



70-734

GA Technologies

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1 October 1985 OCT -3 A8:51

PDR

RETURN TO 396-SS

Mr. William T. Crow  
Office of Nuclear Material  
Safety & Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555Subject: Docket 70-734: Plan for Obtaining Release of Certain Areas to  
Unrestricted Use. (8 copies)Reference: (a) GA letter #696-6077 dated 11/16/84.  
(b) GA letter #696-6085 dated 12/6/84.  
(c) GA letter #696-6092 dated 12/21/84.

Dear Mr. Crow:

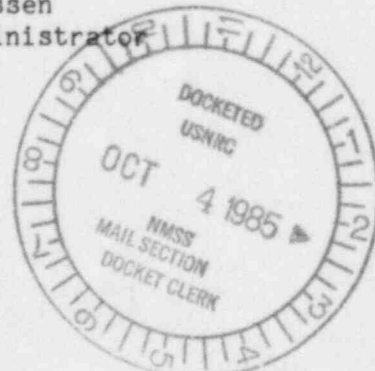
Enclosed are eight (8) copies of a plan prepared by GA Technologies Inc. (GA) for obtaining approval to release certain portions of its site to unrestricted use. This plan is a revised version of a previously submitted plan and supporting information (References a, b and c). It has been modified in response to recommendations contained in an NRC draft evaluation of the original plan as well as to reflect GA's current strategy for obtaining release following discussions with Messrs. Thomas and B. Brock of Region V. Further, the enclosed plan includes an updated schedule.

Your early approval of our criteria and plan are respectfully requested. Thank you for your timely support in this regard. If you have any questions or comments, please contact me at (619) 455-2823.

Very truly yours,

*Keith E. Asmussen*Keith E. Asmussen  
Licensing Administrator

KEA:hc

Enclosure:  
Plan for Obtaining Approval to Release  
Discrete Areas to Unrestricted Use.cc: Mr. John B. Martin, NRC, Region V (1 copy)  
Department of Health, State of California  
(Attn: Ben Kapel) (1 copy)8510210253 851001  
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PLAN FOR OBTAINING APPROVAL TO RELEASE  
DISCRETE AREAS TO UNRESTRICTED USE

I. Objectives

The objectives of this plan are to provide:

1. a description of sites to be released to unrestricted use
2. identification of areas where levels of radioactivity approximate or exceed the regulatory levels for release to unrestricted use (prior to decontamination)
3. methods to identify and quantify levels of radioactivity in these areas
4. criteria for release to unrestricted use
5. a procedure for a detailed final survey (after decontamination) to demonstrate that radioactivity levels in the areas meet the criteria for unrestricted release.

## II. Summary of Plan

Our plan for releasing the sites to unrestricted use is as follows:

1. Identify the activities and their site location, and for each site provide:
  - a. a brief history of the activity;
  - b. a characterization of any residual radioactive materials, including a listing of the principal nuclides, and estimates of their concentrations, and total quantity;
  - c. proposed disposition of contaminated materials;
  - d. schedule proposed dates for clean-up, survey and release to unrestricted use.
2. Decontaminate any such location to:
  - a. meet the license criteria for release of a facility or equipment to unrestricted use (Table 1) and/or
  - b. remove any contaminated soil and/or vegetation until the residuals meet the NRC policy (SECY 81-576) Option 1 criteria. This option assures that no individual is likely to receive an external radiation exposure at a rate greater than 10  $\mu$ R/hr above background measured at one (1) meter above the surface or 20 millirem/yr to the lung or 60 millirem/yr to the bone. See Table 2.
3. Provide NRC with the results of our final surveys and request NRC confirmatory surveys to independently verify that the specified sites and their environs have been appropriately decontaminated.
4. Request NRC confirmation(s) that soils surrounding the removed underground radioactive material storage tanks listed above have been decontaminated to acceptable levels for release to unrestricted use. This confirmation will be used as evidence the locations need not be reconsidered at the time of future decommissioning activity.
5. Request and obtain a license amendment indicating that the several acres which contained and surrounded the waste pond area, incinerator area, waste processing and storage areas and the adjacent canyon areas have been appropriately cleaned up and may be released to unrestricted use.



TABLE 2

Criteria for Soil Decontamination at the GA Site

<u>Exposure Pathway</u>	<u>Target Criteria</u>	<u>Other Existing Criteria or Guidance</u>
External Radiation (whole body)	10 $\mu$ r/hr (35 mrem/yr) (a)	20 $\mu$ r/hr indoor <sup>(b)</sup> -EPA cleanup standard for Inactive Uranium Processing Site; 500 mrem/yr- 10 CFR 20; 170 mrem/yr-FRC Guidance; 400-900 mrem/yr-Sur- geon General's Guidance for in- door exposure; 25 mrem/yr- 40 CFR 190.
Inhalation of Partic- ulates (lung, bone)	1 mrad/yr (lung) (20 mrem/yr) <sup>(c)</sup> 3 mrad/yr (bone) (60 mrem/yr)	1500 mrem/yr-10 CFR 20 <sup>(d)</sup> 25 mrem/yr-40 CFR 190 1 mrad/yr (lung), 3mrad (bone) EPA Transuranic Guidance

(a) This value does not include background, the 35 mrem/yr (realistic dose) includes shielding factor of 0.5 from building a residential home for general population and residence time 80 percent.

(b) 40 CFR Part 192 - Federal Register, April 22, 1980.

(c) Based on quality factor of 20 as originally intended for alpha emitted from the transuranic elements.

(d) Designated in or derived from 10 CFR 20.



### III. Sites to be Released to Unrestricted Use

The portions of GA's roughly 430 acre site to be released to unrestricted use are several small localized areas plus a relatively large area associated with and surrounding the old waste processing area. Their locations are shown in Figures I, II, III and IV.

The underground tanks being deactivated range from 750 gallons to 1000 gallons capacity. These tanks served as holdup for radioactive liquid effluents from licensed fuel facilities and laboratories utilizing radioactive materials. Where needed, alternative above ground effluent storage is being provided to eliminate the underground tank monitoring and potential soil contamination problems. Each of the tank sites are being treated as a potential highly localized discrete source area. (Reference Fig. I)

The Waste Processing Area (WPA) is an approximately six acre complex of discrete areas; an incinerator site, solar evaporation ponds, waste processing facility, associated storage yards, and other storage facilities. Their locations are shown in Figure II.

The canyons below the WPA are a discrete area occupying approximately one acre through which run-off from the WPA goes.

Figure III shows the specific areas associated with and surrounding the Waste Processing Area. This relatively large portion of the GA site (~80 acres) is the principal area to be released for unrestricted use. Figure IV shows this area in more detail and identifies the affected areas.

