

L31422 Q905

November 7, 2000 696/CAL-3297 70-734

VIA EXPRESS MAIL SERVICE

Ms. Mary Adams Licensing Section 1/Licensing Branch Division of Fuel Cycle Safety and Safeguards, NMSS U.S. Nuclear Regulatory Commission Washington, DC 20555

Subject: Docket No. 70-734; SNM-696: Request to Release Certain Portions of General Atomics' Facilities to Unrestricted Use and Delete them from License - Torrey Pines Northeast (TPNE) Land Area

and

ATTN: Mr. David Wesley (in Duplicate) State of California Department of Health Services Radiologic Health Branch Mail Stop 178 601 North 7th Street Sacramento, CA 95814-0208

Subject: Radioactive Materials License No. 0145-37: Request to Release Certain Portions of General Atomics' Facilities to Unrestricted Use and Delete them from License - Torrey Pines Northeast (TPNE) Land Area

Dear Ms. Adams and Mr. Wesley:

As you are aware, General Atomics (GA) is in the process of decontaminating, and obtaining the release to unrestricted use of, certain of its facilities (i.e., facilities for which GA currently has no plans for conducting future activities involving the use of radioactive materials).

Most recently, GA completed the decontamination and final surveys of a land area located on GA's main site referred to as the "Torrey Pines Northeast (TPNE) Land Area." The Torrey Pines Northeast Land Area is located on the northeast portion of GA's Main Site. TPNE surrounds Building 22 (previously used to house the TRIGA Fuel Fabrication Facility), which has already been released, and Building 20. Building 20 was the gas bottle storage area for Building 22. The total land area to be released to unrestricted use is ~19,872 ft² (~1840 m²).

Radioactive contamination (enriched uranium) exceeding approved release criteria was detected in the soil in one location. The contaminated soil was removed,

(619) 455-3000

NINSSOLADII

Mary Adams, U.S. NRC 696/CAL-3297

packaged and disposed of off-site as low-level radioactive waste. The results of analyses of subsequent soil samples collected from this area and adjacent to this area showed residual contamination/radiation levels well below the NRC and State approved release criteria for GA's site. No remediation was required in any other location within the TPNE land area.

Following the above mentioned soil remediation, GA conducted extensive and comprehensive final radiation and contamination surveys, sampling and analyses. The results of these efforts demonstrate that the Torrey Pines Northeast Land Area meets the approved criteria for release to unrestricted use. These results are summarized in the enclosed report titled, "General Atomics' Final Radiological Survey Report for the Torrey Pines Northeast (TPNE) Land Area (Including Building 20)," dated November 2000.

Accordingly, GA hereby requests that its Torrey Pines Northeast Land Area, as described in the enclosed report, be released to unrestricted use and deleted from its NRC and State radioactive material licenses. Because of the history of use of enriched uranium in Building 22, and consistent with the GA/NRC/State coordination meetings, it is GA's understanding that the NRC will take the lead in coordinating this release; including regulatory agency confirmatory surveys, as needed.

If you should have any questions regarding this information, please contact Laura Q. Gonzales at (858) 455-2758, or me at (858) 455-2823. Your assistance in responding to our request is very much appreciated.

Very truly yours,

Kith E. Commen

Keith E. Asmussen, Ph.D., Director Licensing, Safety and Nuclear Compliance

Enclosure: Report titled "General Atomics' Final Radiological Survey Report for the Torrey Pines Northeast (TPNE) Land Area (Including Building 20)," dated November 2000.

cc: Dr. D. Blair Spitzberg, Chief, NMSS Branch 3, Region IV Mr. Wayne L. Britz, Fuel Cycle Inspector, NRC Region IV Mr. Emilio Garcia, Fuel Cycle Inspector, NRC Region IV Ms. Kathleen Henner, State, Brea, CA Dr. Ron Rogus, State, Sacramento, CA

GENERAL ATOMICS'

FINAL RADIOLOGICAL SURVEY REPORT FOR

TORREY PINES NORTHEAST (TPNE) LAND AREA and BUILDING 20

Prepared By: William LaBonte, Laura Gonzales

Illustrated By: Stephen Finchum

Final Survey Technicians: B. Lyons, D. Perry, C. Stanley, and J. Sullivan

November 2000

Table of Contents

~~

INTRODUCTION 1
SITE DESCRIPTION 1
PREVIOUS ACTIVITIES (HISTORY OF USE) & CLASSIFICATION
CRITERIA FOR RELEASE TO UNRESTRICTED USE 5 Release Criteria for Soils 5 Exposure Rate Guideline 6
INSTRUMENTATION & BACKGROUND MEASUREMENTS 6 Background Measurements for Instruments/Detectors 6 Background Soil Concentrations 7 Exposure Rate Background 7
FINAL SURVEYS PERFORMED7Objectives and Responsibilities7Survey Plans8Torrey Pines Northeast Land Area8Building 20: Bottled Gas Storage Area9Soil Sampling10Sewer Pumping Station10Electrical Junction Boxes11
SURVEY SUMMARY 11
RESULTS OF BUILDING 20 FINAL SURVEYS 15 Scanning 15 Fixed Exposure Rate Measurements 15 Fixed Measurements (α and β) 15 Removable Contamination 15
RESULTS OF OPEN LAND AREA FINAL SURVEYS 15 Scanning 15 Fixed Exposure Rate Measurements 16 Fixed Measurements (α and β) 16 Removable Activity 16 Soil Samples 16 Sub-Surface Samples 16 PESULTS OF SUBVEYS IN SEWER PLIMPING STATION AND ELECTRICAL UNCTION
BOXES

Sewer Pumping Station	17 17
CONFIRMATORY SURVEYS	17
CONCLUSION	18

List of Tables

Table 1:	USNRC'S Acceptable Surface Contamination Levels
Table 2:	State of California Acceptable Surface Contamination Levels
Table 3:	Torrey Pines Northeast Land Area (Formerly TPN-1a) List of Instruments
Table 4:	Torrey Pines Northeast Swipe Survey Results
Table 5:	Torrey Pines Northeast Soil Sample Results
Table 6:	Torrey Pines Northeast Drain Line Trench Soil Sample Results
Table 7:	Building 20 Swipe Survey Results T-36
Table 8:	Building 22 Pump Station Swipe Survey Results T-37
Table 9:	Torrey Pines Northeast: Electrical Junction Box Soil and Swipe Results
Table 10:	Background Soil Sample Results

List of Figures (unpaged)

Figure 1:	Main Site	and Sorrento	Valley Site
0			~

- Figure 2: Relationship Between Torrey Pines Northeast Land Area and Surrounding Facilities
- Figure 3: Torrey Pines Northeast Land Area
- Figure 4: Torrey Pines Northeast Survey Area
- Figure 5: Survey of Drain Pipe Coming from TFF to Hot Cell Area.
- Figure 6: Torrey Pines Northeast Building 20, Exploded View
- Figure 7: Torrey Pines Northeast: Locations of Removable Contamination Surveys on Asphalt and Concrete
- Figure 8: Torrey Pines Northeast:100% Alpha Scan Survey
- Figure 9: Torrey Pines Northeast: Locations and Results of Fixed Alpha Survey
- Figure 10: Torrey Pines Northeast: 100% Beta Scan Survey (including Berm Area)
- Figure 11: Torrey Pines Northeast: Locations and Results of Fixed Beta Measurements on Ground Surface
- Figure 12: Torrey Pines Northeast: Exposure Rate Measurements
- Figure 13: Torrey Pines Northeast: Locations of Soil Samples Collected
- Figure 14: Torrey Pines Northeast: Building 20 Exposure Rate Surveys
- Figure 15A: Torrey Pines Northeast: Building 20 Fixed Alpha Survey
- Figure 15B: Torrey Pines Northeast: Building 20 Alpha Scan Survey
- Figure 16A: Torrey Pines Northeast: Building 20 Fixed Beta Survey
- Figure 16B: Torrey Pines Northeast: Building 20 Beta Scan Survey

- Figure 17: Torrey Pines Northeast: Building 20 Maslin Survey
- Figure 18A: Building 22 Pump Station, Beta Scan Survey
- Figure 18B: Building 22 Pump Station, Exposure Rate Surveys
- Figure 18C: Building 22 Pump Station, Fixed Alpha Surveys
- Figure 18D: Building 22 Pump Station, Alpha Scan Surveys
- Figure 18E: Building 22 Pump Station, Smear Survey Locations
- Figure 19: Electrical Junction Box Surveys
- Figure 20: Torrey Pines Northeast: Drain Line Trench Soil Sample Locations
- Figure 21: Torrey Pines Northeast: Drain Line Trench Exposure Rate Measurements

Appendixes

- Appendix A: Final Survey Plans
- Appendix B: Confirmatory Survey Plans and Results

CENERAL ATOMICS	Final Radiological Survey Report For Torrey Pines Northeast
	Land Area and Building 20

Introduction

General Atomics (GA) is continuing its efforts directed at decontaminating, as appropriate, and obtaining the release to unrestricted use of selected facilities and land areas at General Atomics. GA has recently completed the Final Radiological Survey of the Torrey Pines Northeast Land Area (formerly called Torrey Pines North, 1a) located on GA's Main Site. The Torrey Pines Northeast land area surrounds Building 22 (TRIGA Fuel Fabrication Facility) and Building 20. GA has also recently completed the Final Radiological Survey of Building 20, which was the gas bottle storage area for Building 22.

GA is requesting both the Nuclear Regulatory Commission (NRC) and the State of California (DOHS/RHB) release the Torrey Pines Northeast Land Area and Building 20 to unrestricted use. (Building 22 has previously been released to unrestricted use).

This report documents the results of the radiological measurements and soil sampling and analysis completed on this land area and Building 20, a sewer pumping station and associated piping, and below grade electrical junction boxes located within the Torrey Pines Northeast footprint. These surveys demonstrate that this area meets the approved criteria for release to unrestricted use. The total land area to be released to unrestricted use is ~ 19,872 ft² (~1840 m²).

Site Description

The Torrey Pines Northeast land area is located on General Atomics' Torrey Pines Mesa Site. A plan view of the GA Site is shown in Figure 1, Main Site and Sorrento Valley Site. The location of Torrey Pines Northeast in relation to other facilities at GA's Main Site is shown in Figure 2, Relationship between Torrey Pines Northeast Land Area and Surrounding Facilities. A diagram of the open land area and Building 20 to be released to unrestricted use is shown in Figure 3, Torrey Pines Northeast (TPNE) Land Area. <u>Note:</u> The Torrey Pines Northeast Land Area was formerly called TPN-1a Area. Therefore, some surveys for this area have a TPN-1a designation.

Building 22, (TRIGA Fuel Fabrication Facility), was previously released to unrestricted use by the NRC and the State of California. Building 20 was the gas bottle storage area for Building 22. It is adjacent to the East side of Building 22, with a 1 m space between the 2 buildings, and surrounded by the Torrey Pines Northeast land area. The total floor surface area of this building is approximately 112.5 m².

is approximately 112.5 m².

The Torrey Pines Northeast land area boundary extends from the Hot Cell Site boundary on the West, to two (2) meters East of the GA Property line on the East and North, and to the Temporary Soil Staging Area to the South, see Figures 2 and 3.

The Torrey Pines Northeast Land Area does not include Building 22 (the former TRIGA Fuel Fabrication Facility). Building 22 has been released by the NRC and the State of California.

A Berm was constructed around the Hot Cell Site to minimize the rain runoff from the Hot Cell Site, which was not released for unrestricted use prior to the completion of this survey, however the Hot Cell Site Final Surveys, which indicated the Hot Cell Site met the GA release criteria, was completed prior to the construction of the Berm. The Area under and two (2) meters out from the Berm was soil sampled by core boring through the existing asphalt prior to construction. The results are included in this report.

There is a sewer pumping station and two (2) below grade electrical junction boxes located Southwest of, and adjacent to, Building 22. A final survey was conducted in these below ground concrete structures. The results of these surveys are included in figures 18A-18E and 19 of this report. The drain lines that were connected to this pumping station were excavated, removed, and disposed of as radioactive waste. Soil samples were taken, after pipe removal, at every pipe connection location (approximately every 2 meters). Soil sample locations are provided in Figure 20, soil sample results are provided in Table 6. This trench was back filled following analysis of the soil samples which indicated all samples were at, or near, natural background levels.

Previous Activities (History of Use) & Classification

This open land area of TPNE is classified as "Suspect Affected Areas" due to their proximity to the Hot Cell Site and the TRIGA Fuel Fabrication Facility. Building 20 was classified as a "Non-Suspect Affected Area". The Sewer Pumping Station and below grade Electrical Junction Boxes, are classified as "Non-Suspect Affected Areas".

In support of GA's efforts involving predominantly government funded nuclear research and development (R&D), General Atomics (GA) continuously maintained a fully operational Hot

Cell Facility (HCF) for over 30 years. Built in 1958 as a heavily shielded remote-handling laboratory, the Facility supported a wide variety of radiological and investigative operations.

The HCF contained three shielded cells, the High Level Cell (HLC), the Low Level Cell (LLC), and the Metallography Cell. The HLC was used to perform destructive post-irradiation examinations on fuels and structural materials. The LLC served as the staging area for samples being transferred into and out of the HLC. The Metallography Cell was used to prepare irradiated fuel and metal samples (i.e., grinding) for use with the metallograph.

The hot cells were used to perform post-irradiation examinations on fuels, structural materials, and instrumentation for dosimetry. Most of the projects involved examination of irradiated fuel and graphite for High Temperature Gas-Cooled Reactors.

The HCF yard and the service gallery had been used for cask handling and cask maintenance activities, and for waste consolidation, packaging, and characterization (e.g., weighing, gamma scanning).

During Decommissioning activities, the HCF was completely dismantled. A substantial portion of the building was disposed of as radioactive waste, including the Cells Manipulator Repair room and Machine shop. All support equipment associated with the HCF, such as underground tanks, wells, and piping systems were excavated and disposed of as appropriate.

Portions of the building which were not directly involved in the handling of radioactive materials, such as the Office Rooms, Change Rooms, Rest Rooms, were dismantled, surveyed, decontaminated if necessary, and released to unrestricted use.

Final surveys on the Hot Cell Site land areas were completed by GA in January 2000. The predominate isotope encountered was Cs-137, and on occasion, Co-60 and Cs-134. Following confirmatory surveys performed by the NRC and ORISE, the NRC released the Hot Cell Site to unrestricted use by SNM - 696 License Amendment No. 66 dated July 3, 2000. The State of California released the Hot Cell Site to unrestricted use by License 0145-37 Amendment No. 143 dated August 31, 2000.

The TRIGA[®] Fuel Fabrication Facility, Building 22, was constructed in 1974 to manufacture TRIGA[®] non-power reactor fuel elements. The physical form of uranium handled or stored in the northern portion of Building 22 and the vault was predominately metal and included uranium metal and uranium-zirconium alloy metal such as U/Zr and Er(U,Zr)H. Small amounts of uranium oxide

compounds (UO₂ and U₃O₈) were also used in the building. Activities associated with the task of manufacturing TRIGA[®] reactor fuel elements included the following:

Receipt of raw materials (including uranium metal enriched to approximately 19.8% ²³⁵U, zirconium metal, carbon, erbium, stainless steel, aluminum and hydrogen gas).

Preparation of raw materials for alloying (crushing, rolling and chopping of materials).

Melting and casting of the fuel alloy in a vacuum induction furnace.

Machining/grinding of the cast fuel alloy utilizing a centerless grinder.

Hydriding of the cast fuel alloy using a vacuum induction furnace.

Finish machining/grinding of the cast fuel alloy.

Fabrication machining and inspection of non-fuel components of assemblies (e.g., cladding, top/bottom end fixtures, graphite inserts, etc.).

Fuel Element assembly (including welding, final machining and inspection).

Residual contamination was found in the Furnace, Machine Shop and Hydride areas of Building 22 (main production area), due to the handling and usage of special nuclear materials (i.e., enriched uranium). This residual radioactive contamination would be limited to virgin enriched uranium.

In the southern-most end of the building, no fuel manufacturing operations were performed, however, work involving limited and short duration use of special nuclear material (enriched uranium) was authorized.

D&D activities were completed in 1998. Final surveys and confirmatory surveys were completed and the Building was released for unrestricted use by the NRC and the State of California in 1999.

Building 20, the gas bottle storage facility for Building 22, was not used for the storage or work on radioactive materials. However, due to it's proximity to Building 22, it is classified as a "Non-Suspect Affected Area"

The Sewer Pumping Station and below grade Electrical Junction Boxes, are classified as "Non-Suspect Affected Areas".

When the Final Survey was initiated, elevated ²³⁵U activity levels were discovered in soil within a fenced storage area North of Building 22. The ²³⁵U soil with activity levels in excess of the approved release criteria was removed. Post Remediation surveys performed indicated remediation was successful, therefore, this Final Survey was continued in accordance with the Final Survey Plans contained in Attachment A.

During D&D work at the Hot Cell site, a "Clean-out" pit was discovered under the asphalt roadway between TFF and the Hot Cell site. The "Clean-out pit" was removed as part of the Hot Cell D&D activities. The two (2) pipes connected to this "Clean-out" pit that headed towards the TFF Building were survey internally as part of this Final Survey. See Figure 5 for survey details.

Following the completion of a Final Survey, GA performed a Confirmatory Survey in accordance with a documented survey plan using qualified Health Physics technicians who were not involved with the Final Survey. The Confirmatory Survey Plan, survey locations, and results are contained in Appendix B, GA Internal Confirmatory Survey Plan and Results.

Criteria for Release to Unrestricted Use

Table 1 contains the USNRC surface contamination limits and Table 2 contains the State of California surface contamination limits.

The primary isotopes of concern for this area are enriched uranium (²³⁴U and ²³⁵U) which was used at building 22 (TRIGA Fuel Fabrication Facility) and fission/activation products (¹³⁷Cs / ⁶⁰Co) from the nearby Hot Cell Facility. The applicable NRC guidelines for enriched uranium and beta/gamma emitters (including Cs-137 and/or Co-60) are as follows:

5,000 dpm/100 cm², averaged over a 1 m² area 15,000 dpm/100 cm², maximum in a 100 cm² area if the average over 1 m² is met 1,000 dpm/100 cm², removable activity

Release Criteria for Soils

The predominant radionuclides found in the soil at GA and the approved release criteria in pCi/g (above natural background concentrations) for these radionuclides are provided as follows:

Enriched Uranium (U-234 + U-235)	30 pCi/g
Cs-137	15 pCi/g
Co-60	8 pCi/g

If more than one radionuclide exists, the sum of the fractions of the concentrations is calculated as follows:

$$\sum_{i=1}^{n} \frac{C_i}{L_i} < 1$$

- C_i = The average concentration of radionuclide *i* in the sample above background levels.
- L_i = The release criteria for radionuclides *i*.

The sum of the fractions must be less than or equal to one (1).

Exposure Rate Guideline

Exposure rates measured at 1 m above the surface are not to exceed 10 μ R/hr above natural background levels.

Instrumentation & Background Measurements

A list of instruments used during the radiological surveys is shown in Table 3. The table includes: (1) a description of the instrument, model number and its serial number, (2) a description of the detector (if applicable) and its serial number, (3) instrument ranges, (4) calibration due dates, (5) typical background readings and (6) calibration efficiencies (if applicable). All of the instruments used were calibrated semiannually and after repair, except for exposure rate meters which were calibrated quarterly.

Background Measurements for Instruments/Detectors

Building 13 on GA's main site was used for conducting background measurements with instruments used for the final survey because: (1) there is no history involving radioactive materials or storage of radioactive materials in Building 13, and (2) the various surfaces and construction materials found at the Hot Cell Site could also be found within and outside of Building 13. Background information, where appropriate, is included in Table 3.

Minimum detectable activities (MDA's) for each type of surface (see Table 3), were calculated using equation (5-2) from the NUREG/CR-5849 as shown below:

Equation (5-2)

$$MDA = \frac{2.71 + 4.65\sqrt{B_R \times t}}{t \times E \times \frac{A}{100}} (dpm/100 cm^2)$$

Where:

 B_R = background rate (cpm) t = count time (min) E = efficiency A = area of the detector (cm²)

Note: MDA information, when applicable, is provided in Table 3.

