, the following elements were considered:

- Location and availability of disposal facilities;
- Potential for off-site release during decommissioning operations;
- Preventing contamination of uncontaminated areas;
- Use of existing facilities to support the waste packaging operations;
- Methods of approach related to waste type and impact on safety;
- Cost effectiveness;

- Logical approach to remediation operations;
- Minimizing the impact on the health and safety of the general public;
- Maintaining flexibility for waste management to allow for unexpected wastes and changes in available technology; and
- Minimization of radioactive waste.

On-site packaging or processing of radioactive waste prior to transportation will be performed in areas designated for these activities. Items not considered for decontamination will be packaged and prepared for possible shipment to a licensed disposal facility.

Currently, no sources of mixed waste have been identified. No chemicals or other substances are anticipated to be used during decommissioning operations that may become hazardous wastes or result in mixed waste. To reduce or avoid the generation of mixed wastes, project management will control the use of any chemical or other substance that may become a mixed waste concern.

If mixed waste is identified during decommissioning, it will be classified and stored on-site until declassified or approved for disposition. The mixed wastes will be managed according to Subtitle C of RCRA to the extent it is not inconsistent with NRC handling, storage and transportation regulations.

3.4.1. Waste Disposal Guidance

There are several categories of waste where specific disposition guidance can be given. These are categories include asbestos, radioactive waste, large contaminated wood items, non-radioactive construction debris.

1. Asbestos waste

There is asbestos in the roofing material on many of the structures of the DU Room. The roofing material is not contaminated and can be disposed of at a local facility licensed for disposal of asbestos. The roofing material will be placed in containers approved for asbestos use.

There is asbestos in the shingle siding on most of the structures of the DU Room. The shingles are not contaminated and can be disposed of at a local facility licensed for disposal of asbestos. The shingles will be placed in containers approved for asbestos use. One local asbestos disposal facility is Central Disposal Systems, Inc., 21265 430th Street, Lake Mills, Iowa 50450 (515) 592-9182.

There is asbestos in some of the pipe insulation in many of the structures of the DU Room. The pipe insulation is also contaminated and it should be disposed of as radioactive waste at the licensed disposal facility at Envirocare of Utah.

2. Radioactive Waste

The radioactive construction debris will be disposed of as radioactive waste at the licensed disposal facility at Envirocare of Utah. This includes asbestos, wood, aluminum siding, fiberglass insulation, drywall material, suspended ceiling materials, piping, wiring, electrical conduit, concrete rubble, and soil.

3. Contaminated Wood

Most of the contaminated wood will be disposed of as radioactive waste as indicated above. However, some of the large items such as heavy construction timbers can be decontaminated by planing to remove the contaminated surface material, then surveying and releasing the wood for unrestricted use. This wood can then be reused or sold. The removed contaminated surface wood will be disposed of at Envirocare of Utah as indicated above.

4. Non-Radioactive Construction Debris

The non-radioactive construction debris will be disposed of as regular construction debris at a local facility designated for disposal of construction debris. This debris will be surveyed to verify that it is not contaminated prior to being released for disposal. One such construction debris disposal facility is SKB Demolition Landfill, 251 Starkey St., St Paul, MN 55107, (612) 224-6329. This debris will probably include materials from the second floor of some of the structures of the DU Room such as drywall, fiberglass insulation, suspended ceiling materials, piping, wiring, and electrical conduit. It may also include aluminum siding and concrete rubble.

3.4.2. Radioactive Waste Processing

1. On-Site Radioactive Waste Volume Minimization

Minimization of radioactive waste requiring disposal is a high priority during the project. Project management will incorporate the radioactive waste minimization practices into work procedures. It is not anticipated that any materials will be sent off-site for processing because it is not anticipated that it will be economical as compared to disposal at Envirocare of Utah. The following elements will be included in the plan:

A. Radiation Worker Training will identify policies and practices to prevent the unnecessary generation of mixed or radioactive wastes.

B. Unnecessary generation of radioactive and mixed wastes should be minimized by controlling chemicals brought on-site, and preventing unnecessary packaging, tools and equipment from entering radiologically controlled areas.

C. Some materials should be reused during the decommissioning. This typically includes contaminated tools, equipment and clothing.

D. The volume of radioactive waste should be minimized by decontaminating areas and equipment where practical, and by segregating waste into radioactive and non-radioactive, where practical.

E. Decontamination activities should be evaluated and planned to minimize the inadvertent generation of secondary waste volumes as a result of decontamination processes.

F. Bulky material should be dismantled or cut up to reduce volume.

G. Waste containers should be packaged so that void space is minimized. Space around large bulky objects will be filled with small items and debris. However, for the waste to be sent to Envirocare of Utah, each waste item in the package must have one dimension equal to or less than 10 inches. The waste is disposed of in 10-inch thick layers at the Envirocare site.

2. Radioactive Waste Categories

Radioactive materials, as categorized below, will be evaluated to determine the optimum method for release, decontamination, or for burial.

A. *Potentially Contaminated or Requiring Minor Spot Decontamination* - This category includes potentially contaminated materials that appear to be uncontaminated; where all surfaces are easily accessible; and for which the cost of surveying and release is less than the cost for disposal as radioactive waste. These materials will be surveyed to determine if the material can be released for unrestricted use without decontamination or require minor decontamination before release.

B. *General Contamination with Accessible Surfaces and A Low Area-to-Weight Ratio* - This category includes large volumes of materials with readily accessible surfaces for purposes of surveying and decontamination and for which the cost of decontamination and surveying and release is less than the cost for disposal as radioactive waste (usually possess a low surface area-to-weight ratio). These materials may also be shipped directly to a licensed off-site processing facility for decontamination of the surfaces and final disposition.

C. *General Contamination/Inaccessible Surfaces/High Surface Area-to-Weight Ratio* - This category includes smaller metallic scrap or metals with inaccessible surfaces for performing surveys (e.g., previously sheared material). These materials will be assumed to be contaminated and packaged for shipment directly to the disposal facility.

3. Liquid Waste Processing System

Some contaminated water may be generated as a result of draining, decontamination, and cutting processes. The contaminated liquids will be processed in a temporary ion exchange and filtration facility. All liquid radioactive waste will be processed in accordance with applicable procedures for waste collection and discharge. Liquid waste processing will be monitored to assure safe operation, storage, packaging, and disposal of waste to approved waste disposal sites. Liquids released from site will be monitored and controlled to ensure all releases of radioactivity to the environment are as low as is reasonably achievable and are within regulatory requirements.

3.4.3. Radioactive Waste Disposal

1. Waste Classification

Proper classification of waste for disposal shall be conducted in accordance with procedures which implement the requirements of federal regulations and disposal site criteria. Procedures ensure that a realistic representation of the distribution of radionuclides in waste is known and that waste classification is performed in a consistent manner. Any of the following basic methods, used individually or in combination, will be used to achieve this goal: materials accountability (including process knowledge), classification by source, and gross radioactivity measurements.

Appropriate instrumentation will be used to determine the type and quantity of radioactive material in each waste stream. When radionuclide concentrations are determined, the curie content of each package can then be calculated. Characterization will be performed by monitoring and/or sampling before packaging, and the activity of DU can then be used to estimate the activity in the final package. Material will be defined as radioactive if it exceeds the limits in Table 2-1. Radioactive waste will be classified according to 10 CFR 61.

An estimate of the volume of radioactive waste generated during the project, including waste generated as a result of remediation activities, is provided in Table 3-2. This estimate assumes that bulky material such as ventilation ducts and large pipes, systems, etc., will be cut up prior to packaging.

Table 3-2
Estimated Volume of Radioactive Waste

Material	Unprocessed Volumes Cu Ft	Contaminated Burial Volumes Cu Ft	Clean Volumes Cu-Ft
Demolition Debris	78,500	56,972	21,528
Concrete	82,859	818	82,041
Soil	10,773	10,773	0
Wood	24,884	760	24,124
Decon Waste Volume	N/A	1,536	N/A
Asbestos	4,040	0	4,040
Lamp Ballasts	8	0	8
Fluorescent Lamps	32	0	32
PPE Waste*	368	368	0
Total	**201,464**	**71,227**	**131,774**

* PPE waste refers to Personal Protective Clothing such as coveralls and respirator filters requiring disposal as radioactive waste.

Waste volume estimates are subject to change as ongoing planning and remediation operations proceed.

2. Waste Packaging, Transfer and Storage

Classification of radioactive waste is required by 10CFR20, 10CFR61, and disposal site requirements. TCAAP decommissioning waste will be classified and loaded into appropriate containers at the location where it is generated. Waste will be surveyed, classified according to procedures, segregated by waste type and placed in appropriate disposal containers.

Waste will be packaged at the point of generation or a designated location within the containment structure. Packaging may include approved disposal containers or DOT approved transport containers such as bagging and/or wrapping, to facilitate safe transportation to other locations within the site for further processing.

After packaging, the waste will be transported to a staging area to be secured and labeled for shipment. If necessary, the waste container will be placed in an interim storage area.

Waste storage facilities planned for use during decommissioning activities include:

- Portions of the Centrifugal Cast Room may be used to house dry packaged waste;
- Trailers and sea/land containers may be stored and used on-site to house dry and solidified low level waste; and
- Selected yard areas may be used for short term storage of packaged waste staged for transport.

The interim storage area will be used for short-term storage of waste until it can be transported to a volume reduction or permanent disposal facility. Once all waste is removed from the storage locations, the areas will be surveyed and decontaminated, if necessary, and temporary structures removed.

3. Waste Transportation

Before waste is shipped from TCAAP, each package will be inspected to ensure it meets all applicable design and/or certification requirements and the container is not damaged or impaired. Most shipments are expected to be low specific activity (LSA) and will be shipped in exclusive-use vehicles. The majority of radioactive material and waste will be transported by truck.

Some of the relevant regulatory requirements are discussed below.

A. DOT Regulatory Requirements

All radioactive material/waste shipments shall be performed in accordance with Department of Transportation (DOT) and other applicable federal regulations, as well as burial site requirements.

B. Documentation

Radioactive waste shall be shipped to Envirocare of Utah licensed disposal facility. The following requirements shall be met:

- All required documents shall be complete and legible;
- The Radioactive Shipment Manifest (RSM), formerly RSR/Manifest, shall be complete in all details (49CFR172.200 Subpart C, 10CFR20.311, and radioactive waste disposal site requirements);
- The number of containers listed on the RSM shall be consistent with the physical count of containers loaded;
- All required certifications, RSMs, and other documents, as appropriate, shall be signed; and
- The use of abbreviations will conform to DOT and NRC specifications;
- Characterization reports shall be completed for each waste stream to sent Envirocare of Utah;
- Radioactive Waste Profile Records shall be completed for each waste stream to sent Envirocare of Utah.

C. Shipping Routes

The actual routing of shipments may vary with weather and highway conditions. Additionally, local and state restrictions pertaining to radioactive material transport may affect some route selections, particularly in congested metropolitan areas. The carrier is responsible for selecting the appropriate route, which must conform to applicable federal, state, and local shipping regulations and requirements.