A brief description of each of the above is given below:

#### A. UNDERGROUND RADIOACTIVE LIQUID WASTE HOLDING TANKS

##### 1. Building 9

The Building 9 Tank is a 750 gallon poured-in-place reinforced concrete tank. The tank was placed under ground 28 years ago and is part of the Building 9 loading dock. The tank was originally used to dilute non-radioactive acid wastes from a metal plating operation and was later converted to a radioactive liquid waste holding tank. The liquid collected in the tank was contaminated with thorium and depleted uranium. At a later time it was used to hold-up liquid contaminated with mixed fission and activation products. The tank has no history of leakage.

2. Building 2/540

The Building 2/540 Tank is a 1,000 gallon poured-in-place reinforced concrete tank. The tank was placed underground 28 years ago. The tank was used to hold-up liquid waste contaminated with natural uranium and thorium from metallurgical labs. No mixed fission or activation products were used in these laboratories. The tank has no history of leakage.

3. Building 2/307

The Building 2/307 Tank is a 1,000 gallon, poured-in-place, reinforced concrete tank. The tank was placed under ground 28 years ago. The tank was used to hold-up liquid from a shielded research laboratory contaminated with Cs-137, Co-60 and Sr-90. The tank has a history of leakage.

4. Building 31

The Building 31 Tank is a 1,000 gallon steel tank. The tank was placed under ground 23 years ago. The tank was used to hold-up hand wash water contaminated with enriched uranium, thorium, and activation products from the HTGR Critical Facility. The tank has no history of leakage.

5. Building 21

The Building 21 Tank is a 1000 gallon steel tank housed in a concrete cradle and surrounded by gravel. The tank was placed under ground 28 years ago and originally served the TRIGA Reactor Facility. Until establishment of the Fuel Development and Research Laboratory (FDRL), the tank saw little use. After establishment of the FDRL the tank was used to hold-up liquid contaminated with mixed fission and activation products. The tank has no history of leakage.

6. Building 37

The Building 37 Tanks are two one-thousand gallon steel tanks. The tanks were placed underground 20 years ago and serve the Building 37 Change Rooms. Only hand wash water contaminated with low levels of enriched uranium and thorium drains to the tanks. The tanks have no history of leakage.

B. Waste Processing Area:

1. Solar Evaporation Ponds

The Solar Evaporation Ponds consists of four sets of three 20' x 20' concrete ponds one foot deep designed to contain contaminated liquid which in turn is evaporated by solar energy. Three sets of ponds were used for liquid waste containing enriched uranium and thorium. The fourth pond contained liquid waste contaminated with mixed fission and activation products. Through the years there was some cross contamination of the ponds necessitated by one or the other set of ponds being full when there was a need to place additional liquid waste in the ponds. Sludge was periodically removed, packaged and disposed of to a licensed radioactive waste disposal site.

2. Radioactive Waste Incinerator Site

The incinerator was located on a 20' x 20' concrete pad. The unit was placed in operation in 1963 and decommissioned and removed in 1980. Only the pad now remains. The incinerator was used to burn solid waste contaminated with enriched uranium. The incinerator was equipped with a particulate filter system. The ash was periodically removed from the incinerator and analyzed for U-235.

3. Waste Processing Facility

The Waste Processing Facility was constructed to process and package solid waste contaminated with enriched uranium and thorium primarily, and small quantities of mixed fission and activation products, and to process and solidify acid waste contaminated with uranium and thorium. The waste processing facility was placed into operation twenty-eight years ago. The surface of the packaging area was asphalt and the solidification area concrete.

4. Upper Storage Yards

The upper storage yards were constructed fourteen years ago with asphalted surfaces. Only equipment properly packaged for storage, and solid waste packaged in accordance with appropriate regulations and awaiting disposal was stored in these areas.



## 5. Other Storage Areas

An underground storage facility was located at the east end of the Waste Processing Facility. The storage area was constructed by placing 10 inch diameter transite pipe underground. Slightly irradiated TRIGA fuel elements in capped and gasketed steel pipe containers were stored in the facility from 1960 to 1982. At the time of removal no measurable contamination was detected on the external surface of the pipe containers nor inside the storage pipes.

The Byproducts Storage Building is a metal "Butler" building located in the Northwest corner of the Waste Processing Facility. Inside the building are:

- a. 4 storage wells 13 feet deep by 3 feet in diameter with removable shield plugs,
- b. 6 "lazy susans" located behind a shield wall. The "lazy susan" can be lowered into individual storage wells 12 feet deep, and
- c. two levels of shielded shelf storage. Liquid cesium chloride was spilled in one of the storage wells several years ago.

A high level storage bunker for 55 gallon drums reading 50 mR/hr or greater at the surface is located in the south east end of the Waste Processing facility. The facility is a three sided open top enclosure constructed of burlap bags filled with a mixture of cement and sand and has an asphalt floor. The drums contained solid waste contaminated with mixed fission and activation products.

### C. Canyon Area

The canyon area is a one acre area adjacent to the solar evaporation ponds, Waste Processing Facility and incinerator pad. A spill in 1972 from the evaporation ponds contaminated part of this canyon area directly below the ponds with approximately 100 gms of enriched uranium along with thorium, Cs-134, Cs-137, Co-60 and Sr-90. Water runoff from the Waste Processing Facility also enters the canyon area.

### D. Principal Area to Be Released to Unrestricted Use

The principal area to be released is shown on Figure III. This area includes the Waste Processing Area (Item B above), the associated canyon area (Item C above), and areas of raw land (mainly hillsides and canyons) surrounding these areas.

#### IV. Survey and Sampling Plan for Each Site

##### A. Underground Tank Removal, Survey and Sampling Plan

Prior to removal of any tank, the tank will be pumped and the contents sampled and analyzed. The inlet lines will be capped, placarded as appropriate, and a site map marked to indicate the location of the drain lines.

The flow chart for the removal of the tank, the surveys to determine contamination levels, if any, as well as decontamination and disposition is shown on the decision tree in Figure V. The isotopic content for any contamination inside or outside of the tank will be determined. The total quantities will be made from dose rate measurements utilizing information from the measured isotopic content.

After removal of the tank, the hole will be surveyed with an appropriate instrument and if no measurable activity above background levels is detected, permission will be requested from the USNRC to backfill the hole. The decision tree for the activity associated with any contamination within the tank pit is also given on Figure V.

If levels above the acceptable criteria are detected, soil samples will be collected, analyzed and evaluated. If the levels are in excess of the release criteria for the identified isotope, the soil will be removed, packaged and shipped to a licensed land burial facility for disposal. In the event the quantity is economically not removable, the profile and total quantity of radioactive material will be determined and a disposition scenario proposed to the USNRC.