Background Soil Concentrations of Concern

Typical background concentrations measured by gamma spectroscopy in soil near the GA site have been established (at the 95% confidence level) and are provided in Table 10 along with the locations where these samples were taken.

Exposure Rate Background

Typical exposure rate background for this site using a Ludlum Model 19 micro R meter is about 15 μ R/hr measured at 1 m from the surface of soil. This value can be measured south of Building 15 (an office building on the eastern portion of the GA site). Measurements taken offsite in 10 different locations (9 offsite and 1 onsite at a non-impacted area near Building 15) over a period of 15 months also averaged ~ 15 μ R/hr (measured at 1 m from the surface). The range of 12-18 μ R/hr is typical at the GA site for the external dose rates measured at 1 meter from the surface. Background over asphalt is higher due to the high concentrations of Naturally Occurring Radioactive Material. This background fluctuates dependant upon the asphalt batch used and the date applied. This background is routinely less than 30 μ R/hr at approximately 1" from the surface of the asphalt.

Final Surveys Performed

Objectives and Responsibilities

The objectives of the final survey plans were: (1) to demonstrate that the soil sample results, both at the surface and sub-surface, were well below GA's approved release criteria for unrestricted use, and, (2) that the exposure rate measurements taken throughout this open land area, measured at 1 meter above the surface, were less than 10 μ R/hr above background.

Surveys were taken in accordance with an approved survey plan by qualified Health Physics Technicians having a minimum of three years health physics experience. Soil samples were counted in GA's Health Physics Laboratory which maintains an effective QA program.

Every survey taken was documented on a daily basis to a worksheet/drawing showing the approximate locations surveyed/sampled. The documentation included the results of the measurements (including units), the technician's signature, date, instrument(s) used (including the model and serial number of both the ratemeter and detector), calibration due date, % efficiency, background readings (if applicable) and any other pertinent information.

Each soil sample collected was properly logged, sealed, labeled, packaged and tracked. The sampling locations were documented on a drawing.

Survey Plans

Final Survey Plans were developed based on the previous history of Building 20 and the Torrey Pines Northeast land area site, the radionuclides of concern for this area, the potential for contamination, the various types of surfaces encountered and the classification of the area. See Appendix A for Final Survey Plans.

Torrey Pines Northeast Land Area

The entire open land area was "gridded" into 2 m x 2 m grids. The surface area was gridded in order to: (1) facilitate systematic selection of radiological measuring and soil sampling locations, (2) provide a means for referencing a measurement back to a specific location and (3) establish a uniform and distinct identification system. The one axis of the gridwork was delineated by numerical characters and the other axis by alphabetical characters. This established unique grids of easily identifiable entities. See Figure 4, for details.

For survey purposes, this land area was sub-divided into 5 Areas. A, B, C, D, and a "Berm" area. Area "A" is the area immediately surrounding Building 22 (TFF), Area "B" is mostly open asphalt areas, Area "C" is an area between an asphalt curb and a the Controlled Area fence, Area "D" is the area two (2) meters outside of the Controlled Area fence, and "Berm" Area is a 2m wide area surrounding the berm installed around the Hot Cell Site to reduce run-off from this site to other areas. See Figure 4, for details.

These surveys included:

- 1. 100% scan of accessible asphalt and concrete surfaces for α and 100% for β activity.
- 2. 100% surface scan for exposure rate (μ R/hr) levels.
- 3. 350 fixed α , and 340 fixed β measurements, plus, 346 swipe samples (analyzed for both α and β activity).
- 4. 1041 exposure rate measurements taken at 1 m from the surface.
- 5. 260 surface and sub-surface soil samples.

Land area surveys are provided in Tables 4 through 6, and Figures 7 through 13.

Building 20: Bottled Gas Storage Area

The grid system established for the land area was also used for Building 20. Walls were illustrated in exploded view on this grid scheme to facilitate systematic presentation of radiological measurements. See Figure 6 for details.

These surveys included:

- 1. 100% of the floor surfaces were scanned with α and β sensitive, 434 cm² gas flow proportional detectors.
- 2. 100% of the Lower portion of the walls (below 2m), were scanned with α and β sensitive, 434 cm² gas flow proportional detectors.
- 3. 10% of the upper walls, (above 2m), were scanned with α and β sensitive, 434 cm² gas flow proportional detectors.
- 4. 36 fixed measurements for α , 39 fixed β measurements and 30 swipes (that were analyzed for α and β activity) were taken. The maximum α activity was <10 dpm/100 cm² and the maximum β was <10.65 dpm/100 cm².
- 5. Exposure rate measurements were taken every 2m across the entire floor surface; a total of 20 contact and 20 readings at 1 m from the surface were taken.

Building 20 survey results are contained in Table 7, "Building 20 Swipe Survey Results", and Figures 14 through 17.

Soil Sampling

Soil samples were taken where soil was exposed and under asphalt as indicated in Figure 13.

Each of the soil samples taken was approximately 1 kilogram in mass. The samples were properly logged, labeled, tracked and packaged into plastic bags. All debris (i.e., grass, rocks, sticks, asphalt and foreign objects) was removed from each sample. Each soil sample was individually crushed to reduce large lumps, dried, placed into a tared marinelli beaker (filled to the top), weighed, sealed and transported to GA's Health Physics Laboratory.

Soil samples were analyzed in GA's Health Physics Laboratory with a Canberra Low Sensitivity Gamma Spectroscopy MCA System using a high purity Germanium Detector. The system is calibrated using NIST traceable standards and performance checked daily.

Soil samples were counted for a minimum of 30 minutes each. A 30 minute count was sufficient to detect the radionuclides of concern at levels well below GA's approved soil release criteria.

Sewer Pumping Station

The Sewer Pumping Station, which was the collection point for the Building 22 sewer system and roof drain system, is a concrete structure approximately $6' \times 6' \times 15'$ deep containing sewer/drain system outflow piping and discharge suction pipes.

Concrete walls of the sewer pumping station were scanned with a hand held α and a hand held β instrument. Exposure rate measurements were taken with 2"x 2" NaI(Tl) probes. Swipe surveys taken were counted for α and β activity. Pipes penetrating this concrete structure were surveyed internally with a NaI(Tl) detector and with large area swipes, which were counted for α and β activity. All survey results indicated the concrete surfaces and piping in this pumping station is at or below natural background activity levels. Fixed Beta readings were not taken inside of this pumping station because it was a "Confined Space" and the instrument customarily used is a gas flow proportional detector, which would have created a safety hazard. See Figures 18A through 18E and Table 8 for survey locations and results.

Electrical Junction Boxes

There are two (2) electrical junction boxes that were surveyed with hand held α and β probes. Swipe surveys were taken and analyzed for α and β activity. Direct exposure rate readings were taken with a Micro-R meter. One (1) of the junction boxes did not have a concrete floor. Soil samples were taken from the bottom of this junction box. All survey results indicated these junction boxes are at, or below, natural background levels. See Figure 19 and Table 9 for survey results.

Survey Summary

Comparisons of the Site Decommissioning Plan requirements with the Final Surveys performed in relation to the percentage of surface area scanned, number of measurements (i.e., number of fixed radiation measurements), exposure rate measurements (μ R/hr) and soil samples taken are provided as follows:

Comparisons of Site Decommissioning Plan Requirements with Final Surveys Performed in Building 20 ^{1,2,3} (Non-Suspect Area)							
Survey	Gridding	# of Measurements Fixed α, β, or swipes	# of Exposure Rate Measurements (μR/hr)	Surface Scans	# of Soil Samples Taken and Analyzed		
GA Site Decommissioning Plan	No	A minimum of 30 measurement locations	Every 10 m ² of floor area for a total of 11	10 % of accessible surface areas below 2 m.	N/A		
Final Surveys	Yes, 2m x 2m	30 swipes, 36 fixed α , and 39 Fixed β readings Total = 105 measurements.	20 contact and 20 1m readings taken.	100% α and 100% β on floors and lower walls below 2m, 10% upper walls (above 2m).	N/A		

The total surface area to be released to unrestricted use is approximately 112.5 m² total. Open Floor surface $\approx 80 \text{ m}^2$, approximately 32.5 m² of the total floor space is occupied by partition walls.

² The contaminants of concern are primarily 19.8% enriched uranium.

³ Large Area Swipes were taken on 100% of the floors and analyzed for α and β activity.

Comparisons of Site Decommissioning Plan Requirements with the Final Surveys of the Torrey Pines Northeast Land Area ¹ (Suspect Affected Area)							
Survey	Gridding	Scanning (on asphalt and concrete only)	# of Exposure Rate Measurements (μR/hr)	# of Measurements (fixed & wipes)	# of Soil Samples Taken and Analyzed		
GA Site Decommissioning Plan	Yes	100% of accessible surfaces	1 per 4 m ² for a total of approximately 525 locations	1 per 4 m ² , approximately 525 locations	1 per 25 m ² total approximately 84 samples		
Final Surveys	Yes 2m x 2m	100% of accessible surfaces for α and 100% for β	100% Surface Scan, 1 measurement/ 4m ² , total measurements= 1041	346 swipes, 350 fixed α , and 340 fixed β . Total = 1036 measurements	Total = 260 surface and sub- surface soil samples		

1. The total surface area to be released is approximately 1840 m^2 .

GENERAL ATOMICS	Final Radiological Survey Report For Torrey Pines Northeast
	Land Area and Building 20

Comparisons of Site Decommissioning Plan Requirements with the Final Surveys of the Building 22 Sewer Pumping Station and Electrical Junction Boxes

			· · · · · · · · · · · · · · · · · · ·		
Survey	Gridding	Scanning (on asphalt and concrete only)	# of Exposure Rate Measurements (μR/hr)	# of Measurements (fixed & wipes)	# of Soil Samples Taken and Analyzed
GA Site Decommissioning Plan, Non-Suspect Affected Area	No	10% of accessible surfaces for α and β	1 per 20 m ² for a total of 1 location	Electrical Pits:1 per 20 m ² for a total of 1 location. Sewer pumping Station: 1 per 20m ² for a total of 2 locations	1 per 25 m ² for a total of 1 soil sample
Final Surveys	No	100% of accessible surfaces scanned for α and 100% for β .	Electrical Pits: 1 reading taken inside each Junction Box for a total of 2 plus 1 reading taken in each of 2 pipes <u>Sewer Pumping</u> <u>Station</u> : 100% of accessible Surfaces scanned, Readings take at pit center@1m and 2m from bottom. Readings taken up to 5' into open, attached pipe.	Electrical pits: Large area wipes taken on approximately 100% of the surfaces, 3 wipes taken in the large junction box sump. Sewer pumping station: 20 smear samples,25 fixed α readings taken	2 soil samples taken in the Instrumentation Junction Box only. The other had a concrete floor. The sewer pumping station has a concrete floor. Sewer pipe trench (after pipe removal),28 soil samples.

Results of the Building 20 Final Surveys

The results for the Building 20 Final Surveys are provided in figures and tables indicated below for each survey technique.

Scanning

Alpha scans indicated no detectable activity above background levels; all were < 20 cpm, see Figure 15B. The highest beta scans indicated no elevated levels. The results of this survey are presented in Figure 16B.

Fixed Exposure Rate Measurements

Direct radiation levels were measured at 1 m from the surface using a 2"x2" NaI(Tl) detector. Maximum readings were 17 μ R/hr. Readings were also taken at contact with the surface. The maximum was 18 μ R/hr. See Figure 14 for locations and results.

Fixed Measurements (α and β)

36 fixed α and 39 fixed β measurements were taken. All α readings were < 100 dpm/100 cm² and the maximum β reading was 443 dpm/100 cm², which is well below the release criteria. This activity is at, or near natural background levels. See Figures 9, Torrey Pines Northeast: Locations and Results of Fixed Alpha Survey, and Figure 11, Torrey Pines Northeast: Locations and Results of Fixed Beta Measurements on Ground Surface for locations and results.

Removable Contamination

30 wipes were taken and counted for α and β activity. The maximum α activity was 8 dpm/100 cm², the maximum β activity was 11 dpm/100 cm². This activity is at or near natural background levels. See Figure 17 for swipe locations and maslin survey results and Table 7 for swipe results.

Results of the Open Land Area Final Surveys

The results for the Open Land Area Final Surveys are provided in figures and tables indicated below for each survey technique.

Scanning_

100% of the accessible asphalt and concrete surfaces were scanned with α , and β , detectors. There were no detectable activity levels above natural background. The results of these surveys are presented in Figures 8 (for α) and 10 (for β).

GENERAL ATOMICS	Final Radiological Survey Report For Torrey Pines Northeast
·	Land Area and Building 20

Fixed Exposure Rate Measurements

Direct radiation levels were measured at 1 m from the surface at each location using a 2"x2" NaI(Tl) detector. Maximum readings were <25 μ R/hr, which is less than 10 μ R/hr above background. Thus, all readings were below the approved release criteria. See Figure 12 for locations and results.

Fixed Measurements (α and β)

There were 350 fixed α and 340 fixed β , measurements taken. The highest α activity level was <200 dpm/100 cm² and the maximum β activity level was <459 dpm/100 cm². All results were far below the release criteria. See Figures 15B, 16B, and 7 for locations and results, and Table 4 for swipe survey results.

Removable Activity

A total of 346 swipe measurements were taken and analyzed for α and β activity. The highest α activity was 14 dpm/100 cm², the highest β activity was 21 dpm/100 cm². These results are far below the approved release criteria. See Table 4 for results and Figure 7 for sample locations.

Soil Samples

A total of 224 surface (0-6") soil samples were collected from exposed ground areas. The approximate soil sample locations are shown in Figure 13. Gamma spectroscopy results are provided for these samples in Table 5. The isotopic results (pCi/g) indicated that, in some samples, ²³⁸U, ²³⁵U, ¹³⁷Cs, and ⁶⁰Co was present above natural background levels, but the results were all well below the approved soil release criteria as summarized below.

	²³⁸ U in pCi/g	²³⁵ U in pCi/g	¹³⁷ Cs in pCi/g	⁶⁰ Co in pCi/g
High	4.28 ± 0.88	0.48 ± 0.32	1.19 ± 0.09	0.22 ± 0.07
Low	ND	ND	ND	ND
Average	1.77 ± 0.63	0.17 ± 0.09	0.12 ± 0.05	0.01 ± 0.009

Sub-Surface Samples

Sub-Surface samples (6" to 12" deep) at 36 locations were collected and analyzed by gamma spectroscopy. In areas covered by asphalt, the asphalt was cored out and the soil samples were taken below the asphalt. The results showed trace levels of Cs-137 and Co-60 in some of the samples, but the concentrations are well below the approved release limits. See Table 5 for a summary of the results.

Results of Surveys in Sewer Pumping Station and Electrical Junction Boxes

Sewer Pumping Station

Prior to the performance of this final survey, all sewer and drain lines external to the pumping station were disconnected and disposed of with the exception of a small (approximately 1 ¹/₂" diameter line) that leads away from Building 22. The other end of small pipe, which is located approximately 2' from the top of the pumping station, could not be located. There is no "corporate memory" of, or any reason to suspect that any radioactive material was introduced into this line in the past. Direct readings and loose surface contamination surveys for α and β were taken at the opening of this line. All results indicated there is no activity above natural background levels. A 1" diameter NaI(Tl) detector was inserted up to 5' into the pipe. No activity above natural background levels were detected. See Figure 18A through 18D for results. The pumping station was drained and decontaminated. All surfaces were scanned for α and β activity. Direct exposure rate readings were also taken, as well as surveys inside of the small drain line. All survey results indicate that the pumping station and remaining pieces of piping are below the release criteria. See Figure 18A through 18D for survey locations and results. The trench generated during the removal of the drain/sewer pipe that was connected to this pumping station was surveyed with a 2"x2" NaI(Tl) detector and soil samples were taken at 2 m intervals. The highest exposure rates measured were 25 μ R/hr at 1 meter from the bottom of the trench and 26 µR/hr at contact with the bottom of the trench. See Figure 18B:" Building 22 Pump Station, Exposure Rate Surveys" for details. Cs-137 and Co-60 were not detected in any of the 28 soil samples taken. U-238 and U-235 activity levels were at, or near natural background levels. The sample locations and exposure rate results are contained in Figure 20. The soil sample results are contained in Table 6.

Electrical Junction Boxes (underground).

There are two (2) underground electrical junction boxes approximately 12'-15' South of the Southwest corner of Building 22. One(1) of the boxes has a concrete floor with a sump pump. The other box is approximately 12-18" deep with a soil floor. The sump pump well in the larger box contained residual water the pump could not remove. This water was dried out prior to surveying. The internal surfaces of both boxes were scanned with a Micro-R meter, a 15 cm² GM beta detector, a 50 cm² alpha detector and large area wipes were taken on all surfaces. In addition, two(2) soil samples were taken in the smaller box and three(3) swipes were taken in the sump well of the larger box. All results indicated that radiation levels are at or near natural background levels. See Figure 19 and Table 9 for results.

Confirmatory Survey

Following the completion of the Final Survey, a Confirmatory Survey was performed by a GA HP

technician that was not associated with the Final Survey in accordance with an approved survey plan. For the land areas, this survey consisted of 14 Exposure rate measurements, 7 Fixed α measurements, 7 fixed β measurements, 6 smear surveys, and 2 soil samples. For Building 20, this survey consisted of 100% β scan of the floor and walls, 5 fixed β readings, 5 fixed α readings, 100% α scan of the floor, exposure rate readings at contact and 1 m in 5 locations, and 5 large area smears which were analyzed for α and β activity. No elevated activity or radiation levels were detected. See Appendix B for the confirmatory survey plan and results.

Conclusion

Final contamination and radiation surveys, as well as the results of analyses of soil samples, as documented in this report, demonstrate that the Torrey Pines Northeast open land area, Building 20, the Sewer Pumping Station, and Electrical Junction Boxes, all meet the approved criteria for release to unrestricted use.

T	Table 1: USNRC'S ACCEPTABLE SURFACE CONTAMINATION LEVELS 1							
	Nuclides ^a	Average ^{b,c,f} (dpm/100cm ²)	Maximum ^{b,d,f} (dpm/100 cm ²)	Removable ^{b.e.f} (dpm/100cm ²)				
U-1 prc	nat, ²³⁵ U, ²³⁸ U, & associated decay oducts	5,000 α	15,000 α	1,000 α				
	unsuranics, ²²⁶ Ra, ²²⁸ Ra, ²³⁰ Th, ²²⁸ Th, ²³¹ Pa, Ac, ¹²⁵ I, ¹²⁹ I	100	300	20				
Th- 131I	-nat, ²³² Th, ⁹⁰ Sr, ²²³ Ra, ²²⁴ Ra, ²³² U, ¹²⁶ I, ¹³³ I,	1,000	3,000	200				
Bet mo spc not	ta/gamma emitters (nuclides with decay des other than alpha emission or ontaneous fission) except ⁹⁰ Sr and other ed above.	5,000	15,000	1,000				
a b c	 a Where surface contamination by both alpha- and beta/gamma-emitting nuclides exists, 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, an geometric factors associated with the instrumentation. c Measurements of average contaminant should not be averaged over more than 1 square meter. 							
d	The maximum contamination level applies	s to an area of not r	nore than 100 cm^2 .					
e	e The amount of removable radioactive material per 100 cm ² 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, then pertinent levels should be reduced proportionally and the entire surface should be wiped.							
f	The average and maximum radiation level beta-gamma emitters should not exceed 0. respectively, measured through not more to absorber.	s associated with so 2 mRad/hr at 1 cm ² han 7 milligrams p	urface contamination and 1.0 mRad/hr and the square centimeters	on resulting from at 1 cm ² , er of total				

•

Table 2: STATE OF CA ACCEPTABLE SURFACE CONTAMINATION LEVELS ¹							
Nuclides ^a	Average ^{b,c,f} (dpm/100cm ²)	Maximum ^{b.d.f} (dpm/100cm ²)	Removable ^{b,e,f} (dpm/100cm ²)				
U-nat, ²³⁵ U, ²³⁸ U, & associated decay products	5,000	15,000	1,000				
Transuranics, ²²⁶ Ra, ²²⁸ Ra, ²³⁰ Th, ²²⁸ Th, ²³¹ Pa, ²²⁷ Ac, ¹²⁵ I, ¹²⁹ I	100	300	20				
Th-nat, ²³² Th, ⁹⁰ Sr, ²²³ Ra, ²²⁴ Ra, ²³² U, ¹²⁶ I, ¹³³ I, ¹³¹ I	1,000	3,000	200				
Beta/gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except ⁹⁰ Sr and other noted above.	5,000	15,000	1,000				

a Where surface contamination by both alpha- and beta/gamma-emitting nuclides exists, 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, an geometric factors associated with the instrumentation.

c Measurements of average contaminant 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 cm^2 .