D. Burial Site Criteria

- Each waste stream to sent Envirocare of Utah shall be analyzed at a Utah certified laboratory.
- Radioactive Waste Profile Records shall be completed for each waste stream to sent Envirocare of Utah.
- Pre-Shipment Samples shall be sent to sent Envirocare of Utah for each waste stream.

- A draft manifest is sent to Envirocare of Utah prior to the first shipment of a particular waste stream. A notice to transport will be provided by Envirocare of Utah after review of the draft manifest.
- A transportation schedule is required prior to the start of shipments to Envirocare of Utah.
- All Envirocare of Utah shipments require 10 days prior notification for arrival at the site.
- The most current, applicable Envirocare of Utah requirements shall be used when the shipments are made.

E. Quality Control

The quality control program shall provide assurance and verification of compliance with radioactive waste shipping regulations. The decommissioning contractor shall have the appropriate DOT certification. The quality control program includes the following items:

- Waste classification verification;
- Waste container inspection, including closure devices, seals and/or gaskets, integrity, etc.;
- Proper labels and markings;
- Transport vehicle loading, bracing and placarding;
- Contamination and radiation surveys; and
- Documentation and records.

F. Transport Vehicle

Containers loaded on the transport vehicle must be blocked and braced to prevent a change in position during conditions normally incident to transportation (49CFR177.425 and 177.842d).

G. Exclusive-Use Vehicle Requirements

The radioactive waste packaged for shipment to Envirocare of Utah should conform to the conditions and limitations in 49 CFR 173.421 for radioactive material, excepted package-limited quantity of material, 7, UN2910. The waste will be shipped using exclusive-use vehicle shipment requirements. Specific instructions for maintenance of exclusive-use shipment controls must be provided by the shipper to the carrier and be included with the shipping paper information.

The following are requirements for exclusive-use vehicle shipment:

- Shipments must be loaded by consignor and unloaded by consignee. The consignor shall be the representative who has the authority to approve packaging and shipping radioactive waste from this project;
- There must be no loose radioactive material in the conveyance;
- The shipment must be braced to prevent shifting of lading under conditions normally incident to transportation (49 CFR 173.425);
- Radioactive material, excepted package-limited quantity vehicle shipments of radioactive materials are exempt from specification markings and labeling.

3.4.4. Disposal of Non-Radioactive Waste

Non-radioactive wastes will be disposed of by release to appropriate disposal facilities such as landfills, scrap yards and scrap recovery facilities. Materials that are inappropriate for surface surveys, such as resin fines, will be sampled and appropriately analyzed. Materials found to be non-contaminated will be disposed of as non-radioactive waste.

4.0 FINAL RADIATION SURVEY

4.1 Introduction

The objective of the final radiation survey is to demonstrate the effectiveness of the decommissioning and to provide documentation that contaminated materials, structure areas and components have been successfully removed/decontaminated to acceptable levels to remove the Twin Cities Army Ammunition Plant (TCAAP) from Alliant Techsystems, Inc. license. The final radiation survey should be performed following the completion of the decontamination and dismantlement activities. Materials and equipment determined to be free of radioactive contamination may be unconditionally released on an on-going basis.

Radiological surveys will be conducted in accordance with approved procedures using techniques that determine the effectiveness of a particular dismantlement and/or decontamination effort. These surveys should indicate when no further decontamination is needed and indicate that the equipment, area or structure has been successfully remediated to the requirements of NRC, *Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material*, April 1993 (Ref 8.2.25).

This section describes the methodology and criteria that should be used in performing the final surveys. This includes definition of residual radioactivity limits (including background evaluation), radiation survey methods, and material release criteria.

4.2 Final Release Criteria

The unrestricted release of TCAAP equipment and materials will be based on proper application of surface contamination release criteria. Criteria for both loose and fixed surface contamination to allow release for unrestricted use have been established in NRC, *Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material*, April 1993 (Ref 8.2.25). This criteria is also presented in Section 2.0, Table 2-1. All final surveys for surface contamination on materials and equipment to be released for unrestricted use shall be based on this criteria.

4.3 Instrumentation

Instrumentation to be used for the final site survey should be of such types and ranges to ensure that measurements can be performed within the unrestricted release criteria limits.

4.3.1 Portable Instruments

Portable field instruments should be chosen based on sensitivity, durability, ease of use, accuracy, and portability. These instruments may include:

- Rate meters with thin window GM tube detectors ("Pancake" Type) sensitive to gross beta radiation.
- Rate meters with scintillation or air proportional detectors sensitive to gross alpha radiation.
- A 100 cm^2 gas-flow proportional detector with data logging capability for alpha and beta measurements of large flat surfaces.
- μR meters sensitive to gross gamma radiation.
- Rate meter with scintillation detectors sensitive to gross gamma radiation.
- Portable multichannel analyzer with semiconductor detector(s) for field gamma spectral analysis.
- Portable scaler(s) with detectors sensitive to alpha, beta and/or gamma radiation.

The radiation detection instruments and their characteristics which may be used during the final survey are summarized in Table 4-1. The details of the surveys and instrumentation to be used should be included in procedures to be prepared by the decommissioning contractor.

4.3.2 Laboratory Instruments

Laboratory instruments for onsite analysis should be chosen based on sensitivity, durability, ease of use, accuracy, and stability. Some laboratory analyses may be performed offsite in which case the type of analysis required, the minimum detectable activity and confidence level should be specified. Onsite analytical instruments may include:

- Multichannel analyzer with semiconductor detector(s) for gamma spectral analysis.
- Liquid scintillation counter with adjustable window(s).
- Scaler(s) with scintillation or gas flow proportional detector sensitive to gross alpha radiation.
- Scaler(s) with GM or gas flow proportional detector sensitive to beta-gamma radiation.

Table 4-1
Typical Radiation Survey Equipment

Instrument	Type of Radiation	Lower Limit of Detection (LLD)[1]
Sodium Iodide (NaI)	Gamma and X-ray	1 μR/hr
Pressurized Ionization Chamber	Gamma and X-ray	Less than 1 μR/hr
Zinc Sulphide (ZnS)	Alpha	32 dpm/100 cm^2
Pancake Geiger-Mueller (G-M)	Beta, gamma and X-ray	2,700 dpm/100 cm^2
ZnS Alpha Swipe Counter	Alpha	2 dpm/100 cm^2
Plastic Scintillator Beta Swipe Counter	Beta	30 dpm/100 cm^2
Gas-Flow Proportional Detector	Alpha and Beta	1000 dpm/100 cm^2 Beta 20 dpm/100 cm^2 Alpha
Lab Gamma Spec	Gamma and X-ray	< that 25% of the guidelines values

[1] Estimated value based on counting time, detector efficiency, and background readings.

Instruments will be calibrated, maintained and repaired in accordance with procedural requirements. Calibration sources to be used for calibration of both field and laboratory instrumentation will be traceable to National Institute of Standards and Technology (NIST) or equivalent standards. Procedural guidance will also be provided for quality assurance and control program for all instruments used as part of the final survey plan.

4.4 Survey Methodology

The final radiation survey of the TCAAP facility will be performed using standard radiation and contamination survey techniques. The guidelines contained in NUREG/CR-5849 (Ref. 8.2.27) will be used to when performing this survey.

4.5 Documentation

Survey data should be presented in a manner that will allow the final radiological condition of the site to be completely and accurately depicted. This should allow independent evaluation of the radiological condition of the site without further analysis of the data.

5.0 DECOMMISSIONING COST ESTIMATE AND FUNDING PLAN

5.1 Source of Estimate

The Radiological Engineering and Field Services division of GTS Duratek, in conjunction with William T. Meyers Consulting Service, provided the independent decommissioning cost estimate. This cost estimate was developed using a systematic approach. Applicable release levels were identified, historical data reviewed, and a site characterization survey performed. Specific information regarding equipment and structures was used to optimize decontamination and demolition methodologies to minimize radwaste volumes and cost.

Itemized costs were determined, including costs for manpower and equipment resources, radioactive waste volume reduction, packaging, shipping and burial activities, and the performance of final status surveys for buildings and structures. The estimated decommissioning cost is $: * in terms of 1997 dollars, not including radioactive waste disposal.

5.2 Cost Estimate

The estimated cost to decommission the TCAAP facility in Arden Hills, Minnesota is $ * . A discussion of the cost estimating methods and a breakdown of this estimate into various cost categories is given in Appendix A. In arriving at this cost, the following assumptions were made:

- Radioactive waste is disposed of at the Envirocare site to be located in Utah. The cost for shipping for disposal has been included in this estimate but the disposal cost has not been included. This cost will be provided separately by Alliant Techsystems, Inc.

- Contaminated areas and equipment are decontaminated to free release activity levels when it is economical and feasible. A detailed economic analysis was performed for each area or equipment item to determine if decontamination was advisable.

- Contaminated items that cannot be economically decontaminated are volume reduced to minimize waste volumes prior to disposal. Volume reduction processing unit costs made available by the Scientific Ecology Group, Inc. (SEG) were utilized in optimizing volume reduction processing to minimize radwaste volumes and costs. SEG is an independent operating company owned by GTS Duratek.

* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

- Costs associated with the demolition and removal of non-contaminated equipment or structures are included in this cost estimate to the extent they are required to remove all DU Room equipment and structures.

- This estimate includes soil remediation and open land surveys.

- TCAAP project management costs, legal fees for license termination, permitting costs, costs for increased security, and costs for NRC verification surveys were provided by Alliant Techsystems, Inc.

5.3 Funding

Funding for decommissioning of the TCAAP at Arden Hills, Minnesota will come from appropriate Alliant Techsystems, Inc. sources.

Additional details on the financial assurance mechanisms are attached as Appendix E.

6.0 PHYSICAL SECURITY PLAN AND MATERIAL CONTROL AND ACCOUNTING PLAN PROVISIONS IN PLACE DURING DECOMMISSIONING

This section is not applicable for the decommissioning at TCAAP. Special nuclear materials are not allowed on this site and there is not a requirement for a NRC-approved physical security plan for this site.

7.0 DECOMMISSIONING QUALITY ASSURANCE PLAN

The decommissioning contractor will establish and implement a Quality Assurance Plan for the TCAAP decommissioning. The Quality Assurance Plan objectives are to protect the health and safety of the public and project personnel and to provide for Quality Assurance regarding project management, compliance with Quality Requirements listed in this document, and sampling and analysis Quality Control.

Compliance with this plan and project procedures is mandatory for TCAAP decommissioning activities; personnel shall, therefore, be familiar with the requirements and responsibilities applicable to their individual activities and responsibilities.

7.1 Quality Assurance Plan

The Plan will provide controls for the activities affecting quality and the health and safety of the general public and project personnel, including the use of appropriate equipment, suitable environmental conditions for accomplishing the activity, and assurance that all prerequisites for the given activity have been satisfied.

- The Plan shall be issued and approved by Alliant Techsystems and the decommissioning contractor.
- The Plan shall be documented by written procedures and implemented throughout the decommissioning project in accordance with those procedures.
- Management of those organizations participating in the Plan shall regularly review the status and adequacy of that part of the plan which they are implementing.
- All changes to the Plan shall be governed by measures commensurate with those applied to the original issue.

