PC-00390/3
w/app.

GENERAL ATOMICS WASTE GENERATOR APPLICATION

PREPARED FOR

NEVADA TEST SITE

OCTOBER 1996

GENERAL ATOMICS

INTRODUCTION

This volume includes all documents which comprise the General Atomics Waste Generator Application for NPR program defense waste for the Nevada Test Site. The waste was generated during the NPR fuel and target development work from about 1990-1993. The application was prepared in response to requirements in DOE document NVO-325 (6/92), "Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements."

The following documents are included in this volume:

PC-000390: "NPR Program Defense Waste Generator Application"

Appendix A: PC-000391, "Low-Level Waste Certification Program Plan"

Attachment A: QAPD-3632, "Quality Assurance Program Document - New Production Reactor Waste Disposal"

Appendix B: PC-000375, "Sampling & Analysis Plan for NPR QC Waste"

Appendix C: PC-000393, "Sampling & Analysis Plan for NPR Program Stablized Process Liquid and Process Material Waste"

GENERAL ATOMICS

GA 2175 (REV. 9/89)

PROJECT CONTROL ISSUE SUMMARY

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General Atomics Waste Generator Application

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CONTINUE ON GA FORM 2175-1

* See list of effective pages.

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LIST OF EFFECTIVE PAGES

Section	Pages	Revision
i through ix	9	3
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B-1	1	3
Total	59	

SIGNATURE PAGE

GENERAL ATOMICS WASTE GENERATOR APPLICATION

OCTOBER 1996

REVISION 3

PREPARED BY

GENERAL ATOMICS

Signatures below attest that the information within this application is correct and that the waste streams to be shipped meet the NTS waste acceptance criteria.

10-3-96
G. C. Bramblett
D&D Projects Manager
(Facility Manager)

10/2/96
R. C. Noren
Project Director (Facility Manager)

10/2/96
A. Fudel
QA Project Engineer and Waste Certification Official

10/2/96
M. B. Dolphin
Nuclear Waste Processing Facility Manager

10/2/96
V. Nicolayeff
Manager Environmental Quality Assurance and Alternate Waste Certification Official

10/2/96
J. J. Saurwein
Quality Control Manager

10/8/96
D. A. Osburn
Waste Management Division
Oakland Operations Office
Department of Energy

10/2/96
K. E. Asmussen
Licensing, Safety, and (Environmental Compliance) Nuclear Compliance Director

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ACRONYMS

ANSI	American National Standards Institute
AP	Administrative Procedure
ASME	American Society of Mechanical Engineers
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
D&D	Decontamination and Decommissioning
DOE	Department of Energy
DOT	Department of Transportation
EPA	Environmental Protection Agency
FQCI	Fuel Quality Control Instructions
FMP	Fuel Manufacturing Procedures
GA	General Atomics
HEPA	High Efficiency Particulate Air
HP	Health Physics
HW	Hazardous Waste
HRI	Human Readable Interpretation
IP	Industrial Packaging
LEL	Lower Explosive Limit
LLW	Low-Level Waste
LSA	Low Specific Activity
LSNC	Licensing, Safety, and Nuclear Compliance
MHTGR	Modular High-Temperature Gas-Cooled Reactor
MHR	Modular Helium Reactor
MW	Mixed Waste
NQA	Nuclear Quality Assurance
NMA	Nuclear Material Accountability
NRC	Nuclear Regulatory Commission
NTS	Nevada Test Site
NVO	Nevada Operations Office
NWPF	Nuclear Waste Processing Facility (GA)
O	Operations—NWPF
OAK	Oakland Operations Office (DOE)
ORNL	Oak Ridge National Laboratory
PCBs	Polychlorinated Biphenyls
PSDR	Package, Storage & Disposal Request
QA	Quality Assurance
QAM	Quality Assurance Manual
QAPD	Quality Assurance Program Document
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RMTR	Radioactive Material Transfer Request
RWMS	Radioactive Waste Management Site
TCLP	Toxicity Characteristics Leaching Procedure
TRIGA	Test Reactor Isotopics at General Atomics
TRISO	Tri-layer Isotopic
TRU	Transuranic
TTLC	Total Threshold Limit Concentration
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage, and Disposal Facility
WAC	Waste Acceptance Criteria
WBS	Work Breakdown Structure

WCO	Waste Certification Official
WI	Work Instructions
WMD	Waste Management Department
WMIS	Waste Management Information System
WO	Waste Observer

1. GENERATOR INFORMATION

This application describes the generator's proposed plan for the disposal of low-level waste (LLW) resulting from process development, manufacturing, decommissioning and demolition activities. This application addresses three waste streams directly but will have additional waste streams added as addenda when identified. The three waste streams are: (1) BGAT-000000003, consisting of radioactive, LLW, solid process by-products, solid process trash (lab coats, shoe covers, wipes, etc.), and radioactive contaminated debris, equipment and parts; (2) BGAT-000000004, consisting of radioactive, low-level waste in the form of stabilized (solidified) process liquid waste and soot, HEPA filters, and stabilized thorium nitrate; and (3) BGAT-000000005, consisting of miscellaneous Quality Control (QC) laboratory low-level waste containing the following waste substreams: 1) vacuum pump oil, and 2) Davies-Gray titration waste.