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, then 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 cm² and 1.0 mrad/hr at 1 cm², respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

Guidelines For Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses For byproduct, Source, or Special Nuclear Material, also known as "Decon-1" incorporated into GA's State of CA Radioactive Materials License.

	Table 3: Torrey Pines Northeast (Formerly TPN-1A) Area List of Instruments							
Meter S/N	Detector	Detector S/N	Calibration Due Date	Efficiency	Range (cpm)	Background Average (cpm)	Description	
Ludlum Rate Meter Model 2221 S/N <u>86302</u>	Ludlum Model 43-37 434 cm ² Beta	S/N <u>086215</u>	1/24/00	21.70% with a Sr90 source, 4π	Four Linear Ranges 0- 500,000 & One Log 50- 500,000	1478 to 1765 on concrete, 2161 to 2530 on asphalt	The instrument is a gas-flow proportional counter with an active probe area of 434 cm^2 . The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from ground surface for optimum performance.	
Ludlum Rate Meter Model 2221 S/N <u>97287</u>	Ludlum Model 43-37 434 cm ² Alpha	S/N <u>148926</u>	5/10/00 9/13/00	21.36% with a Th 230 source, 4π	Four Linear Ranges 0- 500,000 & One Log 50- 500,000	0-20 cpm on asphalt or concrete	The instrument is a gas-flow proportional counter with an active probe area of 434 cm ² . The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.	
Ludlum Rate Meter Model 2221 S/N <u>84459</u>	Ludlum Model 43-37 434 cm ² Beta	S/N <u>086213</u>	1/31/00	21.67% with a Sr-90 source, 4π 21.45%	Four Linear Ranges 0- 500,000 & One Log 50- 500,000	1858-2036 cpm on concrete, 2230-2485 cpm on asphalt	The instrument is a gas-flow proportional counter with an active probe area of 434 cm ² . The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.	

	•	Table 3: To	orrey Pines N	ortheast (For	merly TPN-1	A) Area List of In	struments
Meter S/N	Detector	Detector S/N	Calibration Due Date	Efficiency	Range (cpm)	Background Average (cpm)	Description
Ludlum Rate Meter Model 2221 S/N <u>154202</u>	Ludlum Model 43-37 434 cm ² Beta	S/N <u>149017</u>	4/3/00	22.9% with a Sr-90 source, 4π	Four Linear Ranges 0- 500,000 & One Log 50- 500,000	1600-1995 cpm on concrete 2175-2460 cpm on asphalt	The instrument is a gas-flow proportional counter with an active probe area of 434 cm ² . The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.
Ludlum Rate Meter Model 2221 S/N <u>148445</u>	Ludlum Model 43-37 434 cm ² Alpha	S/N <u>147966</u>	3/10/00	21.33% with a Th 230 source, 4π	Four Linear Ranges 0-500,000 & One Log 50-500,000	0-26 cpm on concrete, 0-32 cpm on asphalt	The instrument is a gas-flow proportional counter with an active probe area of 434 cm ² . The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.
Ludlum Rate Meter Model 2221 S/N <u>148436</u>	Ludlum Model 43-68 100cm ² Beta Probe	S/N <u>120477</u>	1/17/00	26.32% with a Sr-90 source, 4π 26.27%	Four Linear Ranges 0-500,000 & One Log 50-500,000	554±28 counts in 1 min.,MDA=443 dpm/100 cm ² on concrete, 644±26 counts in 1 min., MDA=459 dpm/100 cm ² on asphalt	This instrument is a gas flow proportional counter with an active probe area of 100 cm ² used primarily for beta fixed measurements.
Ludium Model-12 S/N <u>138738</u>	Ludlum Model 43-65 Alpha Scintillator ZnS(Ag)	S/N <u>142349</u>	3/28/00	21.58% With a Th-230 source, 4π	Four Ranges 0-500,000	0-20 cpm on concrete or asphalt, MDA=768 dpm/100 cm ²	Alpha scintillator with an active probe area of 50 cm ² used for Alpha fixed measurements ~7-10sec count and 20 cpm maximum background.

	Table 3: Torrey Pines Northeast (Formerly TPN-1A) Area List of Instruments						
Meter S/N	Detector	Detector S/N	Calibration Due Date	Efficiency	Range (cpm)	Background Average (cpm)	Description
Ludlum Model-12 S/N <u>91051</u>	Ludlum Model 43-65 Alpha Scintillator ZnS(Ag)	S/N <u>94053</u>	10/12/00	21.58% with a Th-230 source,4π	Four Ranges 0-500,000	0-20 cpm MDA=768 dpm/100 cm ²	Alpha scintillator with an active probe area of 50 cm ² used for Alpha fixed measurements ~7-10sec count and 20 cpm maximum background.
Ludlum Model-12 S/N <u>91103</u>	Ludlum Model 43-65 Alpha Scintillator ZnS(Ag)	S/N <u>92192</u>	10/12/00	21.58% with a Th-230 source,4π	Four Ranges 0-500,000	0-20 cpm MDA=768 dpm/100 cm ²	Alpha scintillator with an active probe area of 50 cm ² used for Alpha fixed measurements ~7-10sec count and 20 cpm maximum background.
Ludlum Model-3 Micro-R Meter S/N <u>147819</u>	Ludlum Model 44-10 NaI 2"x 2" Scintillator	S/N <u>153765</u>	2/8/00 11/08/00	NA	Four Ranges 0-500 µR/hr	 10-18μR/hr @ or above soil surface.20-23 μR/hr @ or above asphalt surface 25-27 μR/hr in pits and trenches. 	Used for measuring external dose rates on the surface and at one (1) meter from the surface (i.e., initial ground surveys).
Ludlum Model-3 Micro-R Meter S/N <u>131601</u>	Ludlum Model 44-62 Nal 1/2"x1/2" Scintillator	S/N <u>158626</u>	4/13/00	NA	Four Ranges 0-500 μR/hr	10-18μR/hr @ or above soil surface.20-23 μR/hr @ or above asphalt surface 25-27 μR/hr in pits and trenches.	Used for exposure rates inside of pipes

		Table 3: To	orrey Pines N	Northeast (For	merly TPN-1.	A) Area List of In	struments
Meter S/N	Detector	Detector S/N	Calibration Due Date	Efficiency	Range (cpm)	Background Average (cpm)	Description
Ludlum Model-3 Micro-R Meter S/N <u>153590</u>	Ludlum Model 44-10 NaI 2"x 2" Scintillator	S/N <u>155190</u>	3/9/00	NA	Four Ranges 0-500 µR/hr	10-18μR/hr @ or above soil surface.20-23 μR/hr @ or above asphalt surface	Used for measuring external dose rates on the surface and at one (1) meter from the surface (i.e., initial ground surveys).
						25-27 μR/hr in pits and trenches.	
Ludlum ModeI-3 Micro-R Meter S/N <u>151348</u>	Ludlum Model 44-10 NaI 2"x 2" Scintillator	S/N <u>154618</u>	2/11/00	NA	Four Ranges 0-500 µR/hr	10-18μR/hr @ or above soil surface. 20-23 μR/hr @ or above asphalt surface 25-27 μR/hr in pits and trenches.	Used for measuring external dose rates on the surface and at one (1) meter from the surface (i.e., initial ground surveys).
Ludlum Model-3 Rate Meter S/N <u>138880</u>	Ludlum Model 44-9 15 cm ² pancake GM detector	S/N <u>145963</u>	2/05/00	22.34% with a Sr-90 source, 4π	0-500,000	80-100 cpm on concrete, 80-120 on asphalt	Primarily used for beta fixed measurements.
Ludlum Model-3 Rate Meter S/N <u>139168</u>	Ludlum Model 44-9 15 cm ² pancake GM detector	S/N <u>145981</u>	11/11/99	22.34% with a Sr-90 source, 4π	0-500,000	80-100 cpm on concrete, 80-120 on asphalt	Primarily used for beta fixed measurements.

	Table 3: Torrey Pines Northeast (Formerly TPN-1A) Area List of Instruments							
Meter S/N	Detector	Detector S/N	Calibration Due Date	Efficiency	Range (cpm)	Background Average (cpm)	Description	
Ludlum Model-3 Rate Meter S/N <u>138747</u>	Ludlum Model 43-65 Alpha scintillator ZnS(Ag)	S/N <u>145701</u>	4/24/00	21.58%	0-500,000	0-20 cpm on concrete or asphalt, MDA=768 dpm/100 cm ²	Alpha scintillator with an active probe area of 50 cm ² used for Alpha fixed measurements ~7-10sec count and 20 cpm maximum background.	
Ludlum Model-3 Rate Meter S/N <u>143349</u>	Ludlum Model 15 cm ² GM tube	S/N <u>145967</u>	11/23/00	20.26% with a Sr-90 source, 4π	0-500,000		15 cm ² GM tube used for Beta fixed measurements and scans.	
Ludlum Model-3 Rate Meter S/N <u>61488</u>	Ludlum Model 15 cm ² GM tube	S/N <u>117851</u>	7/10/00	21.35% with a Sr-90 source, 4π	0-500,000		15 cm ² GM tube used for Beta fixed measurements and scans.	
Canberra Low Level α/β Counter	Gas Flow Proportional Detector	N/A	As needed	~ 26-30%	N/A	Varies with Sample	Canberra Model 2400 Low Level α/β gas proportional counting system was used to count soil samples for gross beta and alpha contamination. Results were reported as pCi/gm.	
Canberra Gamma Spectroscopy System	High Purity Germanium Detector	N/A	As needed	Varies with Sample	N/A	Varies with Sample	Gamma Spectroscopy MCA system using a high purity Germanium detector.	

1

	Table 4: Torrey Pines Northeast Swipe Survey Results								
Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²	Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²				
1	<10	<10	26	<10	<10				
2	<10	<10	27	<10	<10				
3	<10	<10	28	<10	<10				
4	<10	<10	29	<10	17.49				
5	<10	<10	30	<10	<10				
6	<10	<10	31	<10	<10				
7	<10	<10	32	<10	<10				
8	<10	<10	33	<10	<10				
9	<10	<10	34	<10	<10				
10	<10	<10	35	<10	<10				
11	<10	<10	36	<10	<10				
12	<10	<10	37	<10	<10				
13	<10	<10	38	<10	<10				
14	<10	<10	39	<10	<10				
15	<10	<10	40	<10	<10				
16	<10	<10	41	<10	<10				
17	<10	<10	42	<10	<10				
18	<10	<10	43	<10	<10				
19	<10	<10	44	<10	<10				
20	<10	<10	45	<10	<10				
21	<10	<10	46	<10	<10				
22	<10	<10	47	<10	<10				
23	<10	<10	48	<10	<10				
24	<10	<10	49	<10	<10				
25	<10	<10	50	<10	<10				

	Table 4: Torrey Pines Northeast Swipe Survey Results							
Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²	Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²			
51	<10	<10	76	<10	10.65			
52	<10	<10	77	<10	<10			
53	<10	<10	78	<10	<10			
54	<10	<10	79	<10	<10			
55	<10	<10	80	<10	<10			
56	<10	<10	81	<10	<10			
57	<10	<10	82	<10	10.65			
58	<10	<10	83	<10	<10			
59	<10	<10	84	<10	<10			
60	<10	<10	85	<10	<10			
61	<10	<10	86	<10	<10			
62	<10	<10	87	<10	<10			
63	<10	14.07	88	<10	<10			
64	<10	<10	89	<10	<10			
65	<10	<10	90	<10	<10			
66	<10	<10	91	<10	<10			
67	<10	<10	92	<10	<10			
68	<10	20.96	93	<10	<10			
69	<10	<10	94	<10	<10			
70	<10	<10	95	<10	<10			
71	<10	<10	96	<10	<10			
72	<10	<10	97	<10	<10			
73	<10	<10	98	<10	<10			
74	<10	<10	99	<10	<10			
75	<10	14.09	100	<10	<10			

	Table 4: Torrey Pines Northeast Swipe Survey Results								
Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²	Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²				
101	<10	<10	126	<10	10.65				
102	<10	<10	127	<10	<10				
103	<10	<10	128	<10	<10				
104	<10	<10	129	<10	<10				
105	<10	- <10	130	<10	<10				
106	<10	<10	131	<10	<10				
107	<10	<10	132	<10	<10				
108	<10	<10	133	<10	<10				
109	<10	<10	134	<10	<10				
110	<10	<10	135	<10	<10				
111	<10	<10	136	<10	<10				
112	<10	<10	137	<10	<10				
113	<10	<10	138	<10	<10				
. 114	<10	<10	139	<10	<10				
115	<10	<10	140	<10	<10				
116	<10	<10	141	<10	<10				
117	<10	<10	142	<10	<10				
118	<10	<10	143	<10	<10				
119	<10	<10	144	<10	<10				
120	<10	<10	145	<10	<10				
121	<10	<10	146	<10	<10				
122	<10	<10	147	<10	. <10				
123	<10	<10	148	<10	<10				
124	<10	<10	149	<10	<10				
125	<10	<10	150	<10	<10				

	Table 4: Torrey Pines Northeast Swipe Survey Results								
Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²	Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²				
151	<10	<10	176	<10	<10				
152	<10	<10	177	<10	<10				
153	<10	<10	178	<10	<10				
154	<10	<10	179	<10	<10				
155	<10	<10	180	<10	<10				
156	<10	<10	181	<10	<10				
157	<10	<10	182	<10	<10				
158	<10	<10	183	<10	<10				
159	<10	<10	184	<10	<10				
160	<10	<10	185	<10	10.65				
161	<10	14.09	186	<10	<10				
162	<10	<10	187	<10	<10				
163	<10	14.07	188	<10	<10				
164	<10	<10	189	<10	<10				
165	<10	<10	190 .	<10	<10				
166	<10	<10	191	<10	<10				
167	<10	<10	192	<10	<10				
168	<10	<10	193	<10	<10				
169	<10	<10	194	<10	<10				
170	<10	<10	195	<10	<10				
171	<10	<10	196	<10	<10				
172	<10	<10	197	<10	<10				
173	<10	<10	198	<10	<10				
174	<10	<10	199	<10	<10				
175	<10	<10	200	<10	<10				

	Table 4: Torrey Pines Northeast Swipe Survey Results								
Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²	Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²				
201	<10	<10	226	<10	<10				
202	<10	<10	227	<10	<10				
203	<10	<10	228	<10	<10				
204	<10	<10	229	<10	<10				
205	<10	<10	230	<10	<10				
206	<10	<10	231	<10	<10				
207	<10	<10	232	<10	<10				
208	<10	<10	233	<10	- <10				
209	<10	<10	234	<10	<10				
210	<10	<10	235	<10	<10				
211	<10	<10	236	<10	<10				
212	<10	<10	237	<10	<10				
213	<10	<10	238	<10	<10				
214	<10	<10	239	<10	10.65				
215	<10	<10	240	<10	<10				
216	<10	<10	241	<10	<10				
217	<10	<10	242	<10	<10				
218	<10	<10	243	<10	<10				
219	<10	<10	244	<10	<10				
220	<10	<10	245	<10	<10				
221	<10	<10	246	<10	<10				
222	<10	<10	247	<10	<10				
223	<10	<10	248	<10	14.09				
224	<10	<10	249	<10	<10				
225	<10	<10	250	<10	<10				
	Table 4	: Torrey Pines N	ortheast Sv	vipe Survey Resul	ts				
--------------	---	--	--------------	---	--				
Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²	Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²				
251	<10	<10	276	<10	<10				
252	<10	<10	277	<10	<10				
253	<10	<10	278	<10	<10				
254	<10	<10	279	<10	<10				
255	<10	<10	280	<10	<10				
256	<10	<10	281	<10	<10				
257	<10	<10	282	<10	<10				
258	<10	<10	283	<10	<10				
259	<10	10.65	284	<10	14.09				
260	<10	<10	285	<10	<10				
261	<10	<10	286	<10	<10				
262	<10	<10	287	<10	<10				
263	<10	<10	288	<10	<10				
264	<10	<10	289	<10	<10				
265	<10	<10	290	<10	<10				
266	<10	<10	291	<10	<10				
267	<10	<10	292	<10	<10				
268	<10	<10	293	. <10	14.07				
269	<10	<10	294	<10	<10				
270	<10	14.09	295	<10	<10				
271	<10	<10	296	<10	<10				
272	<10	<10	297	<10	<10				
273	<10	<10	298	<10	<10				
274	<10	10.64	299	<10	<10				
275	<10	<10	300	<10	<10				

	Table 4	: Torrey Pines N	ortheast Sv	vipe Survey Resul	ts
Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²	Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²
301	<10	<10	326	<10	<10
302	<10	<10	327	<10	<10
303	<10	<10	328	<10	<10
304	<10	<10	329	<10	<10
305	<10	<10	330	<10	<10
306	<10	<10	331	<10	<10
307	<10	<10	332	<10	<10
308	<10	<10	333	<10	<10
309	<10	<10	334	<10	<10
310	<10	<10	335	<10	<10
311	<10	<10	336	<10	<10
312	<10	<10	337	<10	<10
313	<10	<10	338	<10	<10
314	<10	<10	339	<10	<10
315	<10	<10	340	<10	<10
316	<10	<10	341	<10	<10
317	<10	<10	342	<10	<10
318	<10	<10	343	<10	<10
319	<10	<10	344	<10	<10
320	<10	13.76	345	<10	<10
321	<10	<10	346	12.16	<10
322	<10	<10			
323	<10	<10			
324	<10	<10			
325	<10	<10			

					Tab)le 5: Torr	ey Pines N	ortheast ((formerly 7	FPN-1a) S	Soil Sample	e Results	
						Radionucli Backg	de Concenti round Not S	rations (pCi/ ubtracted	′g)				
	Sample	U-:	238		U-	235		Cs-	-137		Co	-60	
#	ID/Grid	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 28	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2ð	± pCi/g
1	TPN1a1/A1	4.28	20.5	0.88	0.27	31.7	0.09	0.18	36.6	0.07	ND		0.00
2	TPN1a2/A3	2.25	29.1	0.65	0.31	27.0	0.08	0.16	44.1	0.07	ND		0.00
3	TPN1a3/A5	1.85	33.8	0.63	0.13	45.8	0.06	0.09	71.9	0.06	ND		0.00
4	TPN1a4/A7	1.66	38.6	0.64	0.15	50.2	0.08	0.10	79.8	0.08	ND		0.00
5	TPN1a5/A9	1.44	47.8	0.69	0.11	62.2	0.07	ND		0.00	ND	~	0.00
6	TPN1a6/A9	1.71	36.6	0.63	0.13	64.9	0.08	ND		0.00	ND		0.00
7	TPN1a7/A11	1.11	56.7	0.63	0.16	60.1	0.10	ND		0.00	ND		0.00
8	TPN1a8/A13	1.70	36.2	0.62	0.11	60.0	0.07	ND		0.00	ND		0.00
9	TPN1a9/A15	2.19	29.1	0.64	0.16	38.1	0.06	ND		0.00	ND		0.00
10	TPN1a10/A17	2.05	43.4	0.89	0.09	96.6	0.09	0.10	86.8	0.09	ND		0.00
11	TPN1a11/A19	2.14	36.9	0.79	0.16	51.6	0.08	0.09	73.0	0.07	0.19	52.9	0.10
12	TPN1a12/A19	1.36	38.6	0.53	0.13	38.3	0.05	0.10	60.9	0.06	ND		0.00
13	TPN1a13/A21	1.33	52.4	0.70	0.11	66.6	0.07	0.08	75.8	0.06	ND	·	0.00
14	TPN1a14/A23	1.38	37.0	0.51	0.14	45.1	0.06	0.07	116.4	0.08	ND		0.00
15	TPN1a15/A25	1.23	42.6	0.52	0.14	57.0	0.08	ND		0.00	ND		0.00
Nom	inal Background	2.10	ing and the second		0.14			0.07			ND		

					Т	able 5: Tor	rey Pines	Northeast	(formerly	TPN-1a)	Soil Sample	e Results	
						Radionucli Backg	ide Cöncenti ground Not S	rations (pCi/ ubtracted	g)				
	Sample	U-	238		U-	235		Cs	-137		Co	•60	
#	ID/Grid	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 28	± pCi/g
16	TPN1a16/A27	1.48	37.7	0.56	0.15	46.0	0.07	ND		0.00	ND		0.00
17	TPN1a17/A29	1.84	40.7	0.75	0.09	87.1	0.08	ND		0.00	ND		0.00
18	TPN1a18/A29	1.84	28.5	0.52	0.16	33.6	0.05	ND		0.00	ND		0.00
19	TPN1a19/A31	1.35	61.3	0.83	0.19	47.9	0.09	0.06	82.8	0.05	ND	·	0.00
20	TPN1a20/A33	2.53	25.6	0.65	0.19	33.5	0.06	0.09	57.9	0.05	ND		0.00
21	TPN1a21/A35	2.36	28.3	0.67	0.19	52.7	0.10	ND		0.00	ND		0.00
22	TPN1a22/A37	2.94	20.9	0.61	0.28	33.9	0.09	ND		0.00	ND		0.00
23	TPN1a23/A39	1.81	55.0	1.00	0.23	44.8	0.10	ND		0.00	ND		0.00
24	TPN1a24/A39	1.44	43.1	0.62	0.19	37.9	0.07	ND		0.00	ND		0.00
25	TPN1a25A41	2.92	32.9	0.96	0.29	37.3	0.11	ND		0.00	ND		0.00
26	TPN1a26/A43	2.14	35.8	0.77	0.15	45.7	0.07	ND		0.00	ND		0.00
27	TPN1a27/A45	0.76	105.7	0.80	0.12	66.9	0.08	ND		0.00	ND		0.00
28	TPN1a28/A47	1.06	57.6	0.61	0.17	47.7	0.08	0.11	51.8	0.06	ND		0.00
29	TPN1a29/A49	ND		0.00	0.11	95.0	0.10	ND		0.00	ND		0.00
30	TPN1a30/A49	1.19	37.8	0.45	0.10	51.2	0.05	ND		0.00	ND		0.00
Nom	inal Background	2.10	a stranged in		0.14			0.07			ND		

.