##### B. Waste Processing Area

###### 1. Survey Plan

In the waste processing area the first part of a survey will be a "walkover" survey. This will consist of random readings taken in the areas with a calibrated meter. This effort will locate any "hot" spots. Readings from this survey will be recorded for any area exceeding 10  $\mu\text{R/hr}$  above background at one meter above the surface.

Upon completion of the "walkover" survey and with "hot" spots removed, the grid survey will be inaugurated. A grid survey will be accomplished by using a 10' x 10' grid in the designated contaminated areas and a 30' x 30' grid in all other affected areas. Measurements at each grid intersection at a distance of one meter above the surface will be made using a MicroR meter. If the readings do not exceed 10  $\mu\text{R/hr}$  above the background at one meter above the surface, the surveyor shall move to the next grid intersection. If the reading exceeds 20  $\mu\text{R/hr}$  above background at

one meter above the surface, a surface reading shall also be taken.

With a reading of 20  $\mu$ R/hr or greater at one meter above the surface, and the surrounding 4 grid area average exceeding the 10  $\mu$ R/hr above background at one meter above the surface, that point shall be considered for soil sampling. See section on Soil Sample Plan for details.

Survey each of the affected areas as noted below;

Solar Evaporation Ponds	10' X 10' grid
Radioactive Waste Incinerator Site	10' X 10' grid
Waste Processing Facility	10' X 10' grid
Upper Storage Yards	10' X 10' grid
Other Storage Areas	10' X 10' grid

#### C. Canyon Area

##### 1. Survey Plan

The canyon area is defined as that area adjacent to and below the solar evaporation ponds, Waste Processing facility and incinerator pad. This area is shown in Figure IV.

Because of the activities previously described for the waste processing areas, it is anticipated that there are several locations at which some contamination is expected.

As was done in Waste Processing Area, the first part of the canyon survey will be a walkover survey. It will be done in an identical manner as that described for the Waste Processing Area. Upon completion of this survey and its associated decontamination, a grid survey will be performed. It will be performed in the same manner as the Waste Processing area, except that the grid description is as follows:

Spill area below ponds	10' x 10' grid
Other affected areas	10' x 10' grid
Canyon floor	30' lengthwise along central axis 10' lateral, parallel to central axis

#### D. Land Surrounding Waste Processing and Canyon Areas

Land surrounding the affected areas described above in Sections B and C but within the boundaries of the principal area for release to unrestricted use, shall be surveyed for external radiation by a "walkover" survey at 30 foot intervals. Grids will not be staked out unless readings  $>10 \mu$ R/hr above background at 1 meter above the surface are detected. If this level is exceeded, the location will be identified as an affected area and characterized.

## E. Soil Sample Plan

### 1. Prior to Clean-up

After the contaminated (affected) areas have been identified, soil samples will be taken to characterize the site. Core samples will be obtained in the Solar Evaporation Ponds, the spill area below the ponds, the canyon floor and the radioactive waste incinerator site and other specific areas where there is a high potential for contamination to migrate downward into the soil strata or transport into the soil by erosion.

#### o Collection

- a. The surface vegetation (brush and weeds) will be removed by cutting off at ground level, not uprooted.
- b. Surface samples (0-1") will be collected; approximately 2 kilograms of soil sample.
- c. A composite soil sample 1"-6" or 1"-12" will be collected based on the area and estimated depth of contamination.
- d. If subsurface soil contamination is found, then additional samples (e.g. core samples) will be taken at sufficient depths to provide an estimate of the extent of contamination.

#### o Preparation

- a. The soil samples will be free of vegetation and rocks.
- b. The samples will be dried to remove moisture.
- c. The sample will be ground to a fine powder with no "clumping" (clumping would be due to excess moisture), or

if it can be demonstrated with adequate data that there is no significant difference between the results obtained with samples that have been ground to a fine powder and samples that have not been ground, then subsequent analyses will not require samples to be ground. Samples that are not ground to a fine powder will be crushed and mixed to eliminate clumping and to homogenize.

o Analysis

The samples will be analyzed by gamma ray spectroscopy, gross alpha, gross beta, DNAA or chemical analyses performed to written procedures. The option to log the core hole, identify and quantify the nuclides present in-situ with a gamma spectrometer and NaI detector or equivalent instrument may be used in lieu of counting the core samples.

2. During Clean-up

During the decontamination phase (removal of soil with contamination above Option 1 target criteria) soil samples will be collected and the locations will be marked and identified on a map. The first foot of soil will be prepared, and analyzed as described above to:

- a. Verify correlation between the microR/hr readings and the soil radionuclide concentrations or
- b. Check compliance with the inhalation criteria in areas where correlation may not exist.

If results indicate contamination levels above the Option 1 criteria, additional decontamination will be conducted in order to meet the target criteria (see Section V).

3. After Clean-up

Upon completion of required decontamination, soil samples will be collected as follows:

- a. In areas where the microR/hour readings are the controlling criterion (i.e., where a correlation between  $\mu$ R meter readings and the results of soil sample analyses has established that both the inhalation and direct radiation pathway limits are met when using the direct reading), random sampling of 5% of the 30' x 30' grids will be conducted.
- b. In all other affected areas, samples will be taken as follows:

Representative soil samples shall be collected at each grid (30' x 30') from the first inch (1") of soil.

The samples will be prepared and analyzed as described above.



## V. Target Criteria for Unrestricted Release

### A. Facility & Equipment

Table 1 is taken from USNRC's criteria for releasing facilities and equipment to unrestricted use. It has been incorporated into our SNM-696 license. This table will be used for releasing process equipment or buildings to unrestricted use. Ponds, tanks, etc. will be treated as process equipment. The above criteria will not be utilized for soils.

### B. Direct Radiation

External radiation (gamma dose rate in air one meter above ground level) shall not exceed  $10 \mu\text{R/hr}$  above background for a diffuse source area (a contaminated area greater than  $30' \times 30'$ ) and shall not exceed  $20 \mu\text{R/hr}$  above background for a discrete area (a contaminated area smaller than  $30' \times 30'$ ).

### C. Inhalation Pathway

Table 3 contains values of soil contamination ( $\text{pCi/gm}$ ) which if residing on the surface and could be inhaled would not lead to an exposure exceeding the Option I acceptability limit. Soil contaminations above these Table 3 values may be acceptable under unusual circumstances but only if a specifically analyzed intrusion scenario shows that any individual will not be exposed to radiation levels greater than those appropriate for NRC/EPA Option I.