This application is for all low-level waste streams generated at General Atomics (GA).The source of this waste is from numerous activities at GA involving the use of nuclear materials and irradiated materials. These activities include production, research and development, analysis, TRIGA Reactor operations, program close out, facility safe shutdown, waste treatment, waste shipment, and facility D&D. Due to the curtailment of nuclear programs at GA, most of the waste to be generated in the future will come from programs close out and D&D activities. New waste streams will be added as addenda to the application. The primary sources of these new waste streams are from programs and facilities including: TRIGA Fuel Fabrication, Thermionics, Bunker D&D, TRIGA Reactor, Sorrento Electronics, Fusion, Nuclear Material Accountability Storage, Analytical Chemistry, Nuclear Waste Processing Facility and general site clean up.

This application was prepared in accordance with NVO-325, "Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements," Rev. 1, dated June 1992, hereafter referred to as NVO-325. Documentation and reporting will include those requirements as stated in the DOE Nevada Operations Office Radioactive Waste Acceptance Program, "Radiological Characterization Guideline," released December 1995.

1.1. Signature Page

The signature page is provided as page iii of this document.

1.2. Facility Name and Location

General Atomics, Nuclear Waste Processing Facility
Building No. 41
11222 Flintkote Avenue
San Diego, CA 92121-1215
Telephone: (619) 455-2555
FAX: (619) 455-4174

1.3. Environmental Protection Agency Identification Number

Not applicable

1.4. DOE Oakland Operations Office and Contact

1.4.1. DOE Oakland Operations Office (OAK)

Waste Management Division
1301 Clay Street, Room 700N
Oakland, CA 94612-5208

1.4.2. DOE Operations Office Contact

D. A. Osburn
Program Manager
Waste Management Division
Telephone: (510)423-2684
FAX: (510) 422-0832

1.5. Contractor Name and Contacts

1.5.1. Contractor

General Atomics
3550 General Atomics Court
San Diego, CA 92121-1194

1.5.2. Contractor Contacts

Robert C. Noren, 39-117
Project Director
Telephone: (619) 455-3217
FAX: (619) 455-3219

George C. Bramblett, 01-168
D&D Projects Manager
Telephone: (619) 455-4240
FAX: (619) 455-3181

Michael B. Dolphin, 37-230
Nuclear Waste Processing Facility Manager (GA)
Telephone: (619) 455-2555
FAX: (619) 455-4174

Keith E. Asmussen, 01-238
GA Compliance Director
Telephone: (619) 455-2823
FAX: (619) 455-2822

Ruben I. DeVelasco, 39-103
Task Manager
Telephone: (619) 455-3267
FAX: (619) 455-3219

All communications from the Disposal Facility regarding shipment and application inquiries will be directed to the Nuclear Waste Processing Facility Manager. All communication from the Disposal Facility regarding packaging and shipping certifications, or documentation, will be directed to the GA Waste Certification Official or alternate (see Section 1.6). All contractor and waste certification official contacts are located at the GA address specified in Section 1.5.1.

1.6. Waste Certification Official and Alternate

1.6.1. Waste Certification Official

Anthony Fudel, Bldg. 42
General Atomics
Telephone: (619) 455-2682
FAX: (619) 455-4174

1.6.2. Alternate Waste Certification Official

Vladimir Nicolayeff, 01-166/B
General Atomics
Telephone: (619) 455-4045
FAX: (619) 455-3181

1.7. Waste Observers (Package Certification Officials)

C. C. Adams
General Atomics
Telephone: (619) 455-3285
FAX: (619) 455-3219

Ruben I. DeVelasco, 39-103
Task Manager
Telephone: (619) 455-3267
FAX: (619) 455-3219

D. M. Giaruso
General Atomics
Telephone: (619) 455-4195
FAX: (619) 455-3219

M. J. Hochbrueckner
General Atomics
Telephone: (619) 455-3656
FAX: (619) 455-4174

F. L. Ranck
General Atomics
Telephone: (619) 455-3726
FAX: (619) 455-3219

J. Bennett
General Atomics
Telephone: (619) 455-3461
FAX: (619) 455-4174

K. E. Partain
General Atomics
Telephone: (619) 455-2886
FAX: (619) 455-4174

D. P. Coppinger
General Atomics
Telephone: (619) 455-3283
FAX: (619) 455-4174

S. E. Perelman
General Atomics
Telephone: (619) 455-3950
FAX: (619)455-4174

1.8. Justification for Shipment to NTS

The Office Of Waste Management (EM-30) has authorized the disposal at the Nevada Test Site (NTS) of waste generated by program activities at the GA Facilities. DOE Order 5820.2A, "Radioactive Waste Management," Chapter III, Section 2.6, states that DOE low-level waste shall be disposed at a DOE disposal facility. GA does not have on-site disposal capability and must rely on the authorization to ship waste to the NTS.