					Ta	able 5: Tor	rey Pines	Northeast	(formerly	TPN-1a)	Soil Sample	e Results	
						Radionucli Backg	de Concenti round Not Si	rations (pCi/ ubtracted	g)				
	Sample	U-:	238		U-:	235		Cs.	137		Co	•60	
#	ID/Grid	pCi/g	% error 2δ	± pCi/g	pCi/g	% error 2δ	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2δ	± pCi/g
31	TPN1a31/A51	0.79	85.1	0.67	0.09	68.8	0.06	ND		0.00	ND		0.00
32	TPN1a32/A53	1.30	48.6	0.63	0.12	48.5	0.06	0.08	77.1	0.06	ND		0.00
33	TPN1a33/A55	1.73	42.0	0.73	0.11	90.9	0.10	0.06	109.5	0.07	ND		0.00
34	TPN1a34/A57	2.51	31.7	0.80	0.18	41.6	0.07	0.11	52.2	0.06	0.13	69.3	0.09
35	TPN1a35/A59	1.54	50.6	0.78	0.10	96.7	0.10	ND		0.00	ND		0.00
36	TPN1a36/A59	2.01	27.2	0.55	0.12	47.8	0.06	ND		0.00	ND		0.00
37	TPN1a37/BD59	1.93	38.8	0.75	0.20	48.7	0.10	ND		0.00	ND		0.00
38	TPN1a38/BB59	1.83	29.0	0.53	0.20	36.4	0.07	1.19	7.6	0.09	0.09	60.2	0.05
39	TPN1a39/AZ59	1.79	50.0	0.90	0.25	37.9	0.09	ND		0.00	ND		0.00
40	TPN1a40/AX59	1.92	31.6	0.61	0.30	109.0	0.33	ND		0.00	ND		0.00
41	TPN1a41/AV59	2.00	36.4	0.73	0.22	36.4	0.08	ND		0.00	ND		0.00
42	TPN1a42/AV59	1.61	36.0	0.58	0.18	38.8	0.07	ND		0.00	ND		0.00
43	TPN1a43/AT59	1.32	57.4	0.76	0.14	59.2	0.08	ND		0.00	ND		0.00
44	TPN1a44/AR59	1.49	41.8	0.62	0.12	46.8	0.06	ND		0.00	ND		0.00
45	TPN1a45/AR59	0.08	93.3	0.07	0.13	66.8	0.09	ND		0.00	ND		0.00
Nor	ninal Background	2.10			0.14			0.07	and and a second se		ND		

					Ta	able 5: Tor	rey Pines	Northeast	(formerly	TPN-1a)	Soil Sampl	e Results	
						Radionucli Backg	de Concenti ground Not S	rations (pCi/ ubtracted	g)				
	Sample	U-:	238		U-	235		Cs·	137		Co	•60	
#	ID/Grid	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2δ	± pCi/g
46	TPN1a46/AN59	1.83	30.4	0.56	0.16	36.7	0.06	ND		0.00	ND		0.00
47	TPN1a47/AL59	2.72	31.8	0.87	0.28	35.9	0.10	ND		0.00	ND		0.00
48	TPN1a48/AL59	2.36	27.1	0.64	0.20	35.9	0.07	ND		0.00	ND		0.00
49	TPN1a49/AJ59	1.61	48.6	0.78	0.13	42.6	0.06	ND		0.00	ND		0.00
50	TPN1a50/AH59	2.87	29.7	0.85	0.21	39.7	0.08	ND		0.00	ND		0.00
51	TPN1a51/AF59	2.40	35.8	0.86	0.07	128.8	0.09	ND		0.00	ND		0.00
52	TPN1a52/AD59	1.84	29.1	0.54	0.18	43.4	0.08	ND		0.00	ND		0.00
53	TPN1a53/AB59	2.05	26.9	0.55	0.12	76.6	0.09	ND		0.00	ND		0.00
54	TPN1a54/B2	0.89	58.1	0.52	0.13	53.4	0.07	0.65	15.2	0.10	0.13	53.0	0.07
55	TPN1a55/B4	2.18	23.9	0.52	0.22	26.2	0.06	0.68	9.7	0.07	0.22	33.0	0.07
56	TPN1a56/B6	1.43	50.0	0.72	0.15	55.4	0.08	0.06	85.4	0.05	ND		0.00
57	TPN1a57/B6	1.56	36.0	0.56	0.17	41.2	0.07	ND		0.00	ND		0.00
58	TPN1a58/B8	1.10	50.7	0.56	0.14	63.7	0.09	0.23	29.9	0.07	ND		0.00
59	TPN1a59/B10	1.93	26.1	0.50	0.14	38.6	0.05	0.16	34.1	0.05	ND		0.00
60	TPN1a60/B12	1.52	41.4	0.63	0.11	81.2	0.09	0.13	63.1	0.08	ND		0.00
Nor	ninal Background	2.10			0.14			0.07			ND		

.

		<u> </u>		-	Т	able 5: Tor	rey Pines	Northeast	(formerly	TPN-1a) S	Soil Sample	e Results	
						Radionucli Backg	de Concenti ground Not S	rations (pCi/ ubtracted	g)				
	Sample	U-:	238		U-	235		Cs•	137		Co	60	
#	ID/Grid	pCi/g	% error 2δ	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 28	± pCi/g	pCi/g	% еггог 28	± pCi/g
61	TPN1a61/B14	1.54	27.0	0.42	0.13	50.1	0.07	0.05	92.8	0.05	ND		0.00
62	TPN1a62/B16	2.50	36.3	0.91	0.11	91.0	0.10	ND		0.00	ND		0.00
63	TPN1a63/B18	1.21	45.6	0.55	0.17	56.5	0.10	0.09	57.9	0.05	ND		0.00
64	TPN1a64/B18	1.60	. 31.8	0.51	0.09	62.0	0.06	0.09	41.8	0.04	ND		0.00
65	TPN1a65/B20	1.21	40.1	0.49	0.16	42.5	0.07	ND		0.00	ND		0.00
66	TPN1a66/B22	2.30	40.4	0.93	0.31	37.4	0.12	0.10	62.7	0.06	ND		0.00
67	TPN1a67/B24	0.98	47.9	0.47	0.11	46.4	0.05	0.07	63.2	0.04	ND		0.00
68	TPN1a68/B26	1.92	44.9	0.86	0.21	49.0	. 0.10	ND		0.00	ND		0.00
69	TPN1a69/B28	1.30	35.5	0.46	0.14	45.1	0.06	ND		0.00	ND		0.00
70	TPN1a70/B30	1.28	38.4	0.49	0.10	59.7	0.06	ND		0.00	ND		0.00
71	TPN1a71/B32	1.54	48.1	0.74	0.11	65.6	0.07	0.08	64.5	0.05	ND		0.00
72	TPN1a72/B34	1.98	27.6	0.55	0.19	27.4	0.05	ND		0.00	ND		0.00
73	TPN1a73/B36	2.92	27.4	0.80	0.22	40.5	0.09	ND		0.00	ND		0.00
74	TPN1a74/B38	1.62	35.6	0.58	0.17	36.8	0.06	ND		0.00	ND		0.00
75	TPN1a75/B40	2.34	31.5	0.74	0.19	42.2	0.08	ND		0.00	ND		0.00
Nor	ninal Background	2.10			0.14			0.07			ND		

					Т	able 5: To	rrey Pines	Northeast	(formerly	TPN-1a)	Soil Sampl	e Results	
			· · · ·			Radionucl Back	ide Concenti ground Not S	rations (pCi/ ubtracted	'g)				
	Sample	U-	238		U-	235		Cs	-137		Co	-60	
#	ID/Grid	pCi/g	% error 28	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2ð	± pCi/g
76	TPN1a76/B40	0.95	38.8	0.37	0.13	63.1	0.08	ND		0.00	ND		0.00
77	TPN1a77/B42	2.03	33.5	0.68	0.11	46.4	0.05	ND		0.00	ND		0.00
78	TPN1a78/B44	0.97	68.8	0.67	0.15	59.5	0.09	ND		0.00	ND		0.00
79	TPN1a79/B46	1.30	38.0	0.49	0.16	33.1	0.05	ND		0.00	ND		0.00
80	TPN1a80/B48	1.33	49.3	0.66	0.16	45.3	0.07	ND		0.00	ND		0.00
81	TPN1a81/B50	1.01	61.3	0.62	0.13	50.7	0.07	ND		0.00	ND		0.00
82	TPN1a82/B52	1.07	52.2	0.56	0.06	114.4	0.07	0.16	41.3	0.07	0.11	112.8	0.12
83	TPN1a83/B54	2.14	31.3	0.67	0.33	88.5	0.29	0.17	36.8	0.06	ND		0.00
84	TPN1a84/B56	2.59	24.8	0.64	0.17	40.4	0.07	0.06	105.8	0.06	ND		0.00
85	TPN1a85/B58	2.02	35.1	0.71	0.13	64.8	0.08	ND		0.00	ND		0.00
86	TPN1a86/A33	1.41	34.0	0.48	0.14	39.8	0.06	ND		0.00	ND		0.00
87	TPN1a87/A31	ND		0.00	ND		0.00	ND		0.00	ND		0.00
88	TPN1a88/A31	1.47	35.0	0.51	0.13	52.8	0.07	ND		0.00	ND		0.00
89	TPN1a89/A19	ND		0.00	ND		0.00	ND		0.00	ND		0.00
90	TPN1a90/A17	1.49	34.3	0.51	0.15	49.3	0.07	0.18	26.4	0.05	ND		0.00
Nor	ninal Background	2.10			0.14			0.07			ND		

and the second second

•

)

/

W:\torrey pines northeast soil table6.wpd

Ť

10000

1

					Та	able 5: Tor	rey Pines	Northeast	(formerly	TPN-1a)	Soil Sampl	e Results	
						Radionucl Back	ide Concent ground Not S	rations (pCi Subtracted	/g)				
	Sample	U-	238		U-	235		Cs	-137		Co	-60	
#	ID/Grid	pCi/g	% error 2δ	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% еггог 2ð	± pCi/g
91	TPN1a91/A17	1.54	37.9	0.58	0.15	45.1	0.07	ND		0.00	ND		0.00
92	TPN1a92/A5	2.20	22.3	0.49	0.15	37.0	0.06	ND		0.00	ND		0.00
93	TPN1a93/A3	2.16	28.7	0.62	0.15	60.4	0.09	0.15	41.9	0.06	0.14	75.8	0.11
94	TPN1a94/A3	1.98	28.3	0.56	0.21	32.6	0.07	0.14	35.6	0.05	ND		0.00
95	TPN1a95/C41	1.37	64.7	0.89	ND		0.00	ND		0.00	ND		0.00
96	TPN1a96/C39	1.19	39.7	0.47	0.10	64.9	0.06	0.06	62.2	0.04	ND		0.00
97	TPN1a97/C37	1.13	60.3	0.68	0.33	31.8	0.10	ND		0.00	ND		0.00
98	TPN1a98/C35	2.73	24.2	0.66	0.09	34.8	0.03	0.56	13.6	0.08	0.08	84.0	0.07
99	TPN1a99/C33	1.86	42.6	0.79	0.21	45.5	0.10	0.25	38.7	0.10	ND		0.00
100	TPN1a100/C29	1.08	40.6	0.44	0.18	122.3	0.22	0.13	45.0	0.06	ND		0.00
101	TPN1a101/C27	1.33	59.6	0.79	0.18	54.3	0.10	0.11	54.5	0.06	ND		0.00
102	TPN1a102/T40	2.39	21.9	0.52	0.21	30.0	0.06	0.70	9.6	0.07	ND		0.00
103	TPN1a103/N21	2.63	34.9	0.92	0.26	39.6	0.10	ND		0.00	ND		0.00
104	TPN1a104/O21	2.85	25.2	0.72	0.24	36.8	0.09	ND		0.00	ND		0.00
105	TPN1a105/O19	3.30	26.3	0.87	0.28	34.8	0.10	ND		0.00	ND		0.00
Nom	inal Background	2.10			0.14			0.07			ND		

					Ta	able 5: Tor	rey Pines	Northeast	(formerly	TPN-1a)	Soil Sampl	e Results	
						Radionuc Back	lide Concen	trations (pC i Subtracted	/g)				
	Sample 1D/Grid	U	-238		U-	235		Cs	137		Co	-60	
#		pCi/g	% error 2δ	± pCi/g	pCi/g	% error 28	± pCi/g	pCi/g	% error 2δ	± pCi/g	pCi/g	% error 2δ	± pCi/g
106	TPN1a106/P20	2.75	25.2	0.69	0.34	25.0	0.09	0.14	40.6	0.06	ND		0.00
107	TRPN1a107/R2J	2.67	28.1	0.75	0.30	31.4	0.09	ND		0.00	ND		0.00
108	TPN1a108/T24	2.78	23.1	0.64	0.31	28.4	0.09	0.10	56.2	0.06	ND		0.00
109	TPN1a109/S30	2.82	33.6	0.95	0.26	47.7	0.12	0.25	33.5	0.08	ND		0.00
110	TPN1a110/U29	1.99	29.3	0.58	0.17	41.7	0.07	0.52	15.6	0.08	ND		0.00
111	TPN1a111/Q19	2.70	30.2	0.82	0.19	56.0	0.11	0.16	50.6	0.08	ND		0.00
112	TPN1a112/S20	3.03	19.1	0.58	0.29	92.4	0.27	0.07	69.6	0.05	ND		0.00
113	TPN1a113/V20	2.05	37.8	0.77	0.28	32.5	0.09	0.11	52.7	0.06	ND		0.00
114	TPN1a114/W21	2.58	20.9	0.54	0.21	32.1	0.07	0.27	29.9	0.08	ND		0.00
115	TPN1a115/X22	2.11	34.5	0.73	0.17	53.4	0.09	ND		0.00	ND		0.00
116	TPN1a116/Z23	2.34	25.2	0.59	0.24	34.1	0.08	0.07	81.0	0.06	ND		0.00
117	TPN1a117/Z1,25	1.87	40.4	0.76	0.12	63.7	0.08	0.10	53.6	0.05	ND		0.00
118	TPN1a118/Z2,27	2.48	22.6	0.56	0.18	36.0	0.06	0.06	81.0	0.05	ND		0.00
119	TPN1a119/Z3,29	NA		0.00	0.10	82.4	0.08	0.09	79.9	0.07	ND		0.00
120	TPN1a120/Z3,31	1.79	34.8	0.62	0.23	35.3	0.08	0.08	79.7	0.06	ND		0.00
Nom	inal Background	2.10			0.14			0.07			ND .		

					Т	able 5: Tor	rey Pines	Northeast	(formerly	TPN-1a)	Soil Sampl	e Results	
					•	Radionuc Baci	lide Concen	trations (pC Subtracted	i/g)				
	Sample ID/Grid	υ	-238		U-	235		Cs	-137		Co	-60	
#		pCi/g	% erтоr 2 ð	± pCi/g	pCi/g	% error 28	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2δ	± pCi/g
121	TPN1a121/Z2,33	1.51	60.1	0.91	0.12	62.1	0.07	0.12	60.4	0.07	ND		0.00
122	TPN1a122/Z2,35	1.67	33.5	0.56	0.16	35.9	0.06	0.05	80.4	0.04	ND		0.00
123	TPN1a123/Z1,37	1.65	45.8	0.76	0.14	69.1	0.10	ND		0.00	ND		0.00
124	TPN1a124/Z1,39	2.47	27.1	0.67	0.16	36.0	0.06	0.04	119.8	0.05	ND		0.00
125	TPN1a125/Z41	1.79	41.7	0.75	0.19	44.4	0.08	0.08	56.3	0.05	ND	·	0.00
126	TPN1a126/F19	2.64	23.0	0.61	0.24	24.1	0.06	0.30	23.2	0.07	ND		0.00
127	TPN1a127/G18	2.35	34.8	0.82	0.23	39.4	0.09	0.24	29.1	0.07	ND		0.00
128	TPN1a128/H19	1.67	32.3	0.54	0.30	79.5	0.24	0.15	35.6	0.05	0.07	69.1	0.05
129	TPN1a129/I18	2.46	37.1	0.91	0.22	37.5	0.08	0.10	67.1	0.07	ND		0.00
130	TPN1a130/J19	2.41	22.3	0.54	0.21	34.3	0.07	0.27	23.2	0.06	ND		0.00
131	TPN1a131/K20	3.43	24.1	0.83	0.36	32.4	0.12	ND		0.00	ND		0.00
132	TPN1a132/L19	2.57	23.1	0.59	0.29	26.9	0.08	0.07	82.0	0.06	ND		0.00
133	TPN1a133/K18	2.51	32.3	0.81	0.20	45.2	0.09	0.15	58.9	0.09	ND		0.00
134	TPN1a134/M18	2.60	25.1	0.65	0.39	76.6	0.30	0.07	64.4	0.05	ND		0.00
135	TPN1a135/J17	1.80	34.7	0.62	0.17	45.8	0.08	0.18	55.4	0.10	ND		0.00
Nom	inal Background	2.10			0.14			0.07			ND		

	a-faddillining-a				Ta	able 5: Tor	rey Pines	Northeast	(formerly	TPN-1a) S	Soil Sampl	e Results	
						Radionuc Back	lide Concent ground Not !	t rations (pC i Subtracted	i/g)				
	Sample ID/Grid	U	-238		U-	235		Cs-	-137		Co	•60	
#	Sumple III Old	pCi/g	% error 2δ	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2ð	± pCi/g
136	TPN1a136/L17	1.72	35.0	0.60	0.24	31.5	0.08	0.22	27.7	0.06	ND		0.00
137	TPN1a137/N17	3.24	31.0	1.00	0.33	30.3	0.10	0.46	17.3	0.08	0.08	92.7	0.07
138	TPN1a138/K16	1.20	39.7	0.48	0.08	56.4	0.05	0.08	57.2	0.05	ND		0.00
139	TPN1a139/M16	2.10	37.3	0.78	0.21	42.0	0.09	0.24	44.7	0.11	ND		0.00
140	TPN1a140/J15	.0.80	47.5	0.38	0.05	71.9	0.04	ND		0.00	ND		0.00
141	TPN1a141/L15	0.99	54.0	0.53	0.09	73.5	0.07	0.15	52.0	0.08	0.08	75.3	0.06
142	TPN1a142/114	0.70	57.2	0.40	0.07	60.2	0.04	0.06	79.9	0.05	ND		0.00
143	TPN1a143/K14	0.76	64.8	0.49	0.07	85.6	0.06	0.16	33.2	0.05	ND		0.00
144	TPN1a144/H13	1.93	32.9	0.64	0.12	63.6	0.08	0.17	33.7	0.06	ND		0.00
145	TPN1a145/J13	ND		0.00	ND		0.00	ND		0.00	ND		0.00
146	TPN1a146/L13	1.57	35.5	0.56	0.11	50.3	0.06	0.12	41.0	0.05	ND		0.00
147	TPN1a147/I12	1.39	53.4	0.74	0.11	66.4	0.07	ND		0.00	ND		0.00
148	TPN1a148/K12	1.01	37.1	0.37	0.11	44.6	0.05	0.05	12.6	0.01	0.05	102.7	0.05
149	TPN1a149/H11	1.58	43.6	0.69	0.10	69.1	0.07	ND		0.00	0.12	67.4	0.08
150	TPN1a150/J11	1.29	37.6	0.49	0.11	43.3	0.05	0.25	24.4	0.06	ND		0.00
Nom	inal Background	2.10			0.14			0.07			ND		