7.2 Quality Assurance Responsibilities

The Quality Assurance organizations of the decommissioning contractor and Alliant Techsystems, Inc. have the responsibility, authority and organizational freedom to:

- Identify quality problems.
- Take action to stop unsatisfactory work and control further processing, delivery, installation or use of nonconforming items
- Initiate, recommend, or provide solutions
- Verify implementation of solutions.

The decommissioning contractor has overall responsibility for the Quality Assurance (QA) Plan implementation and is responsible for verifying the effective execution of the plan.

7.3 QUALITY REQUIREMENTS

7.3.1 Instrumentation Calibration

Field instruments and associated detectors shall be calibrated on a semi-annual basis using National Institute of Standards and Technology (NIST) traceable sources and appropriate calibration equipment. Laboratory instruments shall be calibrated by the manufacturer on an annual basis.

Calibration labels showing instrument identification number, calibration date, and calibration due date shall be attached to all field and laboratory instrumentation.

7.3.2 Instrument Response Testing

Functional checks (source check, battery check, high voltage check, etc.) will be performed on all instruments on a daily basis, or when unusual readings are observed to verify proper performance. Instrument functional checks will also be performed whenever instruments are repaired, cleaned, or have the batteries replaced.

A performance study will be conducted for each type of instrument to determine the duration of the sampling period which is required to obtain a suitable LLD. The LLD should be a maximum of 50% of the release limits for contamination with an objective of less than 25% of the release limits. Typically, a sampling period of one minute is sufficient to obtain a suitable LLD.

7.3.3 Instrument Maintenance

Limited maintenance, such as changing Mylar windows, high voltage cables, etc., may be performed on-site by qualified personnel. Following the change of essential components for maintenance, limited calibration may be performed on-site by qualified personnel purposes.

7.3.4 Instrument Record Keeping

Calibration records and maintenance records, or copies of these records, shall be maintained on-site where they will be available for review. The results of the daily instrument functional checks will be recorded on separate log sheets for each instrument and maintained on-site.

7.4 Sampling and Analysis Quality Control

7.4.1 Sample Collection

Direct surface beta-gamma measurements, removable contamination measurements, gamma exposure rates, soil sampling, and any specialized measurements will be performed to provide the required data to meet the guidance provided in NUREG/CR 5849 (Ref. 8.2.27). Duplicate samples will be obtained for a minimum of 10% of all measurements or samples.

7.4.2 Sample QC

Duplicate soil samples will be obtained for minimum of 5% of all soil samples. Duplicate samples for direct measurements and smears are not required.

7.4.3 Sample Identification

Direct surface beta-gamma measurements, removable contamination samples, gamma exposure rates, and any specialized measurements will be identified as to location, type of measurement, specific instrument and probe used, sample time and date as appropriate, and name of the person collecting the data.

Soil samples shall be identified with a unique sample number, sample location, survey grid designation, depth of sample, sample time and date as appropriate, and with the name of the person collecting the sample.

7.4.4 Sample Labeling

Removable contamination samples and soil samples shall be labeled to include all the information listed under sample identification.

7.4.5 Sample Chain-of-Custody

Sample chain-of-custody shall be initiated for those samples being sent off-site for analysis or transferred to another organization for analysis. A sample Chain-of-Custody Record will be generated which will document the sample identification and sample transfer, and will accompany the sample during shipping to the new custodian of the sample.

7.4.6 Sample Analysis

Vendor laboratories should be on a QA Approved Suppliers List for the decommissioning contractor, Alliant Techsystems, Inc, or the U. S. Army, for the type of analytical services being provided. The decommissioning contractor is responsible for insuring that sample analysis specifications and laboratory capabilities will meet NRC requirements for data quality to release the site for unrestricted use or termination of license.

7.4.7 Sample Documentation

Sample identification information, sample Chain-of-Custody Records, sample analysis results, vendor laboratory qualification records, or copies of these records, shall be maintained on-site where they will be available for review.

7.5 Record Keeping

Measures shall be established to control the issuance of documents and changes to documents, such as procedures, drawings and specifications, that prescribe activities affecting quality. These measures shall ensure that documents and changes to documents are reviewed for adequacy, approved for release by authorized personnel, and distributed to and implemented at the location where the prescribed activity is performed.

7.5.1 Procedure Control

Procedures shall be controlled to ensure that current copies are provided to personnel performing the prescribed activities. Procedures shall be independently reviewed by a qualified person and shall be approved by a management member of the organization responsible for the prescribed activity. Significant changes to procedures shall be reviewed and approved in the same manner as the original.

7.5.2 Radioactive Shipment Package Documents

All documents related to a specific shipping package for radioactive material shall be controlled by appropriate procedures. All significant changes to such documents shall be similarly controlled.

7.5.3 Final Survey Documents

All documents related to the final survey documentation shall be controlled by appropriate procedures. All significant changes to such documents shall be similarly controlled. This documentation would normally include a Survey Plan, Survey Packages, Survey Results, and Survey Report.

7.6 Handling, Storage and Shipping

Measures shall be established to control the handling, storage and shipping of radioactive materials.

7.6.1 Radioactive Material Storage

Areas shall be provided for storage of radioactive material to ensure physical protection and control of the stored material. The handling, storage and shipment of radioactive material shall be controlled through the following requirements:

- Established safety requirements concerning the handling, storage, and shipping of packages for radioactive material shall be followed.

- Shipments shall not be made unless all test, certifications, acceptances and final inspections have been completed.

- Procedures shall be provided for handling, storage and shipping operations.

7.6.2 Shipping and Packaging

Shipping and packaging documents for radioactive material shall be consistent with pertinent regulatory requirements.

7.7 Quality Assurance Records

Sufficient records shall be maintained to furnish evidence of activities important to safe decommissioning as required by code, standard, specification or project procedures. Records shall be identifiable, available and retrievable. The records shall be reviewed to ensure their completeness and ability to serve their intended function. Requirements shall be established concerning record collection, safekeeping, retention, maintenance, updating, location, storage, preservation, administration and assigned responsibility. Requirements shall be consistent with applicable regulations and the potential for impact on quality and radiation exposure to the workers and the public.

Typical records would include:

- Proposed Decommissioning Plan
- Procedures
- Reports
- Personnel qualification records
- Radiological and environmental site characterization records, including final site release records
- Dismantlement records
- Inspection, surveillance, audit and assessment records

7.7.1 Health and Safety Related Activities

Records that have a potential for impact on quality and radiation exposure to the workers and the public include the following:

- Work Permits
- Work Procedures
- Contamination Survey Report
- Airborne Survey Report

- Counting data or air samples and gamma spectrum analysis
- Instrument calibrations
- Source inventory and storage
- Radioactive material inventory and storage
- Shipment records
- Incidents and accidents
- Confined space entry permits
- Monitoring records for oxygen deficient explosive atmosphere

7.7.2 Personal Records

Typical records containing personal information that may impact quality and radiation exposure to the workers and the public are as follows:

- Bioassay analysis
- Respiratory protection qualifications (medial/clearance and fit test)
- Training records
- Visitor logs and exposure information

7.8 Audits

Audits shall be implemented to verify compliance with appropriate requirements of the Quality Assurance Plan and to determine the effectiveness of the plan. The audits shall be performed in accordance with written procedures or checklists by trained and qualified personnel not having direct responsibility in the areas being audited.

7.8.1 Audit Reports

Reports of the results of each audit shall be prepared. These reports shall include a description of the area audited, identification of individual responsible for implementation of the audited provisions and for performance of the audit, and identification of discrepant areas. The audit report shall be distributed to the appropriate level of management and to those individuals responsible for implementation of audited provisions.

7.8.2 Audit Corrective Action

Measures shall be established to ensure that discrepancies identified by audits are resolved. These measures shall include notification of the manager responsible for the discrepancy, and verification of satisfactory resolution. Discrepancies shall be resolved by the manager responsible for the discrepancy. Higher levels of management shall resolve disputed discrepancies.

Follow-up action, including re-audit of deficient areas, shall be taken as indicated.

8.0 REFERENCES

8.1 Standards

8.1.1 American National Standards Institute N18.1, *Selection and Training of Nuclear Project Personnel*, 1971.

8.1.2 American National Standards Institute Z88.2, *Practices for Respiratory Protection*, 1980.

8.1.3 American National Standards Institute N322, *Radiation Protection Instrumentation Test and Calibration*, 1978.

8.1.4 American National Standards Institute 3.1, *Selection and Training of Personnel for Nuclear Power Plants*, 1993.

8.2 Nuclear Regulatory Commission Documents

8.2.1 10 CFR 61, *Licensing Requirements for Land Disposal of Radioactive Wastes*.

8.2.2 10 CFR 50, *Domestic Licensing of Production and Utilization Facilities*.

8.2.3 10 CFR 20, *Standards for Protection Against Radiation*.

8.2.4 29 CFR 1910.134, *Occupational Safety and Health Standards - Respiratory Protection*.

8.2.5 NUREG 0041, *Manual of Respiratory Protection Against Airborne Radioactive Materials*.

8.2.6 NUREG-0586, *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*, August 1988.

8.2.7 NUREG/CR-2082, *Monitoring for Compliance with Decommissioning Termination Survey Criteria*, (ORNL/HASRD-95), June 1981.

8.2.8 NUREG/CR-3254, *Licensee Programs for Maintaining Occupational Exposure to Radiation As Low As Reasonably Achievable*.

8.2.9 NUREG/CR-5512, *Residual Radioactive Contamination from Decommissioning*, Draft Report, January 1990.

8.2.10 Regulatory Guide 1.33, *Quality Assurance Requirements (Operations)*.

8.2.11 Regulatory Guide 7.1, *Administrative Guide for Packaging and Transporting Radioactive Material.*

8.2.12 Regulatory Guide 7.3, *Procedures for Picking Up and Receiving Packages of Radioactive Material.*

8.2.13 Regulatory Guide 7.10, *Establishing QA Programs for Packaging Used in the Transport of Radioactive Material.*

8.2.14 Regulatory Guide 8.2, *Guide for Administrative Practices in Radiation Monitoring.*

8.2.15 Regulatory Guide 8.7, *Occupational Radiation Exposure Records System.*

8.2.16 Regulatory Guide 8.9, *Acceptable Concepts, Models, Equations and Assumptions for a Bioassay Program.*

8.2.17 Regulatory Guide 8.15, *Acceptable Programs for Respiratory Protection.*

8.2.18 Regulatory Guide 8.20, *Applications for Bioassay for I-125 and I-131.*

8.2.19 Regulatory Guide 8.25, *Calibration and Error Limits of Air Sampling Instruments for Total Volume of Air Sampled.*

8.2.20 Regulatory Guide 8.29, *Instruction Concerning Risks from Occupational Exposure.*

8.2.21 Regulatory Guide 10.1, *Compilation of Reporting Requirements for Persons Subject to NRC Regulations.*

8.2.22 NRC Circular 81-07, *Control of Radioactively Contaminated Material*, May, 1981.

8.2.23 NRC letter, John F. Stolz (NRC) to Dr. Roland A. Finston (Stanford), dated March 17, 1981.

8.2.24 NRC letter, James R. Miller (NRC) to Dr. Roland A. Finston (Stanford), dated April 12, 1982.

8.2.25 NRC, Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material, April 1993.

8.2.26 Federal Register Vol. 46, No. 205, *Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operations*, October 23, 1981.