1.9. Waste Minimization Plan Statement

A key element of the waste minimization plan is an accurate characterization and segregation of the waste. Only low-level radioactive contaminated waste, process by-products, construction debris and contaminated equipment and parts will be shipped to the Nevada Test Site (NTS) for disposal.

Non-contaminated waste (computer printouts, office waste, etc.) will be removed and released for sanitary landfill disposal as nonradioactive (industrial) waste. Wastes with a substantial amount of ^{235}U will be sent to Oak Ridge National Laboratory (ORNL) for uranium recovery. Materials that can be recovered for future use will be processed and recycled. Equipment which can be used at other government facilities will be transferred to them. This approach reduces to a minimum the amount of waste to be shipped to NTS.

The waste minimization plans PC-000408, "Nuclear Waste Processing Facility (NWPF) Waste Minimization Plan," and PC-000462, "Fuel Pilot Plant Facility MHR Close-out Activities Waste Minimization Plan," (Refs. 6 and 26) describe in detail the methods that will be used to minimize the amount of waste that will be shipped to the NTS.

1.10. Funding Method

Disposal charges will be funded by GA and/or through funding provided to GA for government projects. The payment for disposal of the waste volume will be estimated and sent to the NTS at the beginning of each fiscal year. The purchase order will be based upon four fiscal quarters estimated waste volume. If the actual volume of waste disposed in one quarter exceeds the forecast amount, the purchase order will be increased proportionally to cover the added waste volume.

2. WASTE CHARACTERIZATION PROGRAM

Wastes generated will be characterized and grouped into waste streams by process knowledge or by a combination of process knowledge and sampling and analysis.

2.1. Process Knowledge Plan

2.1.1. Objective

Solid waste stream BGAT-000000003 will be characterized by process knowledge for both mixed and radiological wastes or by gamma spectroscopy. This waste stream consists of solid process by-products, radioactive contaminated equipment and parts, construction debris, and solid trash. This waste stream was generated and handled according to approved procedures. Procedures were reviewed and approved by experts on different appropriate disciplines per procedures FMP-1000 and NWPF-AP-1.1. This waste stream is nonhomogeneous and does not lend itself to characterization by sampling and analysis. Additionally, many items such as metal piping, glass containers, and graphite parts are difficult to sample because of physical form.

Waste stream BGAT-000000003 will be monitored to:

- Assure packaging and documentation activities required to package solids per NWPF-WI-3.19, "Low-level Waste Packaging at the NWPF," and FMP-1828, "Packaging Solid Waste in Building 39." The same procedures (NWPF-WI-3.19 and FMP-1828) and NWPF-WI-3.32, "Package Content Verification," will be used to inspect and certify the waste.
- Preclude placement of asbestos, hazardous, or mixed waste into LLW packages by Waste Observers per procedure NWPF-WI-3.32 "Package Content Verification," and FMP-1828, "Packaging Solid Waste in Building 39."
- Radionuclide content will be determined by Quality Control and Radiochemistry personnel by gamma spectroscopy and process knowledge per procedure FQCI-610, "Radionuclide Content Measurements of Low-Level Radioactive Waste Content by Gamma Spectroscopy."
- Ensure correct documentation of package contents per procedure NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS," Quality Control Procedure FQCI-603, "QC Inspection—Shipments of Low-Level Radioactive Waste to the Nevada Test Site," and Health Physics Procedure HP-47, "Radioactive Material Removal Record."

2.1.2. Waste Characterization

The LLW to be shipped to NTS under this plan does not contain asbestos, RCRA/California hazardous materials, or Transuranics (TRU) above NVO-325 permissible limits. The Waste Certification Program Plan (Section 4 of this submittal) describes the methodology and techniques used to verify exclusion of these characteristics.

Waste streams to be sent to NTS (BGAT-000000003) under process knowledge are heterogeneous solid process by-products such as: compactible trash containing lab coats and booties, plastic, metal, glass, graphite liners, wood, paper, construction debris, equipment and parts which are not amenable to

representative sampling because of physical form as allowed by NVO-325, Section 4.1.1. This waste stream is not a homogeneous residue that could be removed for testing.