	1. <u>(m</u>				Т	able 5: Tor	rey Pines	Northeast	(formerly	TPN-1a) S	Soil Sampl	e Results	
						Radionucl Back	ide Concent ground Not S	rations (pCi Subtracted	/g)				
	Sample	U-	-238		U.	235		Cs·	137		Co	-60	
#	ID/Grid	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2δ	± pCi/g
151	TPN1a151/G10	0.65	82.4	0.54	0.06	92.9	0.06	0.09	52.6	0.05	ND		0.00
152	TPN1a152/I10	1.95	31.1	0.61	0.13	44.6	0.06	0.12	40.4	0.05	ND		0.00
153	TPN1a153/F9	0.78	71.7	0.56	0.38	21.5	0.08	0.08	97.1	0.08	ND		0.00
154	TPN1a154/H9	1.51	40.2	0.61	0.06	60.4	0.04	0.06	64.3	0.04	ND		0.00
155	TPN1a155/J9	0.94	61.7	0.58	0.18	44.8	0.08	0.35	21.8	0.08	0.05	98.6	0.05
156	TPN1a156/G8	0.77	58.3	0.45	0.07	63.4	0.04	0.10	43.8	0.04	ND		0.00
157	TPN1a157/18	1.81	42.0	0.76	0.16	46.4	0.07	0.35	22.9	0.08	0.11	62.6	0.07
158	TPN1a158/F7	2.15	26.3	0.57	0.19	36.6	0.07	0.08	90.9	0.07	ND		0.00
159	TPN1a159/H7	0.80	70.5	0.56	0.10	65.5	0.07	0.09	56.9	0.05	ND		0.00
160	TPN1a160/E6	0.64	58.0	0.37	0.10	46.9	0.05	0.09	61.5	0.06	ND		0.00
161	TPN1a161/G6	1.87	42.5	0.79	0.17	56.3	0.10	ND		0.00	ND		0.00
162	TPN1a162/D5	1.70	37.9	0.64	0.16	47.2	0.08	0.08	78.4	0.06	ND		0.00
163	TPN1a163/F5	0.67	97.5	0.65	0.17	56.3	0.10	0.34	24.9	0.08	ND		0.00
164	TPN1a164/H5	1.81	34.0	0.62	0.24	25.4	0.06	0.25	26.5	0.07	0.09	51.5	0.05
165	TPN1a165/A4	1.69	37.2	0.63	0.12	63.5	0.08	0.22	40.0	0.09	ND		0.00
Nom	inal Background	2.10			0.14		22	0.07	÷.		ND		

					Ta	able 5: Tor	rey Pines	Northeast	(formerly	TPN-1a) S	Soil Sampl	e Results	
						Radionuc Back	lide Concen	trations (pCi Subtracted	/g)				
	Sample ID/Grid	U	-238		U-	235		Cs·	137		Co	-60	
#		pCi/g	% егтог 28	± pCi/g	pCi/g	% error 28	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2ð	± pCi/g
166	TPN1a166/C4	0.66	54.0	0.36	0.07	53.4	0.04	0.08	49.0	0.04	ND		0.00
167	TPN1a167/E4	0.67	102.1	0.68	0.09	82.1	0.07	0.24	29.8	0.07	ND		0.00
168	TPN1a168/G4	1.46	36.1	0.53	0.25	107.5	0.27	0.27	22.4	0.06	ND		0.00
169	TPN1a169/B3	0.98	63.0	0.62	0.09	76.6	0.07	ND		0.00	ND		0.00
170	TPN1a170/D3	0.94	49.9	0.47	0.09	65.2	0.06	0.14	36.2	0.05	0.03	117.2	0.04
171	TPN1a171/F3	1.71	35.8	0.61	0.16	54.9	0.09	0.13	55.3	0.07	0.10	74.6	0.07
172	TPN1a172/A2	2.39	22.6	0.54	0.22	35.4	0.08	• 0.20	35.5	0.07	0.07	92.1	0.06
173	TPN1a173/C2	1.00	69.5	0.70	0.29	122.4	0.36	0.42	27.0	0.11	0.15	54.4	0.08
174	TPN1a174/E2	2.15	28.1	0.60	0.19	39.1	0.07	0.19	26.4	0.05	0.06	75.9	0.05
175	TPN1a175/B1	ND		0.00	0.12	60.5	0.07	0.46	20.8	0.10	0.13	63.1	0.08
176	TPN1a176/G12	1.95	29.8	0.58	0.14	45.2	0.06	0.15	30.8	0.05	ND		0.00
177	TPN1a177/Z3,26	1.33	44.4	0.59	0.19	44.7	0.08	ND		0.00	ND		0.00
178	TPN1a178/Z1,23	1.95	30.1	0.59	0.18	38.0	0.07	0.04	89.2	0.04	ND		0.00
179	TPN1a179/Z22	1.69	41.7	0.70	0.34	34.5	0.12	0.08	79.7	0.06	ND		0.00
180	TPN1a180/Y20	2.99	22.4	0.67	0.48	67.1	0.32	ND		0.00	ND		0.00
Nom	inal Background	2.10			0.14		a destructions	0.07			ND		

					Ta	ble 5: Tor	rey Pines	Northeast	(formerly	TPN-1a) S	Soil Sample	e Results	
						Radionuc Back	lide Concent ground Not S	trations (pCi Subtracted	i/g)				t
	Sample ID/Grid	U.	-238		U-2	235		Cs-	-137		Co	-60	
#	Sector Contraction	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2δ	± pCi/g	pCi/g	% error 28	± pCi/g	pCi/g	% error 28	· ± pCi/g
181	TPN1a181/V19	2.87	37.8	1.08	0.30	37.8	0.11	0.41	22.0	0.09	0.05	118.6	0.06
182	TPN1a182/T19	1.70	33.7	0.57	0.15	45.0	0.07	0.16	42.7	0.07	ND		0.00
183	TPN1a183/R18	1.43	49.6	0.71	0.17	50.4	0.09	0.19	33.1	0.06	ND		0.00
184	TPN1a184/P17	1.77	29.5	0.52	0.14	43.6	0.06	0.27	27.7	0.07	ND		0.00
185	TPN1a185/N16	2.36	38.9	0.92	0.15	72.2	0.11	0.22	38.4	0.08	ND		0.00
186	TPN1a186/M15	1.40	41.7	0.58	0.23	24.4	0.06	0.13	48.7	0.06	0.15	53.9	0.08
187	TPN1a187/L12	0.90	64.1	0.58	ND		0.00	0.49	18.3	0.09	0.05	121.6	0.06
188	TPN1a188/K10	2.03	31.4	0.64	0.15	52.4	0.08	0.09	54.4	0.05	ND		0.00
189	TPN1a189/K9	0.90	43.4	0.39	0.08	63.9	0.05	0.48	13.5	0.06	ND		0.00
190	TPN1a190/J7	1.66	34.9	0.58	0.23	32.7	0.08	0.31	18.6	0.06	ND		0.00
191	TPN1a191/14	1.49	50.6	0.75	0.09	110.8	0.10	0.27	34.6	0.09	ND		0.00
192	TPN1a192/G2	1.96	32.1	0.63	0.13	54.1	0.07	0.05	113.3	0.06	ND		0.00
193	TPN1a193/E1	1.31	40.4	0.53	0.19	49.3	0.09	0.15	51.5	0.08	0.09	83.2	0.07
194	TPN1a194/D0	1.78	34.3	0.61	0.13	54.5	0.07	0.36	23.1	0.08	ND		0.00
195	TPN1a195/B0	2.91	38.5	1.12	0.21	47.8	0.10	0.67	15.3	0.10	0.11	70.4	0.08
Nom	inal Background	2.10			0.14			0.07	-P. A. Laran		ND		242

Note: Sample #193 detected ¹³⁴Cs at 0.07±0.05 pCi/g

					T۲	able 5: Tor	rey Pines	Northeast	(formerly	TPN-1a) S	Soil Sampl	e Results	
						Radionucli Backg	de Concenti ground Not Si	rations (pCi/g ubtracted	g)				
	Sample ID/	U-	238		U-	235		Cs-	137		Co	-60	
#	Grid	pCi/g	% error 28	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% еггог 2б	± pCi/g	pCi/g	% error 2δ	± pCi/g
196	TPN1a196/A0	2.26	29.2	0.66	0.26	26.7	0.07	0.85	12.8	0.11	0.17	42.9	0.07
197											i		
198									2 				
199													
200													
201													
202								:					
203													
204													
205									a dharach an ta				
206													
207													
208											· · · · ·		
209		<u> </u>											
210													
Nom	inal Background	2.10			0.14			0.07			ND		

Note: Shaded entries were soil sample results for the steep hillsides which are not included in this report. This data will be included in a future report that will address this area along with other steep hillsides on GA's main site.

	<u></u>		<u>, t , t , t , t , t , t , t , t , t , t</u>		Ta	able 5: Tor	rey Pines	Northeast	(formerly	TPN-1a) S	Soil Sample	e Results	
						Radionuc Back	lide Concent ground Not :	t rations (pCi Subtracted	/g)				
	Sample ID/Grid	U	-238		U-	235		Cs-	137		Co	•60	
#		pCi/g	% error 2ð	± pCi/g	pCi/g	% error 28	± pCi/g	pCi/g	% error 2δ	± pCi/g	pCi/g	% error 2δ	± pCi/g
211													
212													
213													
214													
215													
216								-					
217	TPN1a217/Y43	1.38	58.5	0.81	0.14	64.5	0.09	ND		0.00	ND		0.00
218	TPN1a218/Y45	1.43	43.1	0.62	0.17	50.4	0.09	0.08	85.5	0.07	ND		0.00
219	TPN1a219/Y47	0.53	103.8	0.55	0.12	49.2	0.06	ND		0.00	ND		0.00
220	TPN1a220/X50	1.89	30.6	0.58	0.11	47.3	0.05	0.13	32.2	0.04	0.21	38.7	0.08
221	TPN1a221/X52	1.92	38.7	0.74	0.10	76.1	0.08	ND		0.00	0.07	110.6	0.08
222	TPN1a222/W54	1.91	28.3	0.54	0.12	56.6	0.07	0.08	52.8	0.04	ND		0.00
223	TPN1a223/V55	1.47	58.3	0.86	0.11	71.5	0.08	0.12	81.5	0.10	ND		0.00
224	TPN1a224/U56	2.32	25.3	0.59	0.14	44.8	0.06	0.16	41.6	0.07	ND		0.00
225	TPN1a225/T57	2.02	46.1	0.93	0.13	64.7	0.08	0.19	44.1	0.08	ND		0.00
Nom	inal Background	2.10			0.14			0.07			ND		

.

Note: Shaded entries are steep hillside samples not included in this report. This data will be included in a future report that will address this area along with other steep hillsides on GA's main site.

					Ta	able 5: Tor	rey Pines	Northeast	(formerly	TPN-1a) S	Soil Sampl	e Results	
						Radiom Ba	iclide Conce ckground No	ntrations (p of Subtracted	Ci/g)				
		U۰	238		U-	235		Cs	-137		Co	-60	
# .	Sample ID/Grid	pCi/ g	% error 2δ	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2δ	± pCi/g
226	TPN1a226/S58	1.72	39.0	0.67	0.19	31.8	0.06	0.15	39.7	0.06	ND		0.00
227	TPN1a227/Q60	2.04	35.5	0.72	0.32	95.7	0.31	0.21	32.4	0.07	0.09	51.9	0.05
228	TPN1a228/O62	2.21	30.8	0.68	0.13	49.8	0.06	0.24	25.0	0.06	ND		0.00
229	TPN1a229/N63	ND		0.00	0.18	61.5	0.11	0.27	38.3	0.10	ND		0.00
230	TPN1a230/L65	1.38	59.0	0.81	0.20	33.2	0.07	0.10	47.9	0.05	ND		0.00
231	TPN1a231/J67	1.64	49.7	0.82	0.17	57.5	0.10	0.18	48.4	0.09	ND		0.00
232	TPN1a232/I68	2.20	28.3	0.62	0.23	33.2	0.08	0.09	55.6	0.05	ND		0.00
233	TPN1aC5/C5	1.78	33.0	0.59	0.22	30.8	0.07	0.51	15.1	0.08	0.12	51.4	0.06
234	TPN1aC5sub/C5	2.09	35.2	0.74	0.20	44.7	0.09	0.15	49.7	0.07	ND		0.00
235	TPN1a12A/A12	1.32	49.3	0.65	0.16	47.2	0.08	ND		0.00	ND		0.00
236	TPN1a12Asub/A12	1.60	25.7	0.41	0.15	37.7	0.06	ND		0.00	ND		0.00
237	TPN1aC17/C17	2.52	22.4	0.56	0.37	22.1	0.08	0.10	46.8	0.05	ND		0.00
238	TPN1aC18/C18	2.50	26.5	0.66	0.17	55.7	0.09	0.21	44.1	0.09	ND		0.00
239	TPN1a23A/A23	1.88	42.1	0.79	0.11	77.4	0.09	0.14	51.6	0.07	ND		0.00
240	TPN1a23Asub/A23	1.55	49.8	0.77	0.11	67.8	0.07	ND		0.00	ND		0.00
Nom	inal Background	2.10			0.14			0.07			ND	2019 9	

					Ťí	able 5: Tor	rey Pines	Northeast	(formerly	TPN-1a) S	Soil Sampl	e Results	
						Radionu Bac	clide Concer skground Not	n <mark>trations (pC</mark> t Subtracted	Ci/g)				
		U-2	38		U-	235		Cs	-137		Co	-60	
#	Sample ID/Grid	pCi/g	97 error 28	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2ð	± pCi/g
241	TPN1aC24/C24	1.43	46.5	0.66	0.15	67.0	0.10	0.07	117.9	0.08	ND		0.00
242	TPN1aC24sub/C24	2.37	27.1	0.64	0.20	41.2	0.08	0.04	125.3	0.05	ND		0.00
243	TPN1aC25/C25	1.59	45.3	0.72	0.11	93.3	-0.10	0.29	32.3	0.09	ND		0.00
244	TPN1aC25sub/C25	1.91	39.3	0.75	0.15	50.9	0.08	0.67	13.2	0.09	0.10	78.0	0.08
245	TPN1aL/F11	2.15	38.0	0.82	0.12	65.7	0.08	0.18	42.1	0.08	ND		0.00
246	TPN1aL1sub/F11	1.76	44.7	0.79	0.14	70.9	0.10	ND		0.00	ND		0.00
247	TPN1aM/F10	2.34	28.4	0.66	0.21	40.5	0.09	0.29	26.3	0.08	ND		0.00
248	TPN1aM1sub/F10	2.07	32.5	0.67	0.17	35.6	0.06	0.08	44.8	0.04	ND		0.00
249	TPN1aN/F9	1.61	47.1	0.76	0.12	82.4	0.10	ND		0.00	ND		0.00
250	TPN1aN1sub/F9	1.76	45.1	0.79	0.07	120.7	0.08	ND		0.00	ND		0.00
251	TPN1aO/F9	2.65	24.0	0.64	0.20	36.5	0.07	ND		0.00	ND		0.00
252	TPN1aO1sub/F9	1.88	33.7	0.63	0.18	37.6	0.07	ND		0.00	ND		0.00
253	TPN1aP/E8	2.43	41.2	1.00	0.17	56.3	0.10	ND		0.00	ND		0.00
254	TPN1aP1sub/E8	1.48	45.2	0.67	0.18	46.8	0.08	ND		0.00	ND		0.00
255	TPN1aQ1sub/E7	1.94	30.8	0.60	0.19	38.3	0.07	ND		0.00	ND		0.00
Nom	inal Background	2.10			0.14			0.07			ND		

					T	able 5: Tor	rey Pines	Northeast	(formerly	TPN-1a)	Soil Sampl	e Results	
						Radionuc Baci	l ide Concen kg <i>round Not</i> .	trations (pC Subtracted	i/g)			<u> </u>	
	Sample ID/Grid	U	-238		U-	235		Cs	-137		Co	-60	
#		pCi/g	% erтоr 28	± pCi/g	pCi/g	% error 28	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2δ	± pCi/g
256	TPN1aR/E7	1.89	36.5	0.69	0.34	26.5	0.09	0.26	29.6	0.08	ND		0.00
257	TPN1aR1sub/E7	1.66	41.9	0.70	0.21	54.0	0.11	0.16	40.8	0.07	ND		0.00
258	TPN1aS/D6	2.23	27.6	0.62	0.26	31.5	0.08	0.10	65.9	0.07	ND		0.00
259	TPN1aS1sub/D6	2.27	27.3	0.62	0.20	37.4	0.07	ND		0.00	ND		0.00
260	TPN1aT/D6	2.35	38.3	0.90	0.20	54.9	0.11	ND		0.00	ND		0.00
261	TPN1aT1sub/D6	2.22	43.9	0.97	0.22	49.3	0.11	ND		0.00	ND		0.00
262	TPN1aU/D5	2.38	27.7	0.66	0.31	24.4	0.08	0.11	47.4	0.05	ND		0.00
263	TPN1aU1sub/D5	2.19	31.1	0.68	0.23	32.6	0.08	0.07	60.3	0.04	ND		0.00
264	TPN1aV/D5	2.34	32.3	0.76	0.32	35.9	0.11	ND		0.00	ND		0.00
265	TPN1aV1sub/D5	3.15	27.8	0.88	0.23	35.4	0.08	ND		0.00	ND		0.00
266	TPN1aZ29/Z29	2.31	24.8	0.57	0.20	32.7	0.07	0.05	87.2	0.04	ND		0.00
267	TPN1aE18/E18	2.52	35.4	0.89	0.30	38.2	0.11	ND		0.00	ND		0.00
268	TPN1aJ18/J18	1.61	51.2	0.82	0.26	41.2	0.11	0.22	52.1	0.11	ND		0.00
269	TPN1aQ27/Q27	2.58	25.8	0.67	0.39	24.5	0.10	ND		0.00	ND		0.00
270	TPN1aQ42/Q42	2.91	23.8	0.69	0.27	31.1	0.08	0.04	115.0	0.05	ND		0.00
Nom	inal Background	2.10	a taita		0.14			0.07			ND		

					Т	able 5: Tor	rey Pines	Northeast	(formerly	TPN-1a) S	Soil Sampl	e Results	
						Radionucl Back	ide Concent ground Not S	rations (pCi Subtracted	/g)				
	Sample	U	-238		U-	235		Cs-	137		Co	-60	
#	ID/Grid	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 28	± pCi/g	pCi/g	% error 28	± pCi/g	pCi/g	% error 28	± pCi/g
271	TPN1aU55/U55	1.47	41.6	0.61	0.15	45.7	0.07	0.06	66.8	0.04	ND		0.00
272	TPN1aV55/V55	1.73	35.6	0.62	0.09	-52.5	0.05	0.07	60.2	0.04	ND		0.00
273	TPN1aV54/V54	1.46	37.1	0.54	0.13	48.0	0.06	0.14	34.3	0.05	ND		0.00
274	TPN1aL49/L49	0.87	59.0	0.51	0.10	73.8	0.07	0.06	101.3	0.06	ND		0.00
275	TPN1aF48/F48	1.04	52.0	0.54	0.10	50.0	0.05	0.05	84.0	0.04	ND		0.00
276	TPN1aW/E7	1.28	56.3	0.72	0.33	94.3	0.31	0.15	45.7	0.07	ND		0.00
277	TPN1aX/E7	0.51	89.7	0.46	0.13	60.0	0.08	0.11	60.6	0.07	ND		0.00
278	TPN1aY/E7	1.76	34.9	0.61	0.24	36.2	0.09	0.12	55.6	0.07	ND		0.00
279	TPN1aZ/E6	1.88	33.8	0.64	0.23	28.6	0.07	0.21	32.5	0.07	0.03	102.1	0.03
280	TPN1aZ1/E8	2.68	32.9	0.88	0.41	30.0	0.12	0.25	38.6	0.10	ND		0.00
Nom	inal Background	2.10			0.14			0.07			ND		

Note:Samples identified as "TPNxxxxsub" are sub-surface samples taken at 6" to 12" deep. All other samples are surface samples taken at 0" to 6" deep.