8.2.27 NUREG/CR-5849, *Manual for Conducting Surveys in Support of License Termination*, Draft, June 1992.

8.3 Industry Guidelines

8.3.1 National Voluntary Laboratory Accreditation Program.

8.3.2 INPO Good Practice RP-601.

8.3.3 INPO 86-011, February, 1986.

8.3.4 INPO Good Practice 820001-OEN-08A.

8.3.5 INPO Guideline 87-0082.

8.4 TCAAP Documents

8.4.1 Characterization Study Report for the Twin Cities Army Ammunition Plant, Depleted Uranium Facilities, New Brighton, Minnesota, August 1997, GTS Duratek, Inc.

APPENDIX A

Cost Estimation Methods and Cost Breakdown

SUMMARY

The Radiological Engineering and Field Services division of GTS Duratek has provided a decommissioning cost estimate for Alliant Techsystems activities at the Twin Cities Army Ammunition Plant (TCAAP) under the jurisdiction of NRC Source Material License No. SUB-971. This cost estimate was developed using a systematic approach. Applicable release levels were identified and historical data was reviewed. Specific information regarding structures was used to estimate waste volumes and demolition costs.

Itemized costs were determined, including costs for manpower and equipment resources, packaging, shipping and burial activities, and the performance of final status surveys for buildings and structures. The estimated decommissioning cost is $ * in terms of 1997 dollars, not including radioactive waste disposal. This estimate is for budgetary purposes only and is not a proposal or cost estimate for GTS Duratek, to perform decommissioning work.

1.0 ESTIMATION METHODS

The estimated cost to decommission TCAAP is $ * . This section of the cost estimate report provides an overview of the considerations and factors that influenced the decommissioning cost estimate. Table A-1 provides a summary of the cost associated with each area subject to this license.

* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

Table A-1
Decommissioning Cost Summary - TCAAP

Operation	Man-hours	Labor Plus Trav. & Liv.	Waste Processing & Transport	Equipment Contracts & Supplies	Radwaste Shipping	$8 Radwaste Disposal	Clean Waste Shipping & Disposal	Total Cost
DU Room Wood Structures								
DU Room Metal Structures								
Centrifugal Casting Room								
Bldg 502 Incidental Use Areas								
Bldg 576 Incidental Use Areas								
Bldg 519 Storage Magazines								
DU Room Grounds								
Bldg 502 Sewers, Drains, Soil				*				
Compressor Room								
Skid/Chair disposal								
Utility Relocation								
Final Survey & Report								
Planning, Training & Mobilization								
Alliant Oversight & Licensing								
NRC Verification Survey								
TOTALS								

* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

2.0 COST MODIFYING FACTORS

There are modifying factors that significantly affect the overall cost for remediation. One of these factors is an adjustment for personnel protection requirements since various levels of personnel protection equipment will be required for remediation work. The degree of protection required depends upon the extent of contamination and specific activities to be performed in a given area. As the level of personnel protection increases, so does the impact on individual productivity and task duration. Adjustments were made to account for the implementation of personnel protective measures where applicable. A description of standardized levels of personnel protection, along with the associated impacts is provided in Table A-2. The net impact is normalized over an 8 man-hour period.

Table A-2
Personnel Radiological Protection Summary

Protection Level	Description	Task Impact Summary
Level D, used in uncontaminated areas only.	Hard hats, safety glasses and safety shoes. Respiratory protection and protective clothing are not required to perform work.	No lost time or worker time adjustment is necessary.
Level D (modified), used in areas potentially contaminated.	Hard hats, safety glasses, safety shoes and protective clothing are required, however respiratory protection is not required.	Approximately 30 minutes to don and remove protective clothing accounts for a 6% lost-time adjustment.
Level C, used in areas of elevated airborne activity.	Hard hats, safety shoes and a full face respirator are required in addition to protective clothing.	A 170 minute lost-time adjustment (35%) consists of the following factors: · Safety meeting - 5 min · Don/remove protective clothing - 90 min · Breaks - 65 min · Wash up - 10 min A worker's productivity is decreased by 15% due to wearing the full face respirator. Combining this 15% last time adjustment with the 35% lost-time adjustment yields a net adjustment of approximately 50% or all tasks will take twice as long as Level D work.
Level B, used for confined space entries.	Hard hats, safety shoes and self-contained breathing apparatus (SCBA) are required in conjunction with protective clothing.	A 150 minute lost-time adjustment (31%) consists of the following factors: · Safety meeting - 5 min · Don/remove protective clothing - 60 min · Change SCBA tanks - 20 min A worker's productivity is decreased by up to 20% due to wearing the SCBA gear. Combining this 20% lost time adjustment with the 31% lost-time adjustment yields a net adjustment of approximately 50% or all tasks will take twice as long as Level D work.

The volume of radwaste requiring treatment and disposal can be a very significant modifying factor due to the high cost for radwaste disposal. For the TCAAP decommissioning the waste disposal costs area the responsibility of TCAAP and are not included in this estimate. Radwaste volume estimates are discussed in detail in the following section.

3.0 RADWASTE VOLUME ESTIMATES

The radwaste volume estimates are key to developing accurate decommissioning costs. Burial costs are based on waste volume and shipping costs are based on waste volume and weight. Spreadsheets were used to estimate the required volumes and weights. A summary of the clean waste volumes, the contaminated waste volumes and the mixed waste volumes is presented in Appendix B sheets B-1 and B-2.

To address structural materials, the spreadsheet incorporated floor and wall dimensions, determined from drawings and direct measurements, along with the percent of the area contaminated. From this information, the volume of rubble for disposal was calculated. Table A-3 presents a summary of the radwaste volumes calculated for the various areas of the TCAAP.

Table A-3
Waste Volume Summary for the TCAAP

Area Description	Contaminated Demolition Waste Volume (ft'3)	Contaminated Soil Waste Volume (ft'3)	Asbestos Waste Volume (ft'3)	Clean Waste Volume
DU Room Wood Structures	44,194	0	3,931	45,490
DU Room Metal Structures	5,184	0	110	9,723
Centrifugal Casting Room	357	0	0	17,816
Bldg 502 Incidental Use Areas	255	0	0	0
Bldg 576 Incidental Use Areas	5,387	0	0	0
Bldg 519 Storage Magazines	0	0	0	0
DU Room Grounds	7	10,773	0	0
Bldg 502 Sewers, Drains, Soil	754	0	0	0
Compressor Room	4,316	0	0	0
Skid/Chair disposal	2,000	0	0	9,753
TOTALS	62,454	10,773	4,041	82,782

4.9 RADWASTE DISPOSAL COSTS

A significant portion of the overall decommissioning cost is generally attributed to the burial of radioactive and mixed waste. The radioactive waste will be disposed of at Envirocare in Utah. The cost for this disposal is the responsibility of TCAAP and is not included in this estimate.

The costs to transport waste for disposal are based on a transport distance of 1,426 miles. It is assumed that only full loads of waste are transported, that a 40 foot Sea/Land container is the limiting volume and that 44,000 pounds is the limiting weight. The transport charge is $1.98 per mile.

The cost for disposal of clean waste at a local landfill in Minnesota was estimated to be $27.30 per cubic yard for shipping and disposal.

The cost of disposal of uncontaminated asbestos was estimated to be $42.30 per cubic yard including transportation and disposal.

The unit disposal cost factors are listed in Appendix B, sheet B-8.

5.0 UNIT COSTS

There are a number of unit factors used to generate cost estimate. They are listed below in Table A-4 so project costs can be updated when required and the effects of changing units costs can be evaluated.

Table A-4
Decommissioning Estimate Unit Cost Factors

Unit Cost Factor	Unit Cost Rate	Units
Radioactive Waste Disposal		cubic foot
Radioactive Waste Transportation		mile
B-25 Waste Disposal Container		each
Clean Waste Transportation & Disposal		cubic yard
Clean Asbestos Transportation & Waste Disposal	*	cubic yard
Project Manager/RSO		hour
Radiological Engineer/Supervisor		hour
Decon Foreman		hour
HP Instrument Technician		hour
HP Technician		hour
Decontamination Specialist		hour
Airfare		trip
Car Rental (one)		day
Per Diem		day

* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

6.0 FINAL SURVEYS

Final survey cost estimates are based on the methodology presented in NUREG/CR-2241, *Technology and Cost of Termination Surveys Associated With Decommissioning of Nuclear Facilities* (February 1982). This methodology requires the determination of the number of sample points for the various areas being surveyed and the type of survey being performed. The time to perform each of these surveys is determined, and the product of these two items is the labor time to perform the surveys. Equipment and material cost to perform the surveys is added along with staff support costs to determine a total cost. The survey requirements are based on (Draft) NUREG/CR-5849, *Manual for Conducting Radiological Surveys in Support of License Termination* (June 1992). A spreadsheet was developed which incorporates facility dimensions, labor rates and support cost ratios to estimate the final survey cost. The facility survey labor estimate is summarized in Appendix B, Sheet B-10 and the open land and miscellaneous area survey labor estimate is summarized in Appendix B, Sheet B-11.

APPENDIX B

Cost Calculation Sheets for TCAAP

- B-1, Contaminated and Clean Waste Volume Summary
- B-2, Contaminated Waste Disposal Cost
- B-3, Waste Shipping Container Cost
- B-4, Waste Disposal Support Labor Estimate
- B-5, Survey Cost Estimate for Building Areas
- B-6, Outside Survey Labor Estimate
- B-7, Instrumentation Costs
- B-8, Miscellaneous Equipment Costs
- B-9, Decontamination Costs
- B-10, Demolition Estimate
- B-11, Volume Reduction Costs

APPENDIX B-1
CONTAMINATED WASTE VOLUME SUMMARY
TCAAP Facility

	Area Description	Decon* Envirocare Waste Volume (ft^3)	Generated* Envirocare Waste Volume (ft^3)	Envirocare Direct Bury Waste Volume (ft^3)	Total Envirocare Waste Volume (ft^3)
1	DU Room Wood Framed Buildings	1,217	311	38,767	40,295
2	DU Room Metal Framed Buildings	203	12	5,496	5,711
3	Centrifugal Cast Room	202	29	0	231
4	Bldg 502 Incidental Use Areas	239	16	0	255
5	Bldg 576 Incidental Use Areas	0	0	0	0
6	Bldg 519 Storage Magazines	0	0	0	0
7	DU Room Grounds	0	7	11,264	11,271
8	Bldg 502 Sewers, Drains & Soil	5	23	726	754
9	Compressor Room	80	27	2,890	2,997
	TOTALS:	**1,945**	**426**	**59,143**	**61,515**

*** Notes:***

1 Decon Envirocare Waste Volume: This is the volume of waste generated directly by a decontamination process (this includes such items blasting grit, treated chemicals, etc.).
This waste has activity levels which allow disposal at Envirocare of Utah.