### D. Ingestion Pathway

The GA site is located within a semi arid region zoned for light industry and Research and Development. The area is not, nor will likely be, allowed any residential or agricultural land usage. There is no potable water on the site or its environs. A brackish water table is approximately 275-300 ft deep at about the same level as the nearby salt water backwater and marshes. Therefore the pathway for ingestion of any residual contamination via any food or water is highly improbable.

However, vegetation (brush, weeds, etc) removed from the GA site for unrestricted disposal could possibly enter the ingestion pathway. Therefore the contamination levels of such vegetation must satisfy the target criteria for ingestion exposure (as well as the target criteria for direct radiation and inhalation exposure).

The target criteria for food ingestion exposure is 30 mrem/year to the bone (NRC Policy Issue SECY-81-576). The dose commitment resulting from ingestion (vegetation, beef, milk) of radionuclides from contaminated vegetation are shown in Table 4. These values are based upon a unit concentration of 1  $\text{pCi/gram}$  of each radionuclide in the vegetation.

E. Summary of Limiting Concentrations for Direct Radiation and Inhalation Dose Limits

Table 5 summarizes the derived limiting concentrations of various groups of radionuclides for the compliance of the direct radiation and inhalation dose limits. Meeting the target criteria in Table 5 will indicate that the residuals satisfy the Option I acceptability criteria.

TABLE 3

Individual Concentration in Soil Resulting in an Annual Inhalation  
Dose of 20 mrem to the Lung<sup>(1)</sup> and 60 mrem to the Bone<sup>(2)</sup>

Radionuclide	Solubility Classification	Derived Concentration (pCi/g)	
		Lung (20 mrem)	Bone (60 mrem)
U-238	Y	35 <sup>(5)</sup>	1.2x10 <sup>4</sup>
U-238	W	3.2x10 <sup>2</sup>	3.9x10 <sup>3</sup>
U-238	D	1.9x10 <sup>4</sup>	1.2x10 <sup>3</sup>
U-235	Y	35	1.2x10 <sup>4</sup>
U-235	W	3.2x10 <sup>2</sup>	3.9x10 <sup>3</sup>
U-235	D	1.9x10 <sup>4</sup>	1.2x10 <sup>3</sup>
U-234	Y	30	1.0x10 <sup>4</sup>
U-234	W	2.8x10 <sup>2</sup>	3.6x10 <sup>3</sup>
U-234	D	1.7x10 <sup>4</sup>	1.1x10 <sup>3</sup>
Th-232	Y	35	2.6x10 <sup>2</sup>
Th-232	W	3.3x10 <sup>2</sup>	1.0x10 <sup>2</sup>
Ra-228	W	3.3x10 <sup>3</sup>	2.9x10 <sup>3</sup>
Th-228 <sup>3</sup>	Y	20	1.8x10 <sup>3</sup>
Th-228	W	1.3x10 <sup>2</sup>	3.3x10 <sup>2</sup>
Co-60 <sup>4</sup>	Y	1.2x10 <sup>4</sup>	1.6x10 <sup>6</sup>
Co-60	W	1.2x10 <sup>5</sup>	5.8x10 <sup>6</sup>
Cs-137 <sup>4</sup>	D	9.6x10 <sup>5</sup>	1.8x10 <sup>6</sup>
Sr-90 <sup>4</sup>	Y	1.8x10 <sup>3</sup>	2.6x10 <sup>5</sup>
Sr-90	D	1.6x10 <sup>6</sup>	2.8x10 <sup>4</sup>

(1) Pulmonary lung (570 gm); consistent with EPA's Transuranics Guidance.

(2) Bone means osseous tissue, (5,000 gm); consistent with EPA's Transuranic Guidance.

(3) The daughters of Th-228 and Ac-228 do not contribute significantly to the inhalation dose because of their comparatively short half-lives.

(4) Solubility classifications are based on ICRP-30.

TABLE 4<sup>(1)</sup>

Dose Commitment Resulting from Ingestion (Vegetation, Beef, Milk) of Radionuclides from Contaminated Vegetation (brush, weeds, etc.). Figures Based on a Unit Concentration of 1 pCi/g of Each Nuclide in the Vegetation.

<u>Radionuclides</u>	<u>Bone Dose</u> (mrem/yr)
U-238	1.9E-0
U-235	1.9E-0
U-234	2.2E-0
Th-232	2.1E-0
Th-230	2.0E-0
Th-228	4.0E-1
Ra-228	4.5E-0
Ra-226	8.9E-0
Sr-90	6.1E-0
Cs-137	2.3E-1
Pu-239	5.6E-2

(1) Reference: NRC's Docket No. 70-820 - United Nuclear Corporation Resources Company "Soil Decontamination Criteria for the Decommissioning of the UNC's Facility." Scrap Recovery Junction, Rhode Island.

TABLE 5

Derived Limiting Concentrations For Various Groups of Radionuclides

<u>Derived Limiting Concentration (pCi/gm)</u>			
<u>Radionuclide</u>	<u>Inhalation</u>		<u>Direct Radiation<sup>(1)</sup> (10 <math>\mu</math>R/hr)</u>
	<u>Lung (20 mrem)</u>	<u>Bone (60 mrem)</u>	
<u>Depleted uranium</u>			
U-238, U-234 (Y)	35	--	--
U-238, U-234 (W)	$3.2 \times 10^2$	--	--
U-238, U-234 (D)	--	--	$8.0 \times 10^2$
<u>High-enriched uranium</u>			
U-234, U-235 (Y)	30	--	--
U-234, U-235 (W)	$2.8 \times 10^2$	--	--
U-234, U-235 (D)	--	--	$8.0 \times 10^2$
<u>Natural Thorium</u>			
Th-232, Th-228 (Y)	--	--	10
Th-232, Th-228 (W)	--	--	10
<u>Cobalt</u>			
Co-60 (Y)	--	--	8
Co-60 (W)	--	--	8
<u>Cesium</u>			
Cs-137 (D)	--	--	15
<u>Strontium</u>			
Sr-90 (Y)	$1.8 \times 10^3$	--	--
Sr-90 (D)	--	$2.8 \times 10^4$	--

(1) GA prefers to use an instrument (microRmeter) to demonstrate compliance of 10  $\mu$ R/hour above background at one meter for diffuse areas.



## VI. Compliance With the Target Criteria

Given below are the target criteria for direct radiation and inhalation pathways. Both criteria must be met prior to release of the area for unrestricted use.

### A. Direct Radiation

The direct radiation level of  $10 \mu\text{R/hr}$  above background is intended as a target criterion for open land cleanup. The dose limit will be measured using calibrated micro R meters accurate enough to differentiate background.