.

				Ta	able 6: To	rrey Pines	Northeast	(formerly	TPN-1a) l	Drainline S	Soil Sampl	e Results	
See	Figure 20 for Locations					Radionucl Backį	ide Concenti ground Not S	rations (pCi/ ubtracted	g)				
#	Sample ID	U-	238		U-	235		Cs	-137		Co	-60	
		pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 28	± pCi/g
1	22-P01	2.59	22.4	0.58	0.26	27.1	0.07	ND		0.00	ND		0.00
2	22-P02	1.98	38.1	0.75	0.19	32.2	0.06	ND		0.00	ND		0.00
3	22-P03	1.40	36.7	0.51	0.17	40.6	0.07	ND		0.00	ND		0.00
4	22-P04	1.02	64.5	0.66	0.08	69.4	0.06	ND		0.00	ND		0.00
5	22-P05	1.82	31.5	0.57	0.22	32.0	0.07	ND		0.00	ND		0.00
6	22-P06	1.16	47.6	0.55	0.15	45.1	0.07	ND		0.00	ND		0.00
7	22-P()7	1.60	34.9	0.56	0.11	55.1	0.06	ND		0.00	ND		0.00
8	22-P08	1.65	31.6	0.52	0.17	40.6	0.07	ND		0.00	ND		0.00
9	22-P09	1.78	42.5	0.76	0.11	60.5	0.07	ND		0.00	ND		0.00
10	22-P10	1.49	37.7	0.56	0.12	39.7	0.05	ND		0.00	ND		0.00
11	22-P11	1.23	55.1	0.68	0.07	94.3	0.07	ND		0.00	ND		0.00
12	22-P12	2.05	29.2	0.60	0.15	47.9	0.07	ND		0.00	ND		0.00
13	22-P13	3.12	36.7	1.15	0.12	63.7	0.08	ND		0.00	ND		0.00
14	22-P14	1.71	37.4	0.64	0.18	47.7	0.09	ND		0.00	ND		0.00
15	22-P15	1.49	53.5	0.80	ND		0.00	ND		0.00	ND		0.00
Nom	inal Background	2.10			0.14		5	0.07			ND	an a	

				Tab	le 6: Torr	ey Pines N	lortheast (formerly '	FPN-1 a) D	rainline S	oil Sampl	e Results	
See	Figure 20 for Locations					Radionucli Backg	de Concenti ground Not S	rations (pCi/ ubtracted	(g)				
		U-	238		U-	235		Cs-	137			Co-60	
#	Sample ID	pCi/g	% error 28	± pCi/g	pCi/g	% error 28	± pCi/g	pCi/g	% error 2δ	± pCi/g	pCi/g	% error 2δ	± pCi/g
16	22-P16	1.43	51.3	0.73	0.12	78.0	0.09	ND		0.00	ND		0.00
17	22-P17	1.25	65.9	0.82	0.19	67.6	0.13	ND		0.00	ND		0.00
18	22-P18	1.73	31.0	0.54	0.17	40.8	0.07	ND		0.00	ND		0.00
19	22-P19	1.58	45.4	0.72	0.11	87.8	0.10	ND		0.00	ND		0.00
20	22-P20	1.67	31.7	0.53	0.16	46.6	0.07	ND		0.00	ND		0.00
21	22-P21	1.50	50.5	0.76	0.14	69.6	0.10	ND		0.00	ND		0.00
22	22-P22	1.65	34.2	0.56	0.10	56.6	0.06	ND		0.00	ND		0.00
23	22-P23	1.59	51.0	0.81	0.14	64.8	0.09	ND		0.00	ND		0.00
24	22-P24	1.89	32.9	0.62	0.22	91.7	0.20	ND		0.00	ND		0.00
25	22-P25	1.49	62.2	0.93	0.14	66.6	0.09	ND		0.00	ND		0.90
26	22-P26	0.79	56.6	0.45	0.13	45.4	0.06	ND		0.00	ND		0.00
27	22-P27	1.66	.48.2	0.80	0.19	50.0	0.10	ND		0.00	ND		0.00
28	22-P28	2.01	34.1	0.69	0.08	76.1	0.06	ND		0.00	ND		0.00
Nom	inal Background	2.10			0.14			0.07			ND	and a straight	

	Table 7: Torre	ey Pines Northea	st, Building	g 20 Swipe Survey	/ Results
Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²	Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²
1	<10	<10	26	<10	<10
2	<10	<10	27	<10	<10
. 3	<10	<10	28	<10	<10
4	<10	<10	29	<10	<10
5	<10	<10	30	<10	<10
6	<10	<10			
7	<10	10.65			
8	<10	<10			
9	<10	<10			
10	<10	<10			
11	<10	<10			
12	<10	<10			
13	<10	<10			
14	<10	<10			
15	<10	<10			
16	<10	<10			
17	<10	10.64			
18	<10	<10			
19	<10	<10		·	
20	<10	<10			
21	<10	<10			
22	<10	<10			
23	<10	<10			
24	<10	<10			
25	<10	<10			

Table 8: Building 22 Pump Station Swipe Survey Results							
Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²	Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²		
l	<10	<10	11	<10	<10		
2	<10	<10	12	<10	<10		
3	<10	<10	13	<10	<10		
4	<10	<10	14	<10	<10		
5	<10	<10	15	<10	<10		
6	<10	<10	16	<10	<10		
7	<10	<10	<u>1</u> 7	<10	10.91		
8	<10	<10	18	<10	<10		
9	<10	<10	19	<10	<10		
10	<10	<10	20	<10	<10		

	Electrical Junction Box Soil Sample Results												
		Radionuclide Concentrations (pCi/g) Background Not Subtracted											
	C 1	U-238		U-235		Cs-137			Co-60				
#	Sample ID	pCi/g	% error 2δ	± pCi/g	pCi/g	[%] error 2δ	± pCi/g	pCi/g	% error 2δ	± pCi/g	pCi/g	% error 2δ	± pCi/g
1	TFF INST PIT #1	1.52	43.8	0.67	0.22	25.9	0.06	0.89	[].1	0.10	0.17	43.8	0.07
2	TFF INST 2	2.01	28.3	0.57	0.27	35.4	0.10	1.33	7.8	0.10	0.32	25.5	0.08

Table 9: Torrey Pines Northeast Electrical Junction Box Soil Sample and Smear Results

Swipe Survey Results								
Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²						
1	<10	15.42						
2	<10	<10						
3	<10	<10						

Table 10: Background Soil Sample Results								
Sample ID ²	Cs-137	Th-228	Ra-228 (Th-232)	Total Thorium Th-228 + Th-232	U-238	U-235		
Radionuclide Concentrations (pCi/g)								
AJ	ND	1.28 ± 0.07	1.47 ± 0.14	2.75	1.98 ± 0.31	0.15 ± 0.03		
G2	0.12 ± 0.03	0.92 ± 0.07	1.01 ± 0.12	1.93	1.86 ± 0.29	0.12 ± 0.02		
AC	ND	1.29 ± 0.07	1.34 ± 0.14	2.63	2.27 ± 0.27	0.20 ± 0.03		
BKG-1	ND	1.40 ± 0.16	1.44 ± 0.28	2.84	2.06 ± 0.48	0.19 ± 0.06		
BKG-2	ND	1.54 ± 0.15	1.57 ± 0.27	3.11	2.30 ± 0.45	0.17 ± 0.05		
BKG-3	ND	1.40 ± 0.14	1.62 ± 0.26	3.02	ND	0.19 ± 0.05		
BKG-4	ND	0.67 ± 0.09	0.84 ± 0.17	1.51	1.15 ± 0.37	0.09 ± 0.04		
BKG-5	ND	1.51 ± 0.16	1.79 ± 0.31	3.30	2.77 ± 0.67	0.12 ± 0.06		
BKG-6	ND	0.68 ± 0.09	0.76 ± 0.16	1.44	ND	0.08 ± 0.03		
BKG-7	ND	1.17 ± 0.12	1.28 ± 0.22	2.45	1.83 ± 0.43	0.11 ± 0.04		
Mean ± 2 O		1.19 ± 0.64	1.31 ± 0.68	2.5 ±1.32	2.03 ± 0.93	0.14 ±0.09		

Samples gamma scanned for 1 hour.

ND = < 0.1 pCi/g for Cs-137, < 1.0 pCi/g for U-238

² Samples collected in June and August 1993, typically about 1-2 miles from the Building 37 site at the following locations:

A] Collected on a hillside west of Building 39 & northwest of building 37, ~3' from GA's fence.

G2 Collected about 1200 feet west of Bldg 1 (near T.P. RD.), and ~7/8 of a mile southwest of Building 37.

AC Collected about 1 mile southeast of the main site & about 2 miles southeast of Building 37.

BKG-1 Collected about 1 mile from Building 37 at the Scripps Hospital Entrance, east of Genesee Ave.

BKG-2 Collected about 1.2 miles from Building 37 at Sorrento Court Rd. by North entrance to Post Office.

BKG-3 Collected about 1.5 miles from Building 37 at Sorrento Vista Parkway near Lusk Blvd. South.

- BKG-4 Collected about 1 mile west from Building 37, west off Genesee corner of North Torrey Pines Road and Torrey Pines Scenic Drive
- BKG-5 Collected about 2 miles west of GA off of La Jolla Shores Drive.
- BKG-6 Collected about 2 miles northwest of Building 37 on North Torrey Pines Road
- BKG-7 Collected about 2 miles near V.A. Hospital on La Jolla Village Drive (southwest)

Figure 1: Main Site and Sorrento Valley Site





Figure 2: Relationship Between Torrey Pines Northeast Land Area and Surrounding Facilities







FIGURE 5 : Survey of Drain Pipe Coming From TFF to Hot Cell Area



Technician: J.T. Sullivan Date: 04/26/00

Comments:

The μ R probe was inserted into each pipe ~ three feet downline, the swipe was taken in the same manner and counted using handheld instruments. No indications of contamination above background levels were observed.

Instrument	Serial #	probe#	Cal Due	Eff %	Background	Background
Model 3 15.5cm²β	61488	44 - 9 117851	07/10/00	21.35	100 - 120 cpm 100 - 120	
Model 3 µR	131601	N/A	04/13/00	N/A	17 - 18 μR/hr pvc pipe	12 - 13 μR/hr steel pipe
Model 12 - 50cm ² α	91103	43-65 092192	10/12/00	21.58	0 - 20cpm	0 - 20cpm



68 67 66 65 64 63 62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1



- 1



Ĵ.

6.53

Ĩ






68 67 66 65 64 63 62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

- 5

119





.















All areas direct frisked found to be less than or equal to background of 80 - 100cpm beta for the 15cm² Beta instrument GM.

Figure 18B: Building 22 Pump Station, Exposure Rate Surveys

Sodium Iodide Survey

06/12/2000





Except as noted, all readings are the highest observed during a 100% scan at contact with the surface.

Figure 18C: Building 22 Pump Station, Fixed Alpha Survey

Alpha Fixed 50cm²







All areas surveyed found to be <100dpm/100cm².

Figure 18D: Building 22 Pump Station Alpha Scan Survey

Alpha Direct Scan

06/12/2000







Background for the 50cm² Alpha was ~10cpm. All areas surveyed found to be less than or equal to background. (<20cpm)

Figure 18E: Building 22 Pump Station, Smear Survey Locations

06/12/2000



n = Denotes Smear Location

C. Stanley



Figure 19: Electrical Pit & Instrumentation Pit - Survey

- 5. The shaded circles indicate the approximate locations of soil samples taken.
- 6. The unshaded circles indicate the approximate locations of wipe survey samples taken in the sump.

Figure 20: Torry Pines Northeast: Drain Line Trench Soil Sample Locations



3 2 _S ∢(∢



N

0

0

ΒB

СС

4 1 3 1 2 1 1 1



General Atomic's

Final Radiological Survey Report

For Torrey Pines Northeast (also known as TPN-1a)

Appendix A

Final Survey Plans

<u>Torrey Pines North (Ia)</u> <u>Final Survey Plan for Building 22 Outside Area</u>



Building 22 (TRIGA Fuel Fab Facility) has been released to unrestricted use by both the NRC and the State of California. The release included the entire building, the outside north concrete pad and the footprint around the building. The building is currently uninhabited.

A fence has been erected between Building 22 and the former Hot Cell Facility Building 23 land area which separates the Hot Cell Facility radiation restricted area from the land area surrounding Building 22. This Survey Plan covers the survey of the area around the facility (Building 22) as shown in Figure 1 as Torrey Pines North (TPN) area Ia. *Note: This area excludes Building 20 which is currently being used to store radioactive material. Building 20 is the former bottled gas storage pad which will have its own Survey Plan.*

PREVIOUS HISTORY & CLASSIFICATION

This land area (TPN-Ia) is located around Building 22 (see Figure 1). The area has been classified as a **suspect affected area** due to its proximity to Buildings 22 and 23. In addition, surveys in the past have indicated isolated areas of contamination within Building 22 (enriched uranium) and in the land area outside the former Hot Cell Facility, Building 23 (elevated beta/gamma radiation levels).

CRITERIA FOR RELEASE TO UNRESTRICTED USE

Exposure Rate Guideline

The guideline value for exposure rates measured at 1 m above the surface is 10 μ R/hr above background. Typical background measures ~15 μ R/hr.

Release Limits

The primary contaminants of concern for this area are enriched uranium (U-234 + U-235) as well as Cs-137 and Co-60 (beta/gamma emitters). The applicable NRC guidelines for beta/gamma emitters (and enriched uranium) and are as follows:

Beta/Gamma Emitters and Uranium

5000 dpm/100cm², averaged over a 1 m² area 15,000 dpm/100cm², maximum in a 100 cm² area if the average over 1 m² is met. 1000 dpm/100cm², removable activity

Soil Release Criteria

The predominant radionuclides found in soil at GA and the soil release criteria in pCi/g is provided below:

Co-60	8 pCi/g
Cs-137	15 pCi/g
Thorium (Th-228 + Th-232)	10 pCi/g
Enriched Uranium (U-234 + U-235)	30 pCi/g
Depleted Uranium	35 pCi/g

If more than one radionuclide exists, the sum of the fractions of the concentrations must be less than one (calculated as follows):

$$\sum_{i=1}^{n} \frac{C_i}{L_i}$$

 C_i = The average concentration of radionuclides *i* in the soil above background levels.

 L_i = The release criteria for radionuclides *i*.

SURVEY PLAN

The following table describes the radiation and contamination surveys to be performed for this area as well as the soil sampling plan.

ALERT LEVELS

Notify Health Physics management if any of the following alert levels are exceeded.

Smears (removable activity)

If any smear is > 75% of the release level (750 dpm/100 cm²).

Alpha Monitoring

)

If > 150 cpm alpha using a 434 cm² probe, then check the area with a hand-held alpha probe and record the results.

> 80 cpm alpha using a 50 cm² hand-held probe.

Beta Monitoring

> 500 cpm above Building 13 background using a 434 cm² probe.

- > 350 cpm above Building 13 background using a 100 cm² probe.
- > 100 cpm above Building 13 background using a portable GM detector.

A:\220UT.99

Exposure rate Measurements

 $\geq 25 \,\mu$ R/hr at contact - Notify John Turner if large areas > 20 μ R/hr at contact are measured. $\geq 20 \,\mu$ R/hr at 1m above the surface

Site Conditions

Presently, the surveys will be limited to the northern portion of the TPN-(Ia) land area due to the presence of several LSA boxes and other materials in the southern portion. The southern end of this land area will be surveyed when these items are removed.

Building 20 will be surveyed per another Survey Plan at a later date.

Notes:

)

Drains/drain pipes that entered this area (especially from the former Hot Cell Facility) will be located and tagged for removal. The resulting exposed soil will then be surveyed/sampled.

All drainage run-off locations emanating from this land area (TPN-Ia) will be located and surveyed with added significance.

Documentation

Every survey conducted must be documented on a daily basis on a drawing showing the approximate locations surveyed. Include the results (including units), the technician's name and signature, date, instrument(s) used (including model and serial number of both the rate meter and the detector), calibration due date, % efficiency, background readings, (if applicable), and any other applicable information.

	Survey	y and Soil Sam	pling Plan for Area ar	ound Building 22 (TI	FF) See Figure 1	
Location	Gridding	Scans with 434 cm ² detectors	Survey Areas above alert level with 15 cm ² GM detector and/or 50 cm ² α detector as appropriate	Measurements Fixed and Removable (smears)	Exposure Rate Surface Scan and Measurements (µR/hr)	Soil Samples (If asphalt or concrete is removed) ¹
			Suspect Affect	ed Area		
Asphalt and concrete around Building 22	Yes 2m x 2m Grid	100% α 100% β	100%	Take a radiation measurement every 2m, alternate between a 1 min. Fixed β count, a 100 cm ² Smear and a Fixed α count (repeat this sequence) ²	 1. 100% scan at contact. 2. Measurements every 2 m @ 1 m above the surface. Record readings @ contact and @1 m above surface every 2m. 	Two samples (surface and subsurface) under every location where remediation was performed.
Soil	Yes 2m x 2m Grid		100%	N/A	 100% scan at contact. Measurements every m @ 1 m above the surface. Record readings @ contact and @ 1 m above surface every 2m. 	Surface soil sample (0-6'') every 4 m (on the 2m x 2m grid) ³

Asphalt and concrete removal:

- -- Spot check survey the bottom side of larger pieces of asphalt and concrete with a GM detector during removal.
- -- Collect samples of any contaminated asphalt or concrete for characterization.
- -- Contaminated asphalt and concrete should be removed and placed in waste containers before the clean asphalt or concrete is removed.
- ² For beta fixed measurements; take a 1 minute count using a 100 cm² β gas flow proportional detector with a Model 2221 ratemeter. For alpha fixed measurements; take a ~ 10 second reading using a 50 cm² α hand-held detector. For removable measurements; take a 100 cm² smear and count using a low level α/β counter in the HP Laboratory.
- ³ The Site Decommissioning Plan requires sampling in suspect affected areas on a 5 m triangular grid. Sampling on a 4 m x 4 m grid is more conservative and consistent with the established grid needed for fixed and removable measurements.



Date: 10/20/99 Prepared by: John Turner Approved: Laura Gonzales Natura Aonzales Date: 10/19/99

Final Survey Plan for Building 20: Bottled Gas Storage Area

Purpose

The purpose of this survey is to demonstrate that the radiological conditions in Building 20 (Gas Bottled Storage Area) satisfy the NRC and State of CA guidelines for release to unrestricted use, and ensures that the radiological conditions are below the approved release criteria specified in GA's Site Decommissioning Plan.