2 Generated Envirocare Waste Volume: This is the volume of protective clothing waste generated by all operations on site and is a function of labor hours for each activity. This waste has activity levels which allow disposal at Envirocare of Utah.

APPENDIX B-2
CONTAMINATED WASTE DISPOSAL COST
TCAAP Facility

Named Block
DISP COST

	Area Description	Decon Envirocare Disposal Cost	Generated Envirocare Disposal Cost	Envirocare Direct Bury Disposal Cost	Total Waste Disposal Cost
1	DU Room Wood Framed Buildings	$0	$0	$0	$0
2	DU Room Metal Framed Buildings	$0	$0	$0	$0
3	Centrifugal Cast Room	$0	$0	$0	$0
4	Bldg 502 Incidental Use Areas	$0	$0	$0	$0
5	Bldg 576 Incidental Use Areas	$0	$0	$0	$0
6	Bldg 519 Storage Magazines	$0	$0	$0	$0
7	DU Room Grounds	$0	$0	$0	$0
8	Bldg 502 Sewers, Drains & Soil	$0	$0	$0	$0
9	Compressor Room	$0	$0	$0	$0
	TOTALS:	$0	$0	$0	$0

Note: 1. Shading indicates a named field linked to another spreadsheet.
2. Direct burial & generated waste shipped to Envirocare of Utah.

WASTE DISPOSAL PACKAGING & SHIPPING COST

Named Block
SHIP COST

	Area Description	Decon Envirocare Pack & Ship Cost	Generated Envirocare Pack & Ship Cost	Envirocare Direct Bury Pack & Ship Cost	Total Waste Pack & Ship Cost
1	DU Room Wood Framed Buildings				
2	DU Room Metal Framed Buildings				
3	Centrifugal Cast Room				
4	Bldg 502 Incidental Use Areas				
5	Bldg 576 Incidental Use Areas				
6	Bldg 519 Storage Magazines				
7	DU Room Grounds				
8	Bldg 502 Sewers, Drains & Soil				
9	Compressor Room				
	TOTALS:				

*

*Notes:
1 Shading indicates a named field linked to another spreadsheet.
2 These are exclusive use shipments and there is a minimum cost for shipping one B-25 Box of waste to Envirocare equal to:

* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

APPENDIX B-3
WASTE SHIPPING CONTAINER COST
TCAAP Facility

	Area Description	Total Envirocare Volume (ft^3)	B-25* Waste Containers (Ea.)	Waste Container Cost ($)
1	DU Room Wood Framed Buildings	40,295	447.7	
2	DU Room Metal Framed Buildings	5,711	63.5	
3	Centrifugal Cast Room	231	2.6	
4	Bldg 502 Incidental Use Areas	255	2.8	
5	Bldg 576 Incidental Use Areas	0	0.0	*
6	Bldg 519 Storage Magazines	0	0.0	
7	DU Room Grounds	11,271	125.2	
8	Bldg 502 Sewers, Drains & Soil	754	8.4	
9	Compressor Room	2,997	33.3	
	TOTALS:	61,515	684	

* Notes:

1 The number of waste containers is rounded up to next full container.

UNIT DISPOSAL COST FACTORS

Decon waste disposal rate for Envirocare of Utah :		per cubic foot
DAW waste disposal rate for Envirocare of Utah :		per cubic foot
Estimated transport rate to Envirocare of Utah :		per cubic foot
Estimated transport rate to Envirocare of Utah :		per load
Estimated mileage rate to Envirocare of Utah :		per mile
Estimated transport distance to Envirocare of Utah :	*	miles
Average direct bury waste density :		lb/cubic foot
Average generated waste density (Barnwell waste) :		lb/cubic foot
Truck transport waste weight limit :		pounds
Truck transport waste volume limit :		B-25 Boxes
B-25 box internal volume :		cubic feet
Estimated cost of used B-25 shipping containers :		each
Local Industrial Waste Landfill Shipping & Disposal Rate :		per cubic yard
Labor rate for shipping :		per hour

* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

APPENDIX B-4
WASTE DISPOSAL SUPPORT LABOR ESTIMATE
TCAAP Facility

	Area Description	B-25 Waste Containers (Ea.)	Radioactive* Waste Shipments (Ea.)	Waste* Shipment Labor (man-hr)
1	DU Room Wood Framed Buildings	447.7	37.3	
2	DU Room Metal Framed Buildings	63.5	5.3	
3	Centrifugal Cast Room	2.6	0.2	
4	Bldg 502 Incidental Use Areas	2.8	0.2	
5	Bldg 576 Incidental Use Areas	0.0	0.0	*
6	Bldg 519 Storage Magazines	0.0	0.0	
7	DU Room Grounds	125.2	10.4	
8	Bldg 502 Sewers, Drains & Soil	8.4	0.7	
9	Compressor Room	33.3	2.8	
	TOTALS:	684.0	57.0	

** Notes:*

1 The number of waste shipments is rounded up to next full shipment.

Estimated waste loading operator time : 4 hr per load
Estimated HP Tech time per rad or mixed waste load : 4 hr per load
Estimated HP shipper time per rad or mixed waste load : 8 hr per load
Estimated clean waste shipping volume limit : 1176 ft^3 per load
Estimated radwaste shipping volume limit : 12 B-25 Boxes

* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

APPENDIX B-5

SURVEY COST ESTIMATE FOR NORMAL BUILDING AREAS

TCAAP Facility

UNAFFECTED AREAS

LOC CODE	BUILDING	Room	AREA	WIDTH (ft)	LENGTH (ft)	HEIGHT (ft)	SURFACE AREA FLOOR (m²)	SURFACE AREA LOWER WALLS (m²)	SURFACE AREA UPPER WALLS (m²)	SURFACE AREA CEILING (m²)	SURFACE AREA ROOF (m²)	SURFACE AREA TOTAL (m²)	FLOOR + L. WALL SURVEY CODE	U. WALL + CEILING SURVEY CODE	FLOOR + L. WALL SURVEY POINTS	U. WALL + CEILING SURVEY POINTS	ROOF SURVEY POINTS	TOTAL SMEAR POINTS	DIRECT SURVEY LABOR (hrs)
4	502	Interior	North Area	80.0	324.0		2,408					2,408	1	4	48			48	
4	502	Interior	Center Area	96.0	54.0		482					482	1	4	10			10	*
4	502	Interior	Southwest Area	48.0	54.0		241					241	1	4	10			10	
4	502	Interior	Southeast Area	160.0	198.0		2,943					2,943	1	4	59			59	
			TOTALS				6,073					6,073			127	0	0	127	

AFFECTED AREAS (Sheet 1)

LOC CODE	BUILDING	ROOM	DESCRIPTION	WIDTH (ft)	LENGTH (ft)	HEIGHT (ft)	SURFACE AREA FLOOR (m²)	SURFACE AREA LOWER WALLS (m²)	SURFACE AREA UPPER WALLS (m²)	SURFACE AREA CEILING (m²)	SURFACE AREA ROOF (m²)	SURFACE AREA TOTAL (m²)	FLOOR + L. WALL SURVEY CODE	U. WALL + CEILING SURVEY CODE	FLOOR + L. WALL SURVEY BLOCKS	FLOOR + L. WALL SURVEY POINTS	U. WALL + CEILING SURVEY POINTS	ROOF SURVEY POINTS	GAMMA SURVEY or SMEAR POINTS	DIRECT SURVEY LABOR (hrs)
4	502	Interior	North Area	80.0	324.0		2,408					2,408	1	4	2,408	3,612	30		2,438	
4	502	Interior	Center Area	96.0	54.0		482					482	1	4	482	722	30		512	*
4	502	Interior	Southwest Area	48.0	54.0		241					241	1	4	241	361	30		271	
4	502	Interior	Southeast Area	160.0	198.0		2,943					2,943	1	4	2,943	4,415	30		2,973	
			TOTALS				6,073					6,073			6,073	9,110	120	0	6,193	
			GRAND TOTAL ALL AREAS				12,147					12,147			6,073	9,237	120	0	6,320	

* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

Appendix B-6

OUTSIDE SURVEY LABOR ESTIMATE

TCAAP Facility

UNAFFECTED OPEN LAND AREAS

LOCATION CODE	SURFACE	AREA	WIDTH (ft)	LENGTH (ft)	WIDTH (m)	LENGTH (m)	WIDTH (blocks)	LENGTH (blocks)	AREA (m^2)	SURVEY BLOCKS	100% SCANS	100% PLAN SAMPLE POINTS	100% GAMMA SURVEY POINTS	10% SURVEY LABOR (hrs)
4	Paved	Paved Area North of DU Room	32.8	393.7	10.0	120.0	1	12	1,200	12	12	N/A	0	
7	Paved	Paved Area West of Bldg 502	32.8	393.7	10.0	120.0	1	12	1,200	12	12	N/A	0	*
4	Soil	Buffer Around Bldg 502	32.8	1600.0	10.0	487.7	1	48	4,877	48	48	10	0	
7	Soil	DU Room Buffer Area	32.8	250.0	10.0	76.2	1	7	762	7	7	20	0	
		TOTALS							8,039	79	79	30	0	

AFFECTED OPEN LAND AREAS

LOCATION CODE	SURFACE	AREA	WIDTH (ft)	LENGTH (ft)	WIDTH (m)	LENGTH (m)	WIDTH (blocks)	LENGTH (blocks)	AREA (m^2)	SURVEY BLOCKS	SCANS	*MAXIMUM* SAMPLE POINTS	*BASE* SAMPLE POINTS	GAMMA SURVEY POINTS	DIR SURVEY LABOR (hrs)
7	Soil	DU Room Footprint	229.7	328.1	70.0	100.0	7	10	7000	70	70	N/A	280	280	*
		TOTALS							7,000	70	70	0	280	280	

SEWER PIPE SURVEY

LOCATION CODE	BUILDING	AREA	DIAMETER (in)	LENGTH (yds)	SURVEY RATE (ft/hr)	CREW SIZE	SURVEY LABOR (hrs)
8	Building 502	Cast Iron Sewer Line	4.0	144	40		
8	DU Room	Vitrified Clay Pipe Sewer	6.0	16	40		*
		TOTALS		160			

GRAND TOTAL :

* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

Appendix B-7
Instrumentation Costs
TCAAP Facility

DECONTAMINATION & REMEDIATION
DURATION (months) 9
Average Onsite Staff 21

ITEM	RADIATION-PROTECTION INSTRUMENTATION FOR DECOMMISSIONING	TASK RENTAL
	Instrumentation provided at monthly rental rate	
1	EBERLINE - PORTABLE ALPHA COUNTER MODEL / SAC-4:	
2	BURK'S - HV-1 HIGH VOLUME AIR SAMPLERS W/ SAMPLE HEAD:	
3	BURK'S - LV-1 LOW VOLUME AIR SAMPLERS W/ SAMPLE HEAD:	
4	LUDLUM - MODEL 12 FRISKER WITH 44-9 PROBE & HARD CASE:	
5	LUDLUM - MODEL 19 MICRO R METER WITH HARD CASE:	
6	LUDLUM - FLOOR MONITOR CART W/ O PROBE MODEL 239-1F FOR USE WITH 2350 MONITOR:	
7	LUDLUM - FLOOR MONITOR CART W/ O PROBE MODEL 239-1F FOR USE WITH CM7A CONTAMINATION MONITOR:	
8	LUDLUM - MODEL 2350 WITH KEYPAD, BARCODE READER, HEADPHONES, HARD CASE AND THE FOLLOWING DETECTORS: 43-68 100 cm2 GAS PROPORTIONAL DETECTOR 43-5 ALPHA SCINTILLATION DETECTOR 44-2 HIGH ENERGY GAMMA SCINTILLATION DETECTOR 44-40 SHIELDED GM PAKCAKE DETECTOR 43-37, 550 cm2 GAS PROPORTIONAL DETECTOR	*
9	LUDLUM - PORTABLE FRISKER MODEL 177 W/ 44-9 PROBE & HARD CASE:	
10	NE TECHNOLOGY CM7A ALPHA/BETA FRISKER W/ DP5HA PROBE & STAND:	
11	TENNELEC - LB5100W-2080- III PC BASED ALPHA/BETA COUNTING SYSTEM:	
12	RADIO INTERCOM WITH THROAT AND RESPIRATOR MICROPHONE:	
	Instrumentation Sources Provided at Monthly Rental Rate	
13	EFFICIENCY DETERMINATION SOURCE FOR MODEL 2350:	
14	NaI DETECTOR CHECK SOURCES FOR MODEL 2350:	
15	CALIBRATION SOURCE FOR MODEL CM7A CONTAMINATION MONITOR:	
16	DATA ANALYSIS COMPUTER SYSTEM	
17	DOWNLOAD NOTEBOOK COMPUTER	
18	HP LASER JET PRINTER	
19	COPIER	
20	HP FAX MACHINE	
21	PORTABLE FRISKER 4ea SOURCE SET:	
	SUBTOTAL HEALTH PHYSICS INSTRUMENTATION:	

* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

RELEASE SURVEY PHASE
DURATION (months) 1
Average Onsite Staff 9

ITEM	RADIATION-PROTECTION INSTRUMENTATION FOR DECOMMISSIONING	TASK RENTAL
	Instrumentation provided at monthly rental rate	
1	EBERLINE - PORTABLE ALPHA COUNTER MODEL / SAC-4:	
2	BURK'S - HV-1 HIGH VOLUME AIR SAMPLERS W/ SAMPLE HEAD:	
3	BURK'S - LV-1 LOW VOLUME AIR SAMPLERS W/ SAMPLE HEAD:	
4	LUDLUM - MODEL 12 FRISKER WITH 44-9 PROBE & HARD CASE:	
5	LUDLUM - MODEL 19 MICRO R METER WITH HARD CASE:	
6	LUDLUM - FLOOR MONITOR CART W/ O PROBE MODEL 239-1F FOR USE WITH 2350 MONITOR:	
7	LUDLUM - FLOOR MONITOR CART W/ O PROBE MODEL 239-1F FOR USE WITH CM7A CONTAMINATION MONITOR:	
8	LUDLUM - MODEL 2350 WITH KEYPAD, BARCODE READER, HEADPHONES, HARD CASE AND THE FOLLOWING DETECTORS:	
	43-68 100 cm2 GAS PROPORTIONAL DETECTOR	
	43-5 ALPHA SCINTILLATION DETECTOR	
	44-2 HIGH ENERGY GAMMA SCINTILLATION DETECTOR	*
	44-40 SHIELDED GM PAKCAKE DETECTOR	
	43-37, 550 cm2 GAS PROPORTIONAL DETECTOR	
9	LUDLUM - PORTABLE FRISKER MODEL 177 W/ 44-9 PROBE & HARD CASE:	
10	NE TECHNOLOGY CM7A ALPHA/BETA FRISKER W/ DP5HA PROBE & STAND:	
11	TENNELEC - LB5100W-2080- III PC BASED ALPHA/BETA COUNTING SYSTEM:	
12	RADIO INTERCOM WITH THROAT AND RESPIRATOR MICROPHONE:	
	Instrumentation Sources Provided at Monthly Rental Rate	
13	EFFICIENCY DETERMINATION SOURCE FOR MODEL 2350:	
14	NaI DETECTOR CHECK SOURCES FOR MODEL 2350:	
15	CALIBRATION SOURCE FOR MODEL CM7A CONTAMINATION MONITOR:	
16	DATA ANALYSIS COMPUTER SYSTEM	
17	DOWNLOAD NOTEBOOK COMPUTER	
18	HP LASER JET PRINTER	
19	COPIER	
20	HP FAX MACHINE	
21	PORTABLE FRISKER 4ea SOURCE SET:	
	SUBTOTAL HEALTH PHYSICS INSTRUMENTATION:	

* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

DECONTAMINATION & REMEDIATION
DURATION (months): 9
Average Onsite Staff: 21

ITEM	MISCELLANEOUS EQUIPMENT FOR DECOMMISSIONING	MAX. No.	LEASE PERIOD Equip-mo	UNIT LEASE RATE	TASK RENTAL
	Equipment provided at monthly rental rate				
1	SITE TRAILERS	3	27		
2	FIRE WATCH DURING DEMOLITION	1	9		
3	TYVEK PPE	1	9		
4	MEDICALS FOR 25 MEN	25			
5	INDEPENDENT LAB FOR LEAD & ASBESTOS MONITORING	25		*	*
6	MOBILIZATION & DEMOBILIZATION	1			
7	COMPRESSOR, 200 PSI, 120 CFM, DIESEL	1	9		
8	MOBILIZATION & DEMOBILIZATION OF HEAVY EQUIPMENT	1			
9	PERMITS & UTILITIES	1			
10	SOIL SAMPLER,	0	0		
	SUBTOTAL MISCELLANEOUS EQUIPMENT:				

RELEASE SURVEY PHASE
DURATION (months): 1
Average Onsite Staff: 9

ITEM	MISCELLANEOUS EQUIPMENT FOR DECOMMISSIONING	MAX. No.	LEASE PERIOD Equip-mo	UNIT LEASE RATE	TASK RENTAL
	Equipment provided at monthly rental rate				
1	SITE TRAILERS	3	2		
2	FIRE WATCH DURING DEMOLITION		0		
3	TYVEK PPE		0		
4	MEDICALS FOR 25 MEN		0		
5	INDEPENDENT LAB FOR LEAD & ASBESTOS MONITORING		0	*	*
6	MOBILIZATION & DEMOBILIZATION		0		
7	COMPRESSOR, 200 PSI, 120 CFM, DIESEL		0		
8	MOBILIZATION & DEMOBILIZATION OF HEAVY EQUIPMENT		0		
9	PERMITS & UTILITIES		0		
10	SOIL SAMPLER,	1	1		
	SUBTOTAL MISCELLANEOUS EQUIPMENT:				

TOTAL PROJECT
DURATION (months): 10
Average Onsite Staff: 20

ITEM	MISCELLANEOUS EQUIPMENT FOR DECOMMISSIONING	LEASE PERIOD Equip-mo	UNIT LEASE RATE	TASK RENTAL
	Equipment provided at monthly rental rate			
1	SITE TRAILERS	29		
2	FIRE WATCH DURING DEMOLITION	9		
3	TYVEK PPE	9		
4	MEDICALS FOR 25 MEN	0		
5	INDEPENDENT LAB FOR LEAD & ASBESTOS MONITORING	0	*	*
6	MOBILIZATION & DEMOBILIZATION	0		
7	COMPRESSOR, 200 PSI, 120 CFM, DIESEL	9		
8	MOBILIZATION & DEMOBILIZATION OF HEAVY EQUIPMENT	0		
9	PERMITS & UTILITIES	0		
10	SOIL SAMPLER,	1		
	TOTAL MISCELLANEOUS EQUIPMENT:			

* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

Appendix B-9
DECONTAMINA[illegible]OSTS
TCAAP Facility

SPECIFIC AREA SURFACE REMOVAL COST ANALYSES WITH ENVIROCARE DISPOSAL

INPUT APP CODE	METHODOLOGY	INPUT AREA	INPUT ITEM	INPUT LOC CODE	INPUT SURFACE AREA (ft^2)	INPUT MATERIAL THICK (in)	TOTAL VOLUME (ft^3)	INPUT CONTAM. REMOVAL DEPTH (in)	INPUT DENSITY = CONTAM. VOLUME (ft^3)	(lb/ft^3) 75.0 CONTAM WEIGHT (lbs)	**PROLESS COST PLUS** **ENVIROCARE WASTE DISPOSAL COST** BURIAL SHIP & BURY ($)	PROCESS COST ($/ft^3)	PROCESS COST ($)	SURFACE RELEASE COST ($)	COST GRAND TOTAL ($)	INPUT ENVIROCARE RATE ($/ft^3)	DIRECT BURIAL SHIP & BURY ($)
1	McDonald U-5 Scabbler	DU Room West Wing	Floor	1	8,336	8	4,224	0.250	176.0	13,200							
1	McDonald U-5 Scabbler	DU Room East Wing	Floor	1	6,912	8	4,308	0.250	192.0	14,400							
1	McDonald U-5 Scabbler	Equipment Room	Floor	1	1,135	8	757	0.250	31.5	2,365							
1	McDonald U-5 Scabbler	Waste Water Treatment Room	Floor	1	2,079	8	1,386	0.250	57.8	4,331							
1	McDonald U-5 Scabbler	Rod/Cutoff Room	Floor	2	3,395	8	2,263	0.250	94.3	7,073							
1	McDonald U-5 Scabbler	Waste Handling/Punch Press Room	Floor	2	2,176	8	1,451	0.250	60.4	4,533							
1	McDonald U-5 Scabbler	Centrifugal Cast Room	Floor	3	4,536	6	3,024	0.250	126.0	9,450							
1	McDonald U-5 Scabbler	Compressor Room	Floor	9	2,871	8	1,914	0.250	79.8	5,981							
36	Wood Planer	DU Room	Wood Timbers	1	33,175	16	5,898	0.125	345.6	13,823							
36	Wood Planer	DU Room	Pine Subfloor	1	39,744	2	2,650	0.125	414.0	16,560							
1	McDonald U-5 Scabbler	Building 502 Miscellaneous Areas	50% of Contaminated Floor	4	6,624	6	4,416	0.250	184.0	13,800							
							TOTAL:		1,761.4	105,516							