Upon completion of any required decontamination, a final survey will be made of the waste processing and canyon areas. The purpose of this survey is to verify all significant contamination has been removed and the area meets the target criteria.

To demonstrate compliance with the direct radiation limit, the affected areas will be divided into grids about  $30' \times 30'$  for surveying purposes. In order to meet the target criterion, the following conditions have to be met:

External radiation (gamma dose rate in air one meter above ground level) shall not exceed  $10 \mu\text{R/hr}$  above background for a diffuse source area (a contaminated area greater than  $30' \times 30'$ ) and shall not exceed  $20 \mu\text{R/hr}$  above background for a discrete area (a contaminated area smaller than  $30' \times 30'$ ).

Land surrounding the affected areas but within the boundaries of the principal area for release to unrestricted use shall be surveyed for external radiation by a "walkover" survey at 30 foot intervals.

### B. Inhalation of Particulates

Table 3 summarizes the derived soil contamination limits for each inhaled radionuclide, which results in a committed dose of 20 mrem/yr to the lung and 60 mrem/yr to the bone. It is noted that Table 3 soil limits are for individual radionuclides. If a mixture of these radionuclides exists in soil, the following formula will be applied to show compliance:

the sum of  $C_i/L_i \leq 1$

where  $C_i$  = the average soil concentration of radionuclide  $i$ , and  
 $L_i$  = the derived maximum soil limit for radionuclide  $i$   
(from Table 3).

To demonstrate compliance with the dose limits established for the inhalation pathway, the following has to be met:

Representative soil samples shall be collected at each grid (30' x 30') from the first inch (1") of soil and analyzed for the various isotopes. The concentrations of isotopes can be averaged by any four adjacent grids to demonstrate compliance with the target criteria given in Table 3.

The derived concentrations in Table 3 also apply to subsurface soil contamination. Therefore, subsurface\* soil samples will also be collected. After decontamination has resulted in the above condition being met for surface soil, compliance with the subsurface requirement will be demonstrated by analyzing a random 5% of the subsurface soil samples.

If a subsurface random sample exceeds the limit, the four adjacent 30' x 30' subsurface samples will be analyzed and the results averaged. If the average is below the limits, the inhalation dose target criteria will have been met. If the averaged result is above the limits, further decontamination will be conducted.

In these affected areas where it can be demonstrated with adequate data that meeting the 10  $\mu$ R/hr above background limit will also meet the inhalation dose limit, direct radiation measurements will be used to demonstrate compliance for both pathways. In this case, soil samples of five (5) percent of the grids will be randomly collected and analyzed to confirm compliance.

C. Ingestion of Vegetation (Brush, weeds, etc.)

Table 4 summarizes the derived vegetation contamination limits for each ingested radionuclide which results in a committed dose of 30 mrem/year to the bone. The vegetation contamination limits given in Table 4 are for individual radionuclides. If a mixture of these radionuclides are present in vegetation, the following formula will be applied to demonstrate compliance:

$$\text{the sum of } C_i/L_i \leq 1.0$$

where  $C_i$  = average concentration of radionuclide  $i$  in vegetation

$L_i$  = derived limit for radionuclide  $i$  in vegetation (from Table 4)

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\*"subsurface soil sample" refers to a soil sample taken starting at a depth of 1" and extending to a depth of 6" or 1' depending on the area and estimated depth of contamination.

## VII. Disposition of contaminated Soil and Vegetation

### Soil

Soil with contamination levels above the Option 1 target criteria will be appropriately packaged and shipped to an authorized radioactive waste disposal facility.

### Vegetation

Vegetation (brush, weeds, etc.) with contamination levels above the target criteria for external radiation or inhalation exposure or ingestion exposure (See Sections V and VI) will be appropriately packaged and shipped to an authorized radioactive waste disposal facility.

Vegetation with contamination levels below the target criteria for external radiation, inhalation exposure and ingestion exposure may be removed from the GA site for unrestricted disposal, e.g. sent to a local land fill facility.

VIII. Protective Measures and Survey Equipment

1. Work performed in controlled areas will be done using proper protective measures to comply with 10 CFR 20 and accepted health physics practices.

Safety equipment on site that will be available for use at the work location includes but is not limited to:

- a. Anti-contamination clothing
- b. Personnel monitoring devices
- c. Respiratory protection equipment (supplied air hoods)
- d. Air samplers
- e. High Efficiency Particulate Air (HEPA) filtered vacuum cleaners.
- f. Calibration standards for instrumentation.
- g. Health Physics Instrumentation
  - o MicroR/hr meters (Ludlum mod 19 or equivalent)
  - o GM meters (Ludlum mod 3 with a Model 44-9 pancake probe or equivalent)
  - o Alpha survey meters (Eberline PAC 1-SA or equivalent)
  - o Gas proportional sample counters (Ludlum mod 2200 or equivalent)
  - o Gamma analyzers with NaI and Ge(Li) detectors  
(Davidson pulse Height Analyzer mod. 4106 or equivalent)

Personnel will be surveyed upon exiting a controlled area.  
Equipment will be surveyed and decontaminated if required prior to removal from the controlled area.

The project will be performed in such a manner to minimize radiation exposure and comply with the "As Low As Reasonably Achievable" (ALARA) philosophy.

Soil samples will be analyzed for uranium content and the results will be the basis for an evaluation/analysis to verify criticality safety is assured.

## IX. Schedule for Release to Unrestricted Use

The schedule of activities leading to the release of contaminated sites are shown on Tables 6, 7, and 8.

### A. Underground Tanks

Table 6 lists underground tanks, the status/date of tank removal, status of any surrounding soil contamination, the dates of Region V verification, the release date authorizing backfill and final survey of environs of the tank site. Where the USNRC staff can be on site during or immediately after tank removal, they will verify absence of soil contamination and sample soils. The pits will be backfilled immediately thereafter if contamination levels are below the criteria for release.

### B. Principal Area to be Released to Unrestricted Use

Contaminated soil removed during decontamination efforts will temporarily be piled in staging areas within the boundaries of the area to be released to unrestricted use. A meaningful survey cannot be completed for the entire area to be released prior to removal of this contaminated soil. Inasmuch as the packaging and shipment of the contaminated soil will be time consuming tasks, and because of the need to prepare (e.g. grade and seed) certain areas (where contaminated soil has been removed) in order to control soil erosion, the NRC confirmatory surveys of the total area to be released will be performed in two phases. The areas associated with Phase I and Phase II are identified on Figure IV. The first phase will involve a NRC confirmatory survey of essentially the entire area except those areas occupied by or influenced by the piles of contaminated soil and one small area containing buried asphalt. Following the NRC confirmatory surveys demonstrating that the Phase I area meets the target criteria for release, this area may be regraded.