Site Description

Building 20 is located on General Atomics' Torry Pines Mesa Site next to Building 22. Building 20 is located to the East of Building 22. A plan view of the GA Site is shown in Figure 1. A diagram of Building 20 located within GA's Torrey Pines North - 1a (TPN-1a) Open Land Area is shown in Figure 2. A diagram of Building 20 is shown in Figure 3.

Background

Building 22 was the former TRIGA Fuel Fabrication Facility which has been released to unrestricted use by the NRC and the State of California. Building 20 served as the storage area for the bottled gas that was utilized within Building 22. Building 20 is separated from Building 22 by a distance of approximately one (1) meter. This survey plan is applicable only to Building 20. A few boxes of packaged radioactive (low level) waste materials are being temporary stored in the southernmost room of the building. These packages will be removed from this area prior to the final survey.

Classification of Building 20

Building 20 was classified as a "suspect affected area" due to its proximity to Building 22. The total floor space of the building is ~ 1211 ft² (~ 112.5 m²).

Release Limits (per GA site Decommissioning Plan)

Facilities and Equipment

The primary contaminants of concern for this area are enriched uranium (U-234 + U-235) from Building 22 as well as Cs-137 and Co-60 (beta/gamma emitters) from the nearby Hot Cell Facility. The applicable guidelines for residual contamination on building surfaces for beta/gamma emitters and enriched uranium are as follows:

5,000 dpm/100cm² (averaged over a 1 m² area) 15,000 dpm/100cm² (maximum in a 100 cm² area if the average over 1 m² is met) 1,000 dpm/100cm² (removable activity)

)

Exposure Rate Measurements

The guideline value for exposure rates measured at 1 m above the surface is 10 μ R/hr above background.

Survey Plan

The following table describes the radiation and contamination surveys to be performed for this area.

<u>Alert Levels</u>

Beta Alert Levels

If the following "alert levels" are exceeded, notify HP Management so an evaluation can be performed to determine if increased survey coverage or reclassification is required.

- > 400 cpm <u>above background levels determined in Building 13</u> using the large area (434 cm²) β probe
- > 300 cpm <u>above background levels determined in Building 13</u> using the 100 cm² β probe
- > 100 cpm <u>above background</u> using the GM 15 cm² pancake probe

Alpha Alert Levels

If the following "alert levels" are exceeded, notify HP Management so an evaluation can be performed to determine if increased survey coverage or reclassification is required.

- > 150 cpm using the large area (434 cm²) α probe; if the alert level is exceeded, check the area with a 50 cm² hand-held α probe & record the results
- > 100 cpm using the hand-held 50 cm² α probe

<u>Smears</u>

)

If any smear is > 75% of the release level (> 750 dpm/100 cm² for α or β).

Exposure Rate Alert

Background is typically ~15 μ R/hr (i.e., an average of 12-18 μ R/hr range) at 1 meter above the surface (but may vary with type of facility & location). The alert level is 20 μ R/hr at 1 meter from the surface and 25 μ R/hr on contact with the surface.

Documentation

Every radiological survey conducted must be documented on a daily basis to a worksheet/log book and on a drawing showing the appropriate locations surveyed. The documentation must include the results of the measurements (including units), the technician's printed name and signature, date, instrument(s) used (including the model and serial number of both the ratemeter and the detector), calibration due date, % efficiency, background readings (if applicable) and any other pertinent information.

į

Type of Survey	Suspect Affected Area - Surveys to be Performed ⁽¹⁾		
Conduct surveys using instruments/probes with known background levels or determine background levels at Building 13 before usage. Structural materials that may be encountered are concrete-block, concrete & metal.			
Grid	Yes		
Large Area Masslinn Surveys on the floor surfaces	Yes - measure activity on the cloths with a 15 cm ² GM pancake detector & a 50 cm ² α detector		
Floor Scans within each room (scan w/434 cm ² $\alpha \& \beta$ probes)	~ 100% α & ~ 100% β		
Lower Wall Scans (Below 2 m) (scan w/434 cm ² α & β probes)	~ 100% α & ~ 100% β		
Upper Wall Scans (Above 2 m) (scan w/434 cm ² α & β probes)	(1) 25% $\alpha \& \beta$ scans conducted if contamination is detected on the lower portion (< 2 m) of this wall (2) 10% $\alpha \& \beta$ scans conducted if <u>no</u> contamination is detected on the lower portion (< 2 m) of this wall		
Number of Planned Measurements ⁽²⁾ (Taken @ ~ 1 every 2 m)	Take ~ 60 measurements: take ~ 15 fixed α measurements, ~ 15 fixed β measurements & ~15 smears on the floors & lower walls and take 15 smears on the horizontal overheads ⁽³⁾		
Exposure Rate Measurements $(\mu R/hr)$	Conduct surface μ R/hr scans to provide 100% coverage & take contact and 1 meter above the floor surface measurements ~ 1 every 2 meters & record readings		

Final Surveys for Building 20: Bottled Gas Storage

(1) Survey coverage will be increased if contamination levels above 75% of release levels are detected (the Site Plan requires reclassification if levels > 75% of release levels are detected).

⁽²⁾ For the fixed measurements:

- * For β measurements: take a 1 minute count using the 100 cm² gas flow proportional detector (beta) with the Model 2221 ratemeter. Document all readings and mark on a drawing where the readings were taken.
- * For α measurements: take a ~ 10 second reading with the 50 cm² hand-held alpha detector. Document all readings and mark on a drawing where the readings were taken.
- * For removable measurements (smears): take a 100 cm² smear at select locations; count using a low level α/β counter in the HP Laboratory. Mark on a drawing where the smears were taken.
- ⁽³⁾ The roof of Building 22 was surveyed and no decontamination was required. Therefore, the top of the roof is considered to be non-impacted. No surveys are required.

Ì

ŧ

)



Figure 1: Plan View of General Atomics Site



Figure 2: Building 20 Location





Date: 10/27/99

Prepared by: John Turner Approved by: Laura Gonzales

[Jonzalen] Date 10/27/99

Initial Final Survey Plan Issued on: 10/08/99 Revised Final Survey Plan Issued on: 10/27/99

REVISED FINAL SURVEY PLAN for TORREY PINES NORTH - (TPN-1a)

BACKGROUND

Building 22 (TRIGA Fuel Fab Facility) has been released to unrestricted use by both the NRC and the State of California. The release included the entire building, the outside north concrete pad and the footprint around the building. The building is currently uninhabited. This Survey Plan covers the survey of the land area around the facility (Building 22) as shown in Figure 1 as Torrey Pines North (TPN) area 1a. Note: This area excludes Building 20 which is currently being used to store radioactive material. Building 20 is the former bottled gas storage pad which will have its own Survey Plan.

A fence has been erected between Building 22 and the former Hot Cell Facility, Building 23 land area which separates the Hot Cell Facility radiation restricted area from the land area surrounding Building 22.

PREVIOUS HISTORY & CLASSIFICATION

This land area (TPN-1a) is located around Building 22 (see Figure 1). The area has been classified as a suspect affected area due to its proximity to Buildings 22 and 23. In addition, surveys in the past have indicated isolated areas of contamination in the land area outside the former Hot Cell Facility, Building 23 (elevated beta/gamma radiation levels).

CRITERIA FOR RELEASE TO UNRESTRICTED USE

Exposure Rate Guideline

The guideline value for exposure rates measured at 1 m above the surface is 10 μ R/hr above background.

Release Limits

The primary contaminants of concern for this area are enriched uranium (U-234 + U-235) as well as Cs-137 and Co-60 (beta/gamma emitters). The applicable NRC guidelines for beta/gamma emitters (and enriched uranium) are as follows:

A:\TPNREVIS.99

Beta/Gamma Emitters and Uranium

5000 dpm/100cm², averaged over a 1 m² area 15,000 dpm/100cm², maximum in a 100 cm² area if the average over 1 m² is met. 1000 dpm/100cm², removable activity

Soil Release Criteria

The predominant radionuclides found in soil at GA and the soil release criteria in pCi/g is provided below:

Co-60	8 pCi/g
Cs-137	15 pCi/g
Thorium (Th-228 + Th-232)	10 pCi/g
Enriched Uranium (U-234 + U-235)	30 pCi/g
Depleted Uranium	35 pCi/g

If more than one radionuclide exists, the sum of the fractions of the concentrations must be less than one (calculated as follows):

$$\sum_{i=1}^{n} \frac{C_{i}}{L_{i}}$$

 C_i = The average concentration of radionuclides *i* in the soil above background levels.

 L_i = The release criteria for radionuclides *I*.

ALERT LEVELS

Notify Health Physics management if any of the following alert levels are exceeded.

Smears (removable activity)

If any smear is > 75% of the release level (750 dpm/100 cm²).

Alpha Monitoring

If > 150 cpm alpha using a 434 cm² probe, then check the area with a hand-held alpha probe and record the results.

> 80 cpm alpha using a 50 cm² hand-held probe.

Beta Monitoring

- > 500 cpm above Building 13 background using a 434 cm² probe.
- > 350 cpm above Building 13 background using a 100 cm² probe.
- > 100 cpm above background using a portable GM detector.

A:\TPNREVIS.99

Exposure Rate Measurements Exposure Rate Measurements at the GA site within open land areas are typically: $\geq 25 \ \mu$ R/hr at contact, & $\geq 20 \ \mu$ R/hr at 1 meter above the surface

The land area around Building 22 is largely composed of asphalt, which typically has higher background levels than exposure rates taken within open land areas containing soil. A Ludlum Model 3 instrument coupled with a Ludlum (NaI) 44-10 gamma detector was utilized to determine background levels on asphalt. The average of 10 measurements conducted within the parking lot on the east side of Building 10 was 22 μ R/hr. The alert levels on asphalt surfaces were adjusted as follows:

Exposure Rate Measurement Alert Level on Asphalt Surfaces $\geq 30 \ \mu$ R/hr at contact, & $\geq 25 \ \mu$ R/hr at 1 meter above the surface

SURVEY PLAN

Refer to the table that follows for detailed information describing the radiation and contamination surveys to be performed for this area as well as the soil sampling plan. Locations for surveying & sampling are also provided in the figures that follow.

Sample Collection

Soil samples will be collected from beneath the asphalt/concrete, underneath and around excavated drain lines, from drainage areas and from the exposed soil in the TPN-1a area as follows:

- 1. A 15 cm (0-6") "surface" soil sample and a 15-30 cm (6-12") "subsurface level" soil sample will be obtained from beneath the asphalt/concrete where remediation was necessary and where contamination was suspected (within areas A & B). Areas A & B are shown in Figure 1.
- A 15 cm (0-6") "surface" soil sample will be taken from those areas inside the fence where the soil is exposed (i.e., no asphalt or concrete covers the soil) at ~ every 4 meters (within areas A & B). Areas A & B are shown in Figure 1.
- 3. A 15 cm (0-6") "surface" soil sample will be taken within the landscaped area between the concrete curbing and the fence on the eastern portion of the TPN-1a land area. Collect the samples in easily accessible areas (i.e., not covered by shrubbery) that are evenly spaced from one another at ~4 meter intervals (within area C). The locations are provided in Figure 1.
- 4. A 15 cm (0-6") "surface" soil sample will be collected outside the fenced area, in the north and northeast portions of the TPN-1a land area, within easily accessible areas (i.e., immediately outside the fence in horizontal locations) at ~ 4 meter intervals. Furthermore, "surface" soil samples will be taken outside the fence, out to GA's property boundary or TPN-1a land areas' boundary, at ~ 4 meter intervals but only within easily accessible, horizontal locations and if safe to do so (within area D). The sampling locations are provided in Figure 1.

- 5. Ten (10) "surface" (0-6") soil samples will be collected at designated locations from beneath the asphalt (within areas A & B). The designated locations are provided in Figure 4.
- 6. Locate all drains/drain lines (i.e., water, sewer, etc.). Determine (radiologically) if they are contaminated by surveying [i.e., use α & β hand-held detectors for external & internal pipe surveys and a specialized probe, such as the Ludlum 44-2 (1" NaI gamma detector) with a Ludlum Model 3 instrument, for internal pipe surveys]. Take external pipe smears and internal pipe smears, as necessary, and count in the HP Laboratory.

If the pipes are contaminated and must be removed then obtain "surface" and "subsurface" soil samples from underneath and around the excavated pipe. Systematic sampling should be ≤ 4 m or where the soil appears affected (i.e., discolored, odoriferous or otherwise abnormal).

If the pipes are not contaminated, as shown by the survey results, the pipes may be plugged and remain in place.

6. All drainage run-off locations emanating from this land area (TPN-1a) will be located and "surface" (0-6") soil samples taken ~ every 4 meters, out to GA's property boundary or TPN-1a land area boundary, if the sampling location is accessible and safe. If elevated levels of contamination are detected, then, depending on the extent of contamination, "subsurface" samples will be taken and/or remediation will be conducted until the release criteria is met.

All samples will be collected and documented to a figure containing the 2m x 2m grid system. Soil samples will be collected with a sample size of approximately 1 kilogram. The sampling locations will be identified on drawings. The samples will be properly logged, labeled, tracked and packaged into plastic bags. All debris (grass, rocks, sticks and foreign objects) will be removed from the sample. Soil samples will be crushed to reduce large lumps. All samples will be dried, placed into tared marinelli beakers (filled to the top), secured, weighed, transferred to and counted in the GA Health Physics Laboratory by gamma spectroscopy. Results will be reported in pCi/g for each radionuclide of concern

Further soil remediation and subsequent sampling at any location may be necessary depending on these "surface" and/or "subsurface" gamma spectroscopy results.

Berm Surveys (locations are provided in Figure 3)

1. A berm will be constructed around the inside border area of TPN-1a (western portion, adjacent to the Hot Cell Site) in order to control rain water run-off into the Hot Cell Site. A berm will also be constructed along the southern border of the Hot Cell Site for the same purposes. The area to be surveyed will be within the first grid (≤ 2m out) from the Hot Cell Site fenced boundary. The following surveys and soil sampling will be conducted along these areas prior to the construction of the berm.

Alpha and beta scans & fixed measurements, smears and exposure rate measurements will be taken within the first 2 meters out from the boundary at the eastern and southern borders of the Hot Cell Site. "Surface" and "subsurface" soil samples will be obtained from beneath the asphalt/concrete where remediation was necessary. Systematic "surface" (0-6") soil samples will be taken from beneath the asphalt/concrete along the eastern & southern borders of the Hot Cell Site every 4 meters. Every 20 meters a "subsurface" (6-12") sample will also be taken.

Inside Berm: "Surface" soil samples (0-6") will also be collected within the second 2 meter grid (≤ 4m out) within the inside border area of TPN-1a (western portion, adjacent to the Hot Cell Site). This is the area between Building 22 and the eastern boundary fence of the Hot Cell Site (locations are provided in Figure 3).

Take "subsurface" soil samples (6-12") at select locations as indicated on Figure 4.

Alpha and beta scans & fixed measurements, smears and exposure rate measurements will also be taken within the second 2 meter grids (locations are provided in Figure 3).

Access Road Survey

Scan (i.e., with 434 cm² beta detectors and microR meters) the surface of the access road into the TPN-1a land area in order to ensure that elevated levels of activity are not discovered. Detailed surveys of this area will be addressed when the final surveys are completed within the TPN-1a area and after the radioactive materials stored near the access road have been relocated (location is provided in Figure 1).

DOCUMENTATION

Every survey conducted must be documented on a daily basis on a drawing showing the approximate locations surveyed. Include the results (including units), the technician's name and signature, date, instrument(s) used (including model and serial number of both the rate meter and the detector), calibration due date, % efficiency, background readings, (if applicable), and any other applicable information.

Survey and Soil Sampling Plan for Area around Building 22 (TFF) See Figure 1						
Location	Gridding	Scans with 434 cm ² detectors	Survey Areas above alert level with 15 cm ² GM detector and/or 50 cm ² α detector as appropriate	Measurements Fixed and Removable (smears)	Exposure Rate Surface Scan and Measurements (µR/hr)	Soil Samples
			Suspect Affe	cted Area		
Asphalt and concrete around Building 22	Yes 2m x 2m Grid	<u>Area A</u> 100% α ¹ 100% β <u>Area B</u> 10% α ^{1 & 2} 100% β	<u>Area A & B</u> 100%	<u>Area A & B</u> Take a radiation measurement every 2m, alternate between a 1 minute Fixed β count, a 100 cm ² Smear and a Fixed α count (repeat this sequence) ³	Area A & B 1. 100% scan at contact. 2. Take measurements every 2 m @ 1 m above the surface. Record readings @ contact and @1 m above surface every 2m.	<u>Area A & B</u> Take two soil samples (a surface and a subsurface sample) under every location where remediation was performed. ⁴
Soil	<u>Area A & B</u> Yes 2m x 2m Grid <u>Area C</u> Yes 2m x 2m Grid <u>Area D</u> No	N/A	<u>Area A, B, C & D</u> 100%	N/A	Area A, B, C & D 1. 100% scan at contact. 2. Take measurements every 2 m @ 1 m above the surface. Record readings @ contact <u>and</u> @ 1 m above surface every 2m.	Area A & B Exposed Soil: A surface soil sample (0-6") every 4 m (on the 2m x 2m grid) ⁵ Area C A surface soil sample (0-6") every 4 m (on the 2m x 2m grid) ⁵ Area D Surface soil sample (0-6") in accessible & safe locations
Planned Berm Area (≤ 2m from the fence on the eastern boundary of the Hot Cell Site)	Yes 2m x 2m Grid	100% α ¹ 100% β	100%	Take a radiation measurement every 2m, alternate between a 1 minute Fixed β count, a 100 cm ² Smear and a Fixed α count (repeat this sequence) ³	 100% scan at contact. Take measurements every 2 m @ 1 m above the surface. Record readings @ contact and @1 m above surface every 2m. 	Take a surface soil sample (0-6") every 4 m (on the 2m x 2m grid) & a subsurface soil sample (6-12") every 20 m (on the 2m x 2m grid) ^{4 & 5}

h ot 7

~

.
Survey and Soil Sampling Plan for Area around Building 22 (TFF) See Figure 1									
Location	Gridding	Scans with 434 cm ² detectors	Survey Areas above alert level with 15 cm ² GM detector and/or 50 cm ² α detector as appropriate	Measurements Fixed and Removable (smears)	Exposure Rate Surface Scan and Measurements (µR/hr)	Soil Samples			
Inside Planned Berm Area (≤ 4m from the fence on the eastern boundary of the Hot Cell Site)	Yes 2m x 2m Grid	100% α ¹ 100% β	100%	Take a radiation measurement every 2m, alternate between a 1 minute Fixed β count, a 100 cm ² Smear and a Fixed α count (repeat this sequence) ³	 100% scan at contact. Take measurements every 2 m @ 1 m above the surface. Record readings @ contact and @1 m above surface every 2m. 	Take a surface (0-6") soil sample every 4 m (on the 2m x 2m grid) ^{4 & 5} Take a subsurface (6-12") soil sample at locations shown in Figure 3.			
Designated Soil Samples	Identified by Grid Number	N/A	N/A	N/A	N/A	Collect 10 surface (0-6") soil samples within Areas A & B as shown in Figure 4. ⁴			

¹ Alpha scans (surveys) are accurate, only if the surface is clean (i.e., free of dust, dirt and debris). Prior to conducting any of the alpha surveys the surfaces to be surveyed will be mechanically cleaned with a street sweeper and manually swept with brooms in order to remove all dust, dirt or debris.

- ² If activity above the alert level for the 434 cm² detector is discovered, this area will be surveyed with a 50 cm² alpha detector. If it is determined that this area is contaminated above 75% of the release criteria, then survey coverage will be increased.
- ³ For beta fixed measurements; take a 1 minute count using a 100 cm² β gas flow proportional detector with a Model 2221 ratemeter. For alpha fixed measurements; take a ~ 10 second reading using a 50 cm² α hand-held detector. For removable measurements; take a 100 cm² smear and count using a low level α/β counter in the HP Laboratory.
- ⁴ Asphalt and concrete removal:
 - -- Spot check survey the bottom side of larger pieces of asphalt and concrete with a GM detector during removal.
 - -- Asphalt will be released to unrestricted use if radiation levels are below the Table 1 Release Criteria.
 - -- Collect samples of any contaminated asphalt or concrete for characterization.
 - -- Contaminated asphalt and concrete should be removed and placed in waste containers before the clean asphalt or concrete is removed.
- ⁵ The Site Decommissioning Plan requires sampling in suspect affected areas on a 5 m triangular grid. Sampling on a 4 m x 4 m grid is more conservative and consistent with the established grid needed for fixed and removable measurements.