SPECIFIC AREA SURFACE CLEANING COST ANALYSES WITH ENVIROCARE DISPOSAL

INPUT APP CODE	METHODOLOGY	INPUT AREA	INPUT ITEM	INPUT LOC CODE	8.6029 INPUT SURFACE AREA (ft^2)	INPUT CONTAM VOLUME (ft^3)	ft^3 per m^2 GENERATED RW VOLUME (ft^3)	GENERATED WASTE DENSITY (lb/ft^3)	GENERATED WASTE WEIGHT (lb)	** PROCESSED RADWASTE DISPOSAL ** BURIAL SHIP & BURY ($)	PROCESS COST ($/ft^3)	PROCESS COST ($)	SURFACE RELEASE COST ($)	COST GRAND TOTAL ($)	INPUT ENVIROCARE RATE ($/ft^3)	DIRECT BURIAL SHIP & BURY ($)
34	Hydraulic Jetting (5k-10k psi)	Centrifugal Cast Room	Lower Walls	3	1,740	1,497	7.9	100.0	789.2							
34	Hydraulic Jetting (5k-10k psi)	Centrifugal Cast Room	Upper Walls	3	5,075	4,475	23.0	100.0	2,301.9							
34	Hydraulic Jetting (5k-10k psi)	Centrifugal Cast Room	Ceiling	3	9,912	1,296	45.0	100.0	4,495.8							
42	Hands-On Decon	Waste Water Treatment Room	Structural Steel Bldg Members	1	958	[illegible]	8.0	25.0	199.7							
42	Hands-On Decon	Rod/Cutoff Room	Structural Steel Bldg Members	2	3,542	453	29.5	25.0	737.8							
42	Hands-On Decon	Waste Handling/Punch Press Room	Structural Steel Bldg Members	2	1,292	164	10.8	25.0	269.1							
42	Hands-On Decon	Building 502 Miscellaneous Areas	50% of Contaminated Floor	4	6,634	N/A	55.2	25.0	1,380.5							
47	Sewer Cleaning	Building 502	4" Cast Iron Sewer	8	452	N/A	4.1	100.0	410.4							
47	Sewer Cleaning	DU Room	8" Vitrified Clay Pipe Sewer	8	75	N/A	0.7	100.0	68.4							
				SUB TOTAL:		8,893	184.1		18,652.3							

SPECIFIC AREA SURFACE REMOVAL LABOR & DURATION

INPUT LOC CODE	METHODOLOGY	SURFACE AREA (ft^2)	CONTAMINATED VOLUME (ft^3)	CONTAMINATED WEIGHT (lb)	PROCESS RATE (ft^2/hr)	CREW SIZE	DURATION (hours)	DURATION (work days)	LABOR USE (man-hrs)
CODE 1	McDonald U-5 Scabbler	36,064	1,002	75,133	150				
CODE 2	McDonald U-5 Scabbler	0	0	0	75				
CODE 3	McDonald 7WCD Scabbler	0	0	0	30				
CODE 4	McDonald 3WCD Scabbler	0	0	0	15				
CODE 5	McDonald 2WCD DOUBLE PASS	0	0	0	8				
CODE 36	Wood Planer	72,919	760	760	150				
TOTAL		108,983	1,761	75,893					

SPECIFIC AREA SURFACE CLEANING LABOR & DURATION

INPUT APP CODE	METHODOLOGY	SURFACE AREA (ft^2)	CONTAMINATED VOLUME (ft^3)	CONTAMINATED WEIGHT (lb)	PROCESS RATE (ft^2/hr)
CODE 34	Hydraulic Jetting (5k-10k psi)	16,727	7263.0	300.0	360
CODE 42	Hands-On Decon	12,416	740.0	100.0	38
TOTAL		29,143	8,003	400	

* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

Percent Labor Cost 65.00%
Average Hourly Labor Rate $45.29

LOC CODE	AREA	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
1	East & West Wing Wood Timbers	93	thousand board feet		
1	East & West Wing Wood Structural Members	251	thousand board feet		
1	East & West Wing Wood Wall Lumber	54	thousand board feet		
1	East & West Wing Transite Siding	26,611	square feet		
1	East & West Wing Reinforced Concrete Floors	625	cubic yard		
1	East & West Wing Concrete Foundations & Footers	331	cubic yard		
1	East & West Wing Loading Dock & Equip Pads	37	cubic yard		
1	East & West Wing Concrete Curbing on Floor	11	cubic yard		
1	East & West Wing Concrete Brick Interior Walls	129	cubic yard		
1	East & West Wing Built Up Roofing over Wood Decking	225	cubic yard		
1	East & West Wing Interior Walls & Plaster Board	180	cubic yard		
1	East & West Wing Fiberglass Wall Insulation	269	cubic yard		
1	East & West Wing Misc Outside Equipment	3	ton		
1	East & West Wing Vents, Blowers, Stacks & Fans on Roof	12	ton		
1	East & West Wing Misc Inside Equipment	3	ton		
1	East & West Wing Steel Pipe, Conduit, Sprinklers & Valves	64	ton		
1	East & West Wing Copper in Switchgear & Cable	33,250	pounds		
7	East & West Wing Soil	191	cubic yard		
7	East & West Wing Replacemant Soil Including Compacting	302	cubic yard		
2	Rod Room Structural Steel Bldg Members	17	ton		
2	Rod Room 29 ga Steel Wall Panels	2	ton		
2	Rod Room 26 ga Steel Roof Panels	2	ton		
2	Rod Room 23 ga Galvanized Steel Wall & Ceiling Liners	2	ton		
2	Rod Room Steel Pipe, Conduit, Sprinkler & Valves	1	ton		
2	Rod Room Fiberglass Insulation in Roof	44	cubic yard		
2	Rod Room Fiberglass Insulation in Walls	38	cubic yard		
2	Rod Room Concrete Building Foundations & Footers	42	cubic yard		
2	Rod Room Reinforced Concrete Floors	55	cubic yard		
7	Rod Room Soil	46	cubic yard		
7	Rod Room Replacemant Soil Including Compacting	42	cubic yard		
2	Punch Press Room Structural Steel Bldg Members	6	ton		
2	Punch Press Room 29 ga Steel Wall Panels	1	ton		
2	Punch Press Room 26 ga Steel Roof Panels	1	ton		
2	Punch Press Room 29 ga Galvanized Steel Bldg Liners	2	ton		
2	Punch Press Room Steel Pipe, Conduit, Sprinkler & Valves	1	ton		
2	Punch Press Room Fiberglass Insulation in Roof	26	cubic yard		
2	Punch PressRoom Fiberglass Insulation in Front Wall	6	cubic yard		
2	Punch Press Room Concrete Building Foundations & Footers	11	cubic yard		
2	Punch Press Room Reinforced Concrete Floors	38	cubic yard		
7	Punch Press Room Soil	31	cubic yard		
7	Punch Press Room Replacemant Soil Including Compacting	49	cubic yard		
2	Waste Evaporator Room Structural Steel Bldg Members	5	ton		
2	Waste Evaporator Room 29 ga Steel Wall Panels	1	ton		
2	Waste Evaporator Room 26 ga Steel Roof Panels	1	ton		
2	Waste Evaporator Room 29 ga Galvanized Steel Bldg Liners	1	ton		
2	Waste Evaporator Room Steel Pipe, Conduit, Sprinkler & Valves	1	ton		
2	Waste Evaporator Room Fiberglass Insulation in Roof	26	cubic yard		
2	Waste Evaporator Room Fiberglass Insulation in Walls	18	cubic yard		
2	Waste Evaporator Room Concrete Building Foundations & Footers	17	cubic yard		
2	Waste Evaporator Room Reinforced Concrete Floors	53	cubic yard		
7	Waste Evaporator Room Soil	46	cubic yard		
7	Waste Evaporator Room Replacemant Soil Including Compacting	46	cubic yard		
3	Centrifugal Cast Room Built Up Roofing over Concrete Decking	133	cubic yard		
3	Centrifugal Cast Room Concrete 32 inch "T" Roof Sections	48	cubic yard		
3	Centrifugal Cast Room Concrete "Lay Up" Wall Panels	221	cubic yard		
3	Centrifugal Cast Room Reinforced Concrete Floors	81	cubic yard		
3	Centrifugal Cast Room Concrete "Sump Pit" Walls, Floor & Lid	18	cubic yard		
3	Centrifugal Cast Room Concrete Curbing on Floors	2	cubic yard		
3	Centrifugal Cast Room Concrete Building Foundations & Footers	36	cubic yard		
3	Centrifugal Cast Room Concrete Loading Dock & Equip Pads	37	cubic yard		
7	Centrifugal Cast Room Soil	31	cubic yard		
7	Centrifugal Cast Room Replacemant Soil Including Compacting	235	cubic yard		
8	18" Dia Corrugated Steel Storm Drain Pipe Under Cent Cast Rm	300	feet		
8	6" Dia Vitrified Clay Drain Pipe Under Rod/Cutoff Room	100	feet		
8	Unidentified Drain Pipe Under Rod/Cutoff Room	40	feet		
8	12" Dia Vitrified Clay Drain Pipe West of Heat Treat Room	70	feet		
8	10" Dia Vitrified Clay Drain Pipe from Compressor Rm to A5-A	60	feet		
8	18" Dia Corrugated Steel Drain Pipe from Machining Rm to A5-A	60	feet		
8	6" Dia Vitrified Clay Sewer Pipe Under Machining Room	100	feet		

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* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

Percent Labor Cost 65.00%
Average Hourly Labor Rate $45.29

LOC CODE	AREA	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
8	8" Dia Cast Iron Sewer Pipe from B14-6 to Elbow	40	feet		
8	8" Dia Vitrified Clay Sewer Pipe from Elbow to B14-5	60	feet		
9	Compressor Room Wood Timbers	3	thousand board feet		
9	Compressor Room Wood Structural Members	9	thousand board feet		
9	Compressor Room Wood Wall Lumber	5	thousand board feet		
9	Compressor Room Reinforced Concrete Floors	71	cubic yard		
9	Compressor Room Concrete Foundations & Footers	34	cubic yard		
9	Compressor Room Concrete Block Interior Walls	52	cubic yard		
9	Compressor Room Built Up Roofing over Wood Decking	26	cubic yard		
9	Compressor Room Vents, Blowers, Stacks & Fans on Roof	2	ton		
9	Compressor Room Misc Inside Equipment	3	ton		
9	Compressor Room Steel Pipe, Conduit, Sprinklers & Valves	20	ton		
9	Compressor Room Copper in Switchgear & Cable	33,250	pounds		
9	Compressor Room Large Compressors	80	ton		
9	Compressor Room Small Compressors	3	ton		
7	Compressor Room Soil	40	cubic yard		
7	Compressor Room Replacemant Soil Including Compacting	40	cubic yard		
9	10" Dia Vitrified Clay Drain Pipe Under Compressor Room	40	feet		
9	3" Cast Iron Drain Pipe Under Compressor Room	144	feet		
9	5" Cast Iron Drain Pipe Under Compressor Room	100	feet		
1	Relocation of Main Water Line in West Wing	1	Ea	*	
1	Refeed Sprinkler Riser #11	1	Ea		
1	Relocate Heat Treating Facility	1	Ea		
9	Relocation of Electrical Service to Compressor Room	1	Ea		
1	6 KEV Electrical Transformer Relocation	1	Ea		
1	Relocation of Electrical Bus from Substation 13	1	Ea		
9	Reinstall Compressors at New Location	1	Ea		
1	Relocation of Nitrogen Service Tank	1	Ea		

* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

Appendix B-11
VOLUME REDUCT... OSTS
TCAAP Facility

SPECIFIC MATERIAL VOLUME REDUCTION COST ANALYSIS - ENVIROCARE DISPOSAL

INPUT		INPUT	INPUT	INPUT	INPUT	INPUT		DIRECT DISPOSAL		** PROCESSED RADWASTE DISPOSAL **					
APP. CODE	VR METHODOLOGY	AREA	ITEM	ITEM CODE	CONTAM. VOLUME (ft^3)	BULK DENSITY (lb/ft^3)	CONTAM. WEIGHT (lbs)	INPUT DISPOSAL CODE	SHIPPING & DISPOSAL COST ($)	PROCESS COST ($/lb)	VOLUME REDUCTION FACTOR	BURIAL VOLUME (ft^3)	BURIAL WEIGHT (lbs)	PROCESS COST ($)	PROCESS COST SAVINGS ($)
76	Metal Melt, 75 lb/ft3	Centrifugal Cast Room	Crane	3	82.4	94	7,717	105							

NOTES:
1 Transport cost for volume reduction based on a full load transported to VR Facility.

* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

APPENDIX C

Cost Calculation Sheets for TCAAP

- C-1, Waste Decontamination Comparison Table
- C-2, Waste Volume Reduction Comparison Table

SUMMARY

As part of the TCAAP Decommissioning Cost Estimate, analyses were performed to determine which decontamination and volume reduction process would be cost effective for TCAAP. The basis for this analysis is the comparison of direct waste disposal costs to process costs plus waste disposal costs for processed and secondary waste. The most important factor in these analyses is the waste disposal rate. However, for this project the waste disposal costs are the responsibility of TCAAP and have not been made available for this estimate. In order to perform these analyses, it was decided to initially utilize a disposal rate of $15 per cubic foot of waste. If the process was not economical, the waste disposal rate was increased until the process became economical. As a result, a disposal rate is established at which the decontamination process or volume reduction process becomes cost effective. These analyses are provided in Appendices C-1 and C-2.

1.0 DECONTAMINATION COMPARISON TABLE

In Appendix C-1, a cost analysis is performed for decontamination processes. It can be seen that it is cost effective to decontaminate wood timbers by wood planing if the waste disposal rate is $15 per cubic foot or more. It was not cost effective to decontaminate the one-inch oak flooring at a waste disposal rate of $15 per cubic foot, but it was just cost effective at a waste disposal rate of $27 per cubic foot. In addition, it would be cost effective to survey the flooring for release if the oak flooring does not require decontamination. Much of the demolition debris generated at TCAAP, such as drywall material, insulation, roofing, and complex shaped metals, is not suitable for decontamination and decontamination cost analyses were not performed for these items.

2.0 VOLUME REDUCTION COMPARISON TABLE

In Appendix C-2, a cost analysis is performed for volume processes. It can be seen here that it is not cost effective to compact demolition debris if the TCAAP waste disposal rate is $15 per cubic foot. Please note that the disposal rate for compacted debris is anticipated to be about $150 per cubic foot of compacted waste. The TCAAP disposal rate for uncompacted debris is not expected to apply. It would be cost effective to compact demolition debris at a TCAAP waste disposal rate of $112 per cubic foot. In addition, it is not cost effective to incinerate materials if the waste disposal rate is $15 per cubic foot. It would be cost effective to incinerate waste materials at a waste disposal rate of $211 per cubic foot. It is clear that volume reduction techniques will not be cost effective as compared to the low disposal rates anticipated for the TCAAP facility.

TABLE C-1
Waste Decontamination Comparison Table

Appendix C-1
WASTE DECONTAMINATION COMPARISON TABLE
TCAAP Facility

ITEM	DECONTAMINATION PROCESS	BURIAL WEIGHT (lbs)	BURIAL VOLUME (ft^3)	CONTAINER VOLUME (ft^3)	CONTAINERS REQUIRED	CONTAINER COST ($)	ENVIROCARE TRANSPORT COST ($)	ENVIROCARE DISPOSAL RATE ($ft^3)	ENVIROCARE BURIAL COST ($)	ENVIROCARE TOTAL COST ($)	VR PROCESS COST ($)	PROCESSING ECONOMICAL (Y/N)
Wood Timbers	Wood Planer	442,387	5,898	90	66							
Concrete Floor Slab	McDonald U-5 Scabbler	422,400	4,224	90	47							
Oak Flooring	Wood Planer	82,800	1,104	90	13							
Oak Flooring	Wood Planer	82,800	1,104	90	13							
Oak Flooring	survey only	82,800	1,104	90	13							
Pine Subfloor	Wood Planer	198,720	2,650	90	30							
Concrete Lower Walls	Hydraulic Jetting (5k-10k psi)	108,750	1,450	90	17							
Concrete Upper Walls	Hydraulic Jetting (5k-10k psi)	317,188	4,229	90	47							
Concrete Ceiling	Hydraulic Jetting (5k-10k psi)	153,300	2,044	90	23							
Structural Steel Bldg Members	Hands-On Decon	9,240	125	90	2							
Steel Panels	Hands-On Decon	1,460	36	90	1							
Steel Panels	Hands-On Decon	1,460	36	90	1							

*

* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

TABLE C-2
Waste Volume Reduction Comparison Table

Appendix C-2
TCAAP Facility
WASTE VOLUME REDUCTION COMPARISON TABLE

ITEM	VOLUME REDUCTION PROCESS	BURIAL WEIGHT (lbs)	BURIAL VOLUME (ft^3)	CONTAINER VOLUME (ft^3)	CONTAINERS REQUIRED	CONTAINER COST ($)	ENVIROCARE TRANSPORT COST ($)	ENVIROCARE BURIAL COST ($)	ENVIROCARE TOTAL COST ($)	PROCESS COST ($)	TOTAL COST ($)	ENVIROCARE DISPOSAL RATE ($/ft^3)
Demolition Debris	Super Compaction	664,200	5,535	90	62							
Demolition Debris	none	664,200	16,605	90	185							
Demolition Debris	none	664,200	16,605	90	185							
Wood & Combustibles	Incineration	908,000	617	90	7							
Wood & Combustibles	none	908,000	21,600	90	240							
Wood & Combustibles	none	908,000	21,600	90	240							
Building Steel Siding	metal melt	23,362	0	90	0							
Building Steel Siding	none	23,362	584	90	7							
Building Steel Siding	none	23,362	584	90	7							
Asbestos Siding	asbestos compaction	159,666	1,080	90	12							
Asbestos Siding	none	159,666	3,240	90	36							
Asbestos Siding	none	159,666	3,240	90	36							

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* Proprietary cost information is in attachment two of transmittal letter to the NRC, September 30, 1997.

APPENDIX D

HAZARDOUS MATERIALS SURVEY DATA

- D-1 DU ROOM ASBESTOS SURVEY SAMPLE DATA
- D-2 DU ROOM HAZARDOUS MATERIALS SURVEY SAMPLE DATA

Appendix D-1
DU ROOM ASBESTOS SURVEY SAMPLE DATA
TCAAP Facility

Location	Sample Number	Sample Date	Material	Physical Description	Condition	Percent Asbestos By Weight
Column U-37 (Heat Treat Room)	502-54	26-Oct-88	2" pipe lagging	White magnesium carbonate	Poor	35-40% Amosite 3-5% Crocidolite
Column V-32 (Heat Treat Room)	502-55	26-Oct-88	4" pipe lagging	White magnesium carbonate	Poor	40-45% Chrysotile 40-45% Amosite
Column Q-27 (Machining Room)	502-56	26-Oct-88	4" pipe lagging	Air cell	Poor	80-85% Chrysotile
Column Q-30 (Machining Room)	502-57	26-Oct-88	2" pipe elbow	White magnesium carbonate	Poor	70-75% Amosite
Column Q-36 (Machining Room)	502-58	26-Oct-88	8" pipe fittings	White magnesium carbonate	Good	15-20% Amosite
Column Q-34 (Machining Room)	502-59	26-Oct-88	4" pipe lagging	Air cell	Good	70-75% Amosite
Column P-30 (Machining Room)	502-60	26-Oct-88	4" pipe lagging	White magnesium carbonate	Good	75-80% Amosite
Column V-29 (Heat Treat Room)	502-61	26-Oct-88	2'x4' ceiling panel	White with indented pattern	Good	<1% asbestos by weight
Column V-29 (Heat Treat Room)	502-62	26-Oct-88	2'x4' ceiling panel	White with indented pattern	Good	<1% asbestos by weight
Column V-29 (Heat Treat Room)	502-63	26-Oct-88	2'x4' ceiling panel	White with indented pattern	Good	<1% asbestos by weight

Appendix D-2

DU ROOM HAZARDOUS MATERIAL SURVEY SAMPLE DATA

TCAAP Facility

Location	Sample Number	Sample Date	Material	Lead mg/kg	Chromium mg/kg	Asbestos %
East Wall (Heat Treat Room)	1	03-Jul-97	Paint	1,720	82	U
Column (Heat Treat Room)	2	03-Jul-97	Paint	2,070	67	U
West Wall (Machining Room)	3	03-Jul-97	Paint	32	6	U
Column (Machining Room)	4	03-Jul-97	Paint	2,060	51	U
East Wall (Machining Room Area 2)	5	03-Jul-97	Paint	3,750	501	U
East Wall (Equipment Room)	6	03-Jul-97	Paint	207	0.7	U
West Wall (Heat Treat Room)	7	03-Jul-97	Paint	2,400	85	U
Air Compressor (Compressor Room)	[illegible]	03-Jul-97	Paint	5,350	657	U
Metal Doors (Machining Room)	9	03-Jul-97	Paint	4,030	357	U
Walls (Machining & Heat Treat Rooms)	10	03-Jul-97	Drywall	282	8	U
South Wall (Machining Room Area 2)	11	03-Jul-97	Joint Compound	70	353	U
Crane (Centrifugal Cast Room)	12	03-Jul-97	Paint	89,600	17,400	U
Office Ceiling Tile (Heat Treat Room)	13	03-Jul-97	Ceiling Tile	U	9	U
Second Floor Ceiling Tile (Machining Room)	14	03-Jul-97	Ceiling Tile	U	10	U
Wall Board DU ROOM	17	17-Jul-97	Paint/Wallboard	90	14	U

Location	Sample Number	Sample Date	Material	TCLP Herbicides µg/l	TCLP Pesticides µg/l	Organochlorine Pesticides µg/kg	TCLP Semi-VOC's µg/l	TCLP VOC's µg/l
Composite (DU Room)	15	17-Jul-97	Building Materials	U	U	U	U	U
Composite (DU Room)	16A	17-Jul-97	Soil	U	U	U	U	U
Composite (DU Room)	16B	17-Jul-97	Soil	U	U	U	U	U

Sample Number	15	16A	16B
Analyte	Concentration mg/l	Concentration mg/l	Concentration mg/l
Arsenic	U	U	U
Barium	0.1	1.0	1.0
Cadmium	U	U	U
Copper	0.07	U	0.06
Chromium	U	U	U
Lead	2	U	U
Mercury	U	U	U
Selenium	U	U	U
Silver	U	U	U
Zinc	3.2	0.6	0.8
Antimony	U	U	U
Beryllium	U	U	U
Nickel	U	U	U
Thallium	U	U	U
pH	7.26	8.08	8.03
Free Liquids	NO	NO	NO
Cyanide	U	U	U
Sulfide	U	U	U