After the contaminated soil has been removed from areas associated with Phase II, NRC will be requested to perform the final confirmatory survey.

Table 7 lists the schedule for equipment removal and appropriate cleanup. Table 8 gives the target schedule for completion of soil and surface surveys and for Region V/ORAU independent verification surveys.



TABLE 6

SCHEDULE FOR UNDERGROUND RADIOACTIVE WASTE  
HOLDING TANKS

Area	Removal Date	Clean-up	GA Survey	Projected USNRC Confirmatory Survey	Backfill Release Date
1. Building 9	10/8/84	NR	10/8/84	Open	10/18/84
2. Building 2/540	7/26/84	NR	7/26/84	10/5/84	10/5/84
3. Building 31	8/13/84	NR	8/13/84	Open	11/16/84
4. Building 2/307	6/28/84	6/28/84 7/23/84 8/14-15/84	6/28/84 7/24/84 8/18/84 8/23/84 9/12/84	10/5/84	12/6/85
5. Byproducts Storage Bldg. (storage pits)	11/16/84	11/17/84	11/19/84	Open	2/85
6. Building 2	11/14/84	NR	11/14/84	Open	11/15/84
7. Building 37	1/8/85	NR	1/8/85	Open	1/9/85

NR - None required.

TABLE 7

## SCHEDULE FOR DECONTAMINATION OF PRINCIPAL AREA TO BE RELEASED

	Remove Equipment	Complete Clean-up*
1. Waste Processing Areas		
a. Solar Evaporation Ponds	8/31/84	10/15/85
b. Incinerator Site	N/A	11/85
c. Waste Processing Facility	11/84 11/85	3/86
d. Upper Storage Yard	11/15/84	3/86
2. Canyon	N/A	11/85
3. Surrounding raw land	N/A	N/A

\*tentative, subject to change due to weather conditions, etc.

TABLE 8

Schedule for Final Surveys of Area to Be Released to Unrestricted Use

	<u>GA Survey*</u>	<u>Final Report*</u>	<u>Request USNRC Confirmatory Survey**</u>
Phase I Area(s)	10/24/85	11/15/85	11/15/85
Phase II Area(s)	3/1/86	4/1/86	4/1/85

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\*Dates are tentative, subject to weather conditions.

\*\*Tentative target dates for requesting NRC confirmatory survey. It is anticipated NRC confirmatory survey would commence about two weeks after request.

#### X. Background Levels

The background for the general area was established by taking soil samples from five (5) selected locations (Figure I) agreed to by GA Technologies Inc. (GA) and the U.S. Nuclear Regulatory Commission (USNRC). Surface samples (0-1") and composite samples from between 1' to 2' depth were taken from each of the five locations.

Samples were assayed by gamma ray spectroscopy by GA, the USNRC and Oak Ridge Associated Universities. The results were compared and the following background levels will be utilized.

<u>Isotope</u>	<u>Conc pCi/gm</u>
K-40	21.81
Co-60	0.003
Cs-137	0.09
U-238	1.5
U-235	0.09
U-232	1.50
Th-228	1.32
Ra-226	0.84
Ra-228	1.37

Background external radiation levels will be established for the work site by taking readings in the adjacent non-contaminated areas and averaging them to obtain an overall background reading for the area.

## APPENDIX A

### QA PLAN

#### 1.0 Purpose

The purpose of the QA Plan is to establish an acceptance plan for the survey, evaluation and release of discrete locations on GA Technologies property in order to meet the U.S. Nuclear Regulatory Commission regulations for release to unrestricted use.

#### 2.0 Scope

The scope will include examination and review of; statistics and procedures, instrumentations and calibration, data and evaluation documentation and verification.

#### 3.0 Statistics and Procedures

Statistics that are used shall be checked for accuracy and applicability. The procedure used shall be current.

#### 4.0 Instrumentation and Calibration

All instruments shall be mechanically and electronically stable. The calibration shall be with applicable standards and be traceable to NBS Standards.

#### 5.0 Data, Evaluation, Documentation and Verification

All data and its documentation shall be maintained as to be retrievable and traceable.