BRID AWAY FROM the HOT CELL SITE boundary fence. TAkin aving ~ 4m, (Sur face samples).

· Am Soil (Sunface) samples (within 15T 2m grig Along Hot Cell Site fence live (boundary). Subsurfree (6-12") taken every ~ 20m Along with the Sur face Sample.

Figure 2: Area "A"







<u>June 6, 2000</u> Prepared by: W	. LaBonte What Botto					
Approved by:	Laure attonzales	_ Date: _	6	12	00	
	L. Q. Gonzales		1			

Final Survey Plan for Torrey Pines Northeast Sewer Pumping Station

This survey plan is for a sewer system pumping station located within the Torrey Pines Northeast footprint.

This survey plan is for surface scans and loose surface contamination surveys of the concrete surfaces and direct dose rate measurements after the pumping station has been pumped out, disinfected and cleaned out. This plan also addresses internal surveys of interconnected piping that remains in this pumping station.

This pumping station is approximately 4' x 4' x 15'. It is located approximately 15' from the Southeast corner of Building 22 (TFF) in a Southerly direction.

This final survey is part of the final survey for Torrey Pines Northeast.

Background and Classification

Background Information

This pumping station collected liquid drainage from the sewer systems installed inside of Building 22 and gutter drainage from the roof. This pumping station was connected to the GA sewer system via a line that traversed the Hot Cell site.

The drain and sewer lines that serviced Building 22 were removed and water samples were taken inside the pumping station. One remaining remnant of the sewer line that traversed the Hot Cell site and a smaller (approximately 2" diameter line) that runs South of Building 22 was found connected to this pumping station will be included in this Final Survey plan.

Water samples taken in this pumping station detected the presence of low levels of Cs-137. This isotope is not one of the predominate isotopes found at Building 22 during Characterization, Post D&D, and Final Surveys. It is suspected that some cross contamination from the adjacent Hot Cell, that ultimately became concentrated in the pumping station may have occurred.

Classification

Because this pumping station serviced Building 22, and, due to it's proximity to the Hot Cell Site, it is classified as a Suspect Affected Area.

Survey Objectives and Responsibility

The purpose of performing a final survey is to demonstrate that the radiological conditions satisfy the NRC and State of California guidelines for release to unrestricted use. The objectives include (1) to show that the average surface contamination levels for each survey unit are within the authorized value, (2) to show that the maximum residual activity ("hot spot" area) does not exceed three times the average value in an area up to 100 cm^2 , (3) that a reasonable effort has been made to clean removable contamination and fixed contamination and (4) that the exposure rates in occupiable locations are less than 10μ R/hr above background measured at 1 meter above the surface. Samples will be taken by qualified Health Physics technicians having a minimum of 3 years Health Physics Technician experience following approved Health Physics procedures and this plan. The survey and final report documenting the survey will be performed by GA's Health Physics group.

Release Criteria (per GA Site Decommissioning Plan)

Direct Surface Scans

The applicable release criteria for beta/gamma, based on the Hot Cell site mix, are:

3,000 dpm/100 cm², averaged over 1 m² area 9,000 dpm/100 cm², maximum in a 100 cm² area 600 dpm/100 cm² removable contamination

Alpha contamination was detected at Building 22, which was serviced by this pumping station. The alpha release criteria for direct scans of surfaces are:

5,000 dpm/100 cm², averaged over 1 m² area 15,000 dpm/100 cm², maximum in a 100 cm² area 1,000 dpm/100 cm², removable contamination.

Exposure Rate Measurements

The guideline value for exposure rates measured at 1 m above the surface is $10 \,\mu$ R/hr above background.

Soil Criteria (soil limits apply to roof gravel, concrete rubble and asphalt rubble)

The pumping station will be pumped, cleaned, and disinfected prior to the performance of this Final survey. Therefore, soil, sludge, or similar materials are not expected or included in this survey plan.

Alert Levels

If the following "alert levels" are exceeded, notify HP Management so an evaluation can be performed to determine if increased survey coverage or decontamination is required.

On Concrete or Asphalt Surfaces

Note: The Alert levels provided below are based on the background cpm plus the meter cpm value taking into account the instrument efficiency and probe surface area. The alert level for each instrument used must be determined prior to performing surveys. The background determination must be performed in building 13 or other HP management approved area.

Alpha Monitoring

>100 cpm alpha using the large area (434 cm^2) probe. If >100 cpm, check with a hand held alpha meter.

>60 cpm using a hand held alpha probe, notify Health Physics Management.

Beta Scanning using 434 cm² probe

 $> \sim 500$ cpm above background using any other 434 cm² probe

Beta Scanning using a 100 cm² detector

> ~ 200 cpm above background

Beta Scanning using a 15 cm² pancake GM detector

> ~ 80 cpm above background.

Exposure Rate Measurement

Exposure rate measurements at contact (1-2" above the surface) and at 1m above the surface: 20 μ R/hr.

Site Conditions at Time of Final Survey

Building 22 has been release for unrestricted use by the NRC and the State of California. A Final Survey for the land surrounding this facility has been completed (the report is being prepared). The pumping station has been pumped out, cleaned, and disinfected.

Final Survey Requirements

The minimum survey requirements for this final survey are outlined in Table-1, Torrey Pines Northeast Pumping Station Minimum Survey Requirements.

Documentation

Every survey conducted must be documented on a **daily basis** on a drawing showing the approximate locations surveyed. Include the results (including units), the technicians' signature, date, instrument(s) used, efficiency, background readings (if applicable) and any other applicable information.

Table 1: Torrey Pines Northeast Pumping Station Minimum Final Survey Requirements									
Area	Surface Contamination	Dose Rate Measurements	Fixed Measurements (fixed α or β or swipes)	Soil Samples					
Pumping Station internal surfaces. (Suspect Affected)	Scan 100% of accessible (not obstructed by piping, etc.) area with a 434 cm ² β probe at 1-2" from surface. Scan 25% of accessible area with a 434 cm ² α probe at 1"-2" from the surface. Areas that are not accessible to the 434 cm ² probe should be scanned with smaller probes.	Scan the entire internal surfaces with a 2" x 2" NaI(tl) detector held at 1"-2" from the surface. Take 1 reading in the center of the pit, 1 m from the bottom and in the center every 1m to the top of the pumping station.	At a minimum, take 1 fixed readings for α , β , and 1 swipe sample on the bottom and on each wall every 1 m from the bottom to the top. Take at least 1 fixed α and β and 1 swipe survey on external surfaces of each pipe and fixture within the pumping station. Note: analyze swipes for α and β contamination	Not Applicable					
Inter-connected pipes (Suspect Affected)	Perform a large area swipe of the internal surfaces, at least 3' into each pipe from the station entrance, and at the other end of the pipes, if exposed. Analyze for α and β contamination.	Using a NaI(tl) probe that will fit inside of the pipes, scan the internal surfaces as far as possible. Note the readings at approximately every 1 foot and note how far into the pipe surveying was possible.	Not Applicable	Not Applicable					

General Atomics

Final Radiological Survey Report

For Torrey Pines Northeast (TPN-1a)

Appendix B

Confirmatory Survey

<u>Appendix B</u>

Torrey Pines Northeast Land Area

GA Confirmatory Survey

Description

Following the completion of the Final Survey of the Torrey Pines Northeast Land Area and Building 20, a confirmatory survey was performed by Health Physics Technician(s) not associated with the Final Survey in accordance with an approved Survey Plan (attached).

The purpose of this survey was to confirm that the Final Survey performed was effective in identifying the radiological conditions of the area.

The Land Area survey consisted of 14 Exposure Rate Measurements, 8 Fixed α , 7 Fixed β , 6 Swipe sample measurements, and 2 soil samples. The survey locations selected were biased by previous survey results and process knowledge. Areas with the highest probability of having elevated activity levels were selected. The Building 20, (which is divided into storage cells), survey consisted of Exposure Rate Measurements at contact and at 1 m in the center of each storage cell, 10% α and 10% β scan of the walls and floor, 1 Fixed α and 1 Fixed β measurement on the floor of each cell, and a Large Area Wipe of each wall which was analyzed for both α and β activity. Survey results are presented in Figure C-1, Torrey Pines Northeast (Formerly TPN-1A) Confirmatory Survey, Figure C-2, Torrey Pines Northeast (formerly TPN1A) Area, Building 20 Confirmatory Survey, Table 1, Torrey Pines Northeast (formerly TPN-1a) Confirmatory Survey Soil Sample Results, and Table 2, Torrey Pines Northeast Confirmatory Survey Results.

A description of instruments used for this survey, along with their calibration, efficiency, and background information is provided in Table 3: List of Instruments For Torrey Pines Northeast (formerly TPN-1A) Area.

Survey Results

Open Land Areas

The soil sample results indicates ²³⁸U, ²³⁵U, ²²⁸Th, and, ²³²Th are at, or near natural background levels. The Highest ¹³⁷Cs activity levels was 0.18 pCi/g, which is far below the approved release criteria, and, ⁶⁰Co was not detected.

The maximum exposure rate at 1 m from the surface was 21 μ R/hr, which is below the approved release criteria.

The highest fixed α reading was <185 dpm/100 cm² (background), the highest fixed β reading

detected, the ⁹⁰Sr to ¹³⁷Cs ratio was 2.1:1. At TFF, enriched uranium was the predominate radioactive contaminate.

The applicable release criteria for beta/gamma, based on the Hot Cell site mix, are:

3,000 dpm/100 cm², averaged over 1 m² area 9,000 dpm/100 cm², maximum in a 100 cm² area 600 dpm/100 cm² removable contamination

Alpha contamination was detected at the TFF facility adjacent to this land area. The alpha release criteria for alpha surveys are:

5,000 dpm/100 cm², averaged over 1 m² area 15,000 dpm/100 cm², maximum in a 100 cm² area 1,000 dpm/100 cm², removable contamination.

Exposure Rate Measurements

The guideline value for exposure rates measured at 1 m above the surface is 10 μ R/hr above background.

Soil Criteria (soil limits apply to roof gravel, concrete rubble and asphalt rubble)

The release criteria for soil are specified in the Site Decommissioning Plan and summarized below. The values presented below are above background levels. Note: Soil, asphalt and concrete rubble must remain on-site until specific approval to move it off-site is granted by the NRC and the State of California.

Cs-137	15 pCi/g
Co-60	8 pCi/g
Enriched Uranium (U-234 plus U-235)	30 pCi/g
Thorium (Th-232 plus Th-228)	10 pCi/g
Sr-90	1800 pCi/g

If multiple nuclides are present, the sum of the ratios of the concentration of each Radionuclide to its respective guideline must not exceed 1. If other nuclides are encountered, notify HP Management for release criteria.

Gross alpha/beta results are required in addition to gamma spectroscopy analysis for a representative number of soil samples (to have an upper bound for the maximum Sr-90 which could be in the soil). Sr-90 analysis may also be required if gross alpha/beta results indicates Sr-90 may be present.

Alert Levels

If the following "alert levels" are exceeded, notify HP Management so an evaluation can be performed to determine if increased survey coverage or decontamination is required.

On Concrete or Asphalt Surfaces

Note: The Alert levels provided below are based on the background cpm plus the meter cpm value taking into account the instrument efficiency and probe surface area. The alert level for each instrument used must be determined prior to performing surveys. The background determination must be performed in building 13 or other HP management approved area.

Alpha Monitoring

>100 cpm alpha using the large area (434 cm²) probe. If >100 cpm, check with a hand held alpha meter.

>60 cpm using a hand held alpha probe, notify Health Physics Management.

Beta Scanning using 434 cm² probe

 $> \sim 300$ cpm above background using any other 434 cm² probe.

Beta Scanning using a 15 cm² pancake GM detector

>~ 80 cpm above background.

Exposure Rate Measurement

Exposure rate measurements at contact (1-2" above the surface) and at 1m above the surface: 20 μ R/hr.

Soil, Gravel, Asphalt Rubble, Concrete Rubble Samples

Any Radionuclide above natural background levels (see HP-40 for background levels). All soil sample results must be reviewed by Laura Gonzales, Paul Maschka, or Bill LaBonte.

Confirmatory Survey Requirements

The minimum survey requirements for this final survey are outlined in Table-1, Torrey Pines Northeast Confirmatory Survey Requirements.

Documentation

Every survey conducted must be documented on a **daily basis** on a drawing showing the approximate locations surveyed. Include the results (including units), the technicians' signature, date, instrument(s) used, efficiency, background readings (if applicable) and any other applicable information.

Table 1: Torrey Pines Northeast Confirmatory Survey Requirements									
Area	Surface Contamination	Dose Rate Measurements	Fixed Measurements (Fixed α, β, or swipes)	Soil Samples					
Land	NA	Take 1 contact and 1 meter reading in the areas shown in Figure 2. Total locations=14	Take 1 α and 1 β measurement in the areas shown in Figure 2. Total locations=8 α , 7 β , 6 swipes	2 samples at 0-6" as shown on Figure 2.					
Building 20	Scan 10% of the inside walls and floor with a 434 $cm^2 \alpha$ and β probe held at 1-2" from the surface.	Take 1 contact and 1 meter reading in the center of each storage cell inside Building 20	Take 1 α and 1 β measurement on the floor of each storage cell. Take a large area wipe of each wall and analyze for α and β	NA					



FIGURE-2: TORREY PINES NORTHEAST CONFIRMATORY SURVEY 8 = EXPOSURE RATE A-CONTACTE IM alpha fixed nea . A Beta fixed mea . S Swipe $\textcircled{\below}{\blow}{\below}{\below}{\below}{\below}{\below}{\below}{\below}{\bl$ 9 20 TORREY PINES × NORTHEAST A 8 ð 2 0 ${}^{\textcircled{\baselinetwidth}}$ ۱×-Building G 22 Building 20 (a) (5) $\textcircled{\baselinetwidth}{\b$ マーメ × 5 Building 23 $\textcircled{\baselinetwidth}$ ٢ uilding 21 BERM AREA A CO IS Г × Hot Cell Road -000



FIGURE C-2: TFF BUILDING 20 CONFIRMATORY SURVEY



Instrument	Serial #	probe#	Cal Due	Eff %	Background	Background
2221 434cm ² α	148445	43 - 37 147966	07/19/00	21.30	0 - 32cpm (concrete)	0 - 32cpm (cement Block)
2221 434cm²β	86302	43 - 37 086215	07/17/00	21.92	1478 - 1765 cpm (Concrete)	1253 - 1538 cpm (Cement Block)
2221 100cm²β	148436	43 - 68 120447	07/10/00	26.27	933 +/- 19cpm (Concrete)	1227 +/- 21 cpm (asphait)
Model 3 µR	153590	N/A	04/13/00	N/A	15 - 18 μR/hr	15 - 18 μR/hr
Model 12 - 50cm ² α	91103	43-65 092192	10/12/00	21.58	0 - 20cpm (concrete)	0 - 20cpm (cement Block)

Technician: J.T. SULLIVAN Date: 04/17/00 - 04/18/00

LEGEND:					
Concrete					
Concrete Block					

			Table	1: Torrey	Pines No	rtheast (fo	rmerly TI	PN-1a) Co	nfirmator	y Survey S	Soil Sampl	e Results	
			Radionuclide Concentrations (pCi/g) Background Not Subtracted										
		U-238		U-235		Cs-137		Co-60					
#	Sample ID	pCi/g	% error 2ð	± pCi/g	pCi/g	% error 28	± pCi/g	pCi/g	% error 2δ	± pCi/g	pCi/g	% error 28	± pCi/g
1	TFFI	1.96	39.5	0.77	0.10	76.2	0.08	0.17	54.0	0.09	ND		0.00
2	TFF2	1.61	40.0	0.64	0.16	62.5	0.10	0.18	54.9	0.10	ND		0.00
Nom	inal Background	2.10		1.1.1	0.14			0.07			ND		

÷.

.

5

.

Table 2: Torrey Pines Northeast Confirmatory Survey Swipe Survey Results							
Swipe No.	Gross α in dpm/100 cm ²	Gross β in dpm/100 cm ²					
1	<10	10.91					
2	<10	<10					
3	<10	<10					
4	<10	<10					
5	<10	<10					
6	<10	<10					

	Table 3: Torrey Pines Northeast (Formerly TPN-1A) Area Confirmatory Survey List of Instruments									
Meter S/N	Detector	Detector S/N	Calibration Due Date	Efficiency	Range (cpm)	Background Average (cpm)	Description			
Ludlum Rate Meter Model 2221 S/N <u>148445</u>	Ludlum Model 43-37 434 cm ² Alpha detector	S/N <u>147966</u>	7/19/00	21.30% with a Th-230 source, 4π	Four Linear Ranges 0- 500,000 & One Log 50- 500,000	0 to 32 cpm on concrete, 0-32 cpm on asphalt	The instrument is a gas-flow proportional counter with an active probe area of 434 cm ² . The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from ground surface for optimum performance.			
Ludlum Rate Meter Model 2221 S/N <u>86302</u>	Ludlum Model 43-37 434 cm ² Bea Detector	S/N <u>086215</u>	7/17/00	21.92% with a Sr-90 source, 4π	Four Linear Ranges 0- 500,000 & One Log 50- 500,000	1253-1530 cpm on concrete, 2161 to 2530 cpm on asphalt	The instrument is a gas-flow proportional counter with an active probe area of 434 cm ² . The detector and rate meter are combined and mounted on a roll around cart. The instrument features a static-flow system, quick connects, a portable gas bottle and a means to adjust the height of the detector from the floor for optimum performance.			
Ludlum Rate Meter Model 2221 S/N <u>148436</u>	Ludlum Model 43-68 100cm ² Beta Probe	S/N <u>120477</u>	7/10/00	26.32% with a Sr-90 source, 4π	Four Linear Ranges 0-500,000 & One Log 50-500,000	554±28 counts in 1min., MDA=443 cpm on concrete, 644±26 counts in 1 min., MDA=459 dpm/100cm ² on asphalt	This instrument is a gas flow proportional counter with an active probe area of 100 cm ² used primarily for beta fixed measurements.			
Ludlum Model-12 S/N <u>91103</u>	Ludlum Model 43-65 Alpha Scintillator ZnS(Ag)	S/N <u>092192</u>	4/05/01	21.58% With a Th-230 source, 4π	Four Ranges 0-500,000	0-20 cpm on concrete or asphalt, MDA=768 dpm/100 cm ²	Alpha scintillator with an active probe area of 50 cm ² used for Alpha fixed measurements ~7-10sec count and 20 cpm maximum background.			

Page 2 of 2

Table 3: Torrey Pines Northeast (Formerly TPN-1A) Area Confirmatory Survey List of Instruments								
Meter S/N	Detector	Detector S/N	Calibration Due Date	Efficiency	Range (cpm)	Background Average (cpm)	Description	
Ludlum Model-3 Micro-R Meter S/N <u>153590</u>	Ludlum Model 44-10 NaI 2"x 2" Scintillator	S/N <u>155190</u>	3/9/00	NA	Four Ranges 0-500 µR/hr	10-18μR/hr @ or above soil surface.20-23 μR/hr @ or above asphalt surface	Used for measuring external dose rates on the surface and at one (1) meter from the surface (i.e., initial ground surveys).	
Canberra Low Level α/β Counter	Gas Flow Proportional Detector	N/A	As needed	~ 26-30%	N/A	Varies with Sample	Canberra Model 2400 Low Level α/β gas proportional counting system was used to count soil samples for gross beta and alpha contamination. Results were reported as pCi/gm.	
Canberra Gamma Spectroscopy System	High Purity Germanium Detector	N/A	As needed	Varies with Sample	N/A	Varies with Sample	Gamma Spectroscopy MCA system using a high purity Germanium detector.	