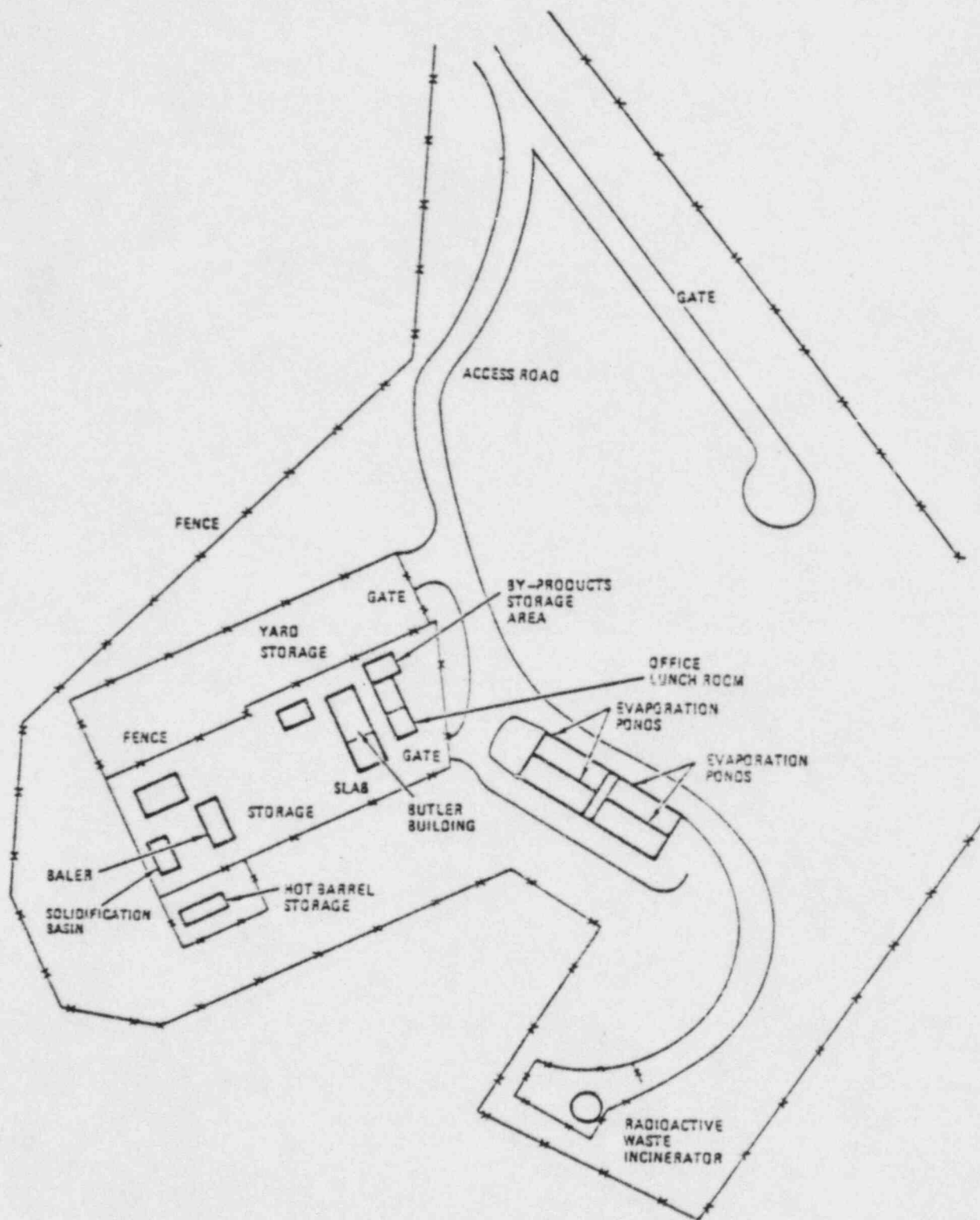
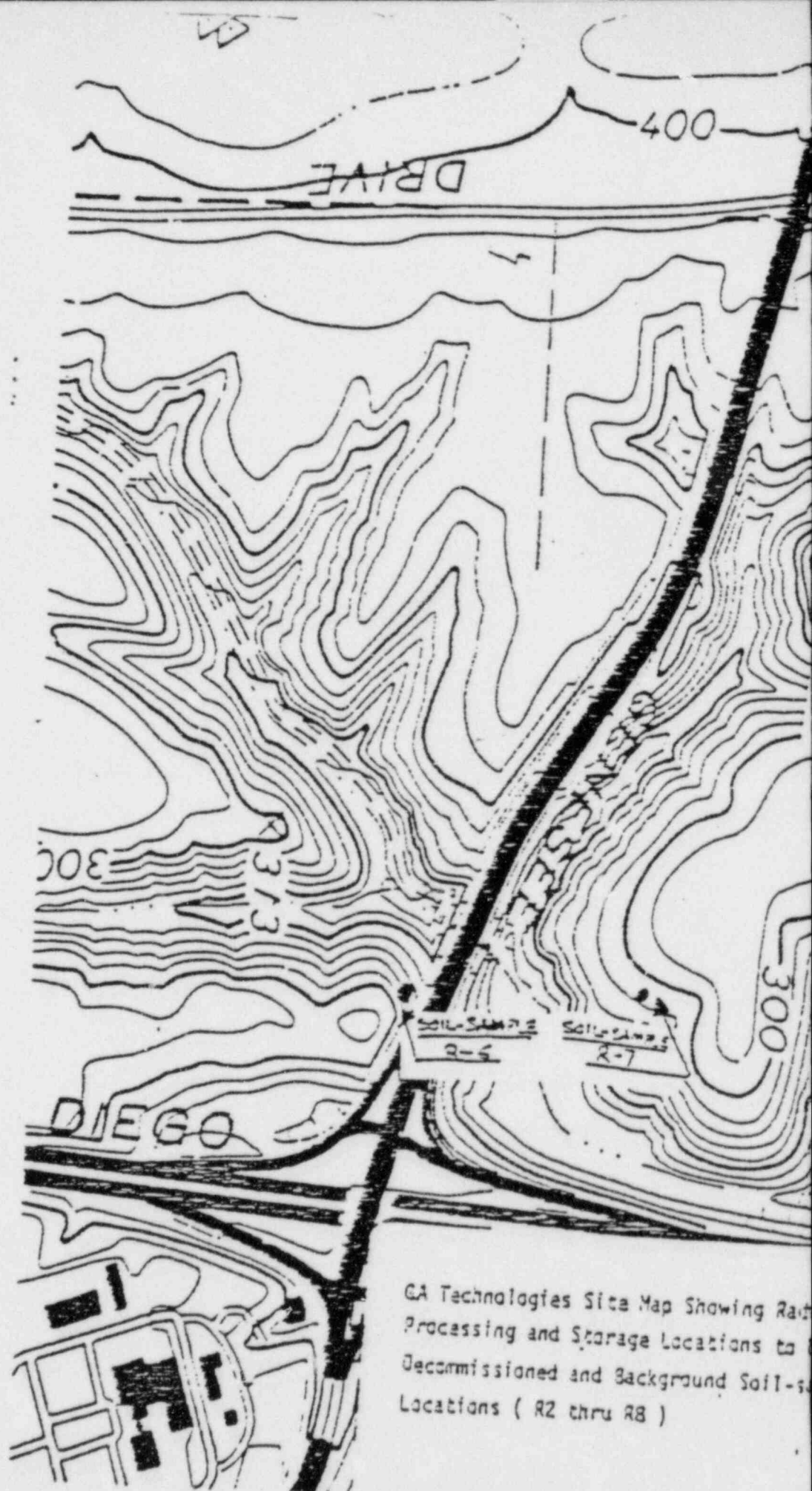


Fig. II Waste Yard and Adjacent Facilities



GA Technologies Site Map Showing Rail Processing and Storage Locations to Decommissioned and Background Soil-s Locations ( R2 thru R8 )



Figure I

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Figure V. Decision Tree Associated with Underground Tank Removal, Determination of Contamination, and Subsequent Disposition

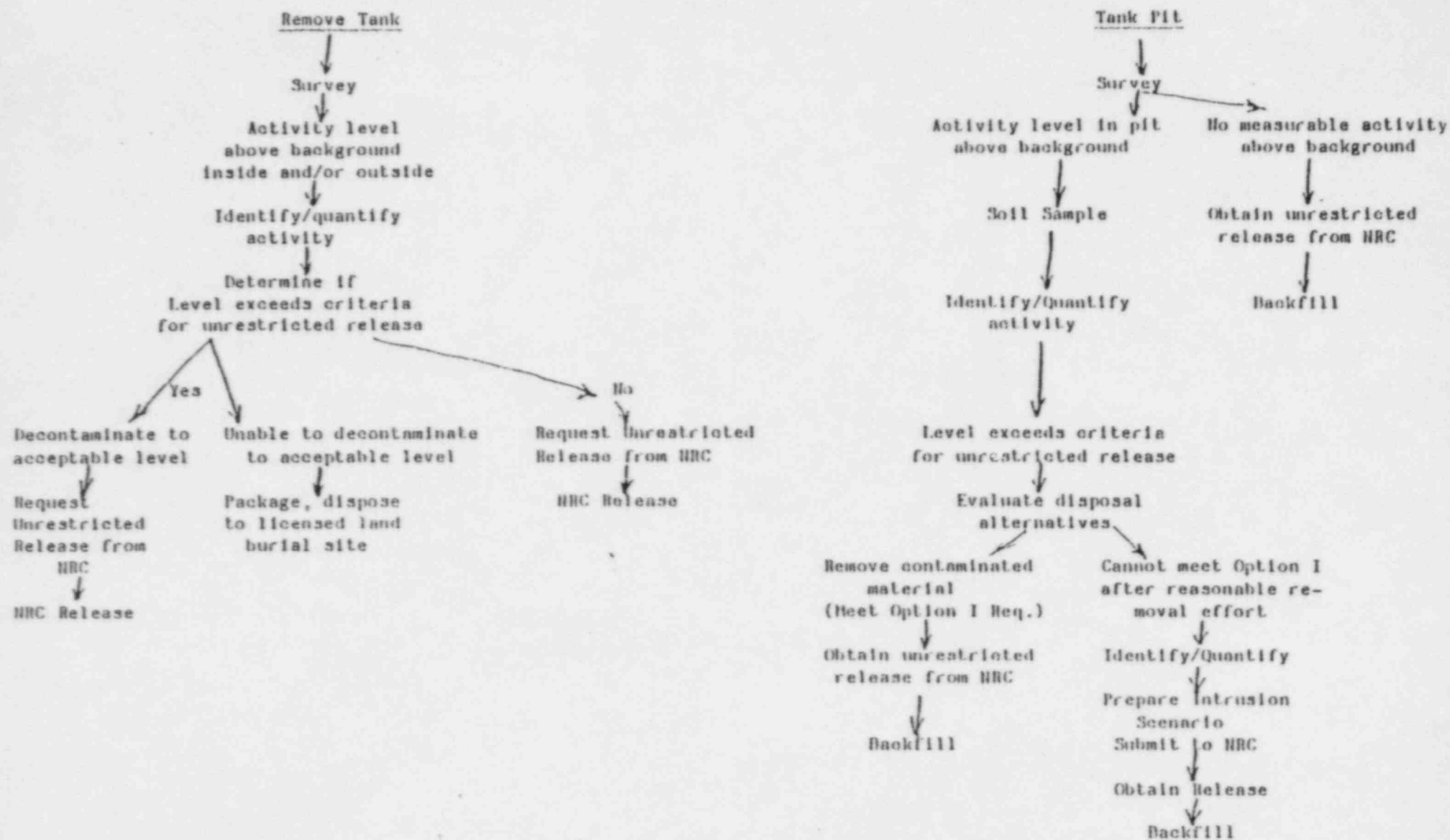
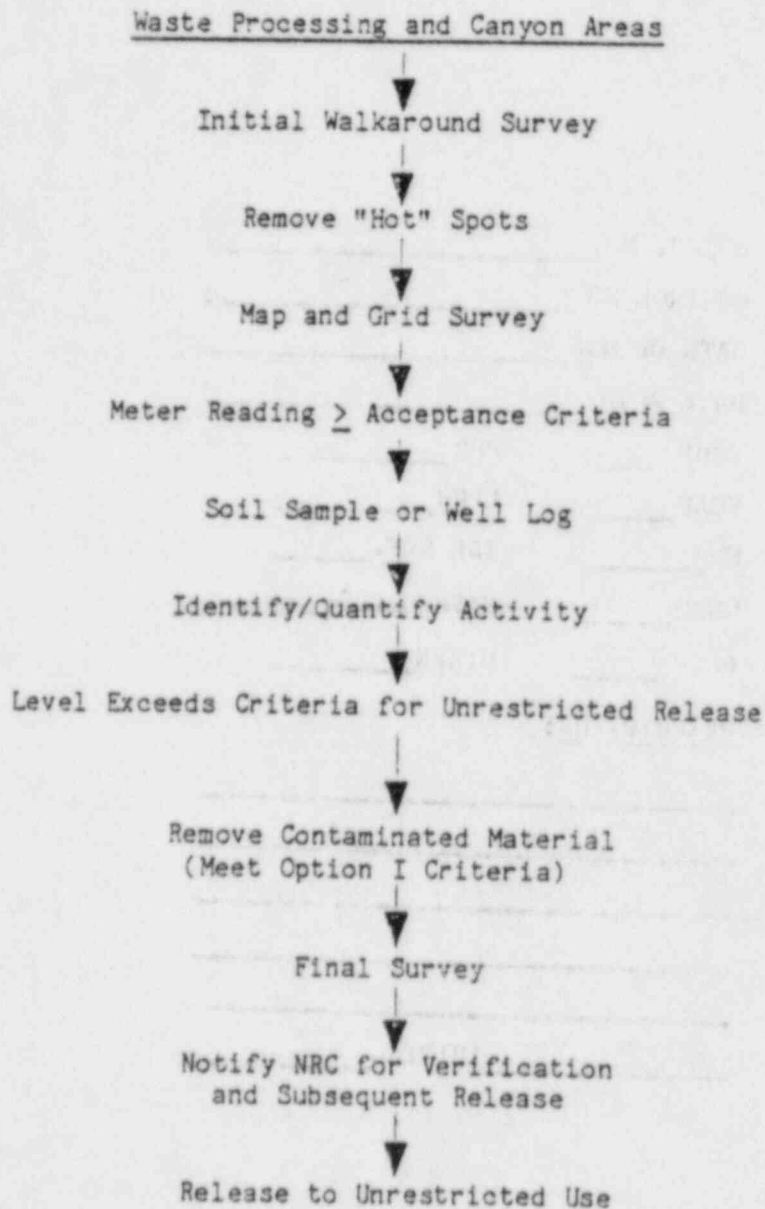




FIGURE VI

Flow Chart Associated with Contaminated  
Areas in Waste Processing and Canyon Areas



DOCKET NO. 70-234  
CONTROL NO. 25855  
DATE OF DOC. 10/01/85  
DATE RCVD. 10/23/85  
FCUF ☒ PDR ☒  
FCAF ☐ LPDR ☐  
WM ☐ I&E REF. ☒  
WMUR ☐ SAFEGUARDS ☒  
FCTC ☐ OTHER ☐

DESCRIPTION:

plan for obtaining  
Release of Certain  
areas to unrestricted  
Use

10/04/85 INITIAL Cec