2.1.3. Characterization for Hazardous, Asbestos, and TRU Waste

Wastes were from process development and manufacturing of nuclear fuel and targets. Manufacturing was limited to small quantities required for irradiation demonstration experiments.

The process development and fabrication operations were strictly controlled by procedures that not only defined product characteristics but narrowly defined process parameters such as times, temperatures, and process chemicals. During the period of operation all facilities and their operations were audited by the Nuclear Regulatory Commission on a regular basis to assure conformance to applicable regulations.

GA utilized defined processes using equipment installed in specific locations, thus allowing process knowledge to be used in waste characterization. Table 2-1 lists all chemicals that were used during the process development and manufacturing activities. Data from Table 2-1, other historic information and specific instructions provided in waste substream characterization reports will be used by GA waste observers to characterize the solid waste by process knowledge.

For solid waste containers requiring repackaging prior to shipment to the NTS, the waste will be separated into two waste streams according to NWPF-WI-3.27, "Compacting and Baling," FMP-1828, "Packaging Solid Waste in Building 39" or NWPF-WI-3.32, "Package Content Verification." One waste stream will be LLW, the other mixed waste. Execution of these procedures will be the basis for the waste observer and the waste certification official to be able to certify the waste. The radiological waste contents will be based on measured values.

2.1.4. Disposal

Disposal of the waste will be as follows:

- Waste that contains only hazardous components identified or listed in Title 40 CFR will be sent to a commercial disposal site.
- The generator recognizes that mixed waste is not accepted at NTS, and therefore it will be stored until sent to a DOE designated site other than NTS for treatment and disposal.
- LLW will be sent to the NTS. Based on process knowledge the vast majority of this waste stream will fall in this category.
- Wastes that are not radiologically contaminated and do not contain hazardous components listed in 40 CFR will be handled as refuse and sent to a local disposal site.

Table 2-1—Process Chemical Inventory

Chemical	49 CFR Hazardous Material Table
Acetic Acid	UN 2790
Acetylene	UN 1001
Alconox	
Aluminum Oxide	
Argon, refrigerated liquid	UN 1951
Ammonia	UN 1005
Ammonium Nitrate	
Ammonium Thiosulfate	
Boric Acid	
Bromoform	UN 2515
Diethylene Glycol, antifreeze	
Erbium Oxide	
Hydrogen	UN 1966
Hydrochloric Acid	UN 1050
Hydrofluoric Acid	
Hydroquinone	UN 2662
Isopropyl Alcohol (Isopropanol)	UN 1219
Kerosene	UN 1223
4 (Methylamino) Phenol Sulfate	
Methyltrichlorosilane	UN 1250
Methylene Iodide	
Mercury	UN 2809
Nitric Acid	UN 2031
Nitrogen, refrigerated liquid	UN 1977
Octodecanol	
Petroleum Pitch	
Phosphoric Acid	
Polystyrene	
Polyvinyl Alcohol	UN 1805
Potassium Dichromate	
Potassium Hydroxide	UN 1814
Potassium Sulfite	
Propylene	UN 1077
Pyrolitic Carbon	UN 1361
Quinoline	
Silicon Carbide	
Sodium Acetate	
Sodium Sulfite	
Sodium Tetraborate	
Sulfuric Acid	UN 1830
Tetrahydrofurfuryl Alcohol	
Thorium Nitrate	
Uranium Oxide	
Vacuum Pump Oil	
Uranium Oxycarbide	
Zirconium Oxide	
Zirconium Silicate	

2.2. Sampling Plan

2.2.1. Objectives

Waste streams (BGAT-000000004 and BGAT-000000005) will be characterized by a combination of process knowledge and sampling and analysis. These two waste streams will be sampled and analyzed for hazardous and radioactive constituents. Analyses for hazardous characteristics or listed hazardous substances will be performed by a qualified contract laboratory which has been audited and approved by GA Quality Assurance. State of California certification does not absolve GA from responsibility of qualifying and monitoring the contracted laboratory. Analyses for radiological contamination will be performed by GA QC or a QA approved laboratory. The sampling methodology and sampling procedures for these waste streams are specified in the sampling and analysis plan (Ref. 32).

2.2.2. Waste Sampling and Analysis Requirements

Analytical methods specified in EPA document SW-846, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," (EPA 1992), and other standard references will be utilized for sample analysis to determine the presence of RCRA and California listed constituents, and/or RCRA characteristics. Uranium content in the waste will be determined according to procedure FQCI-610, "Radionuclide Content Measurement of Low-Level Radioactive Waste Containers by Gamma Spectroscopy."

Analytical parameters were selected in accordance with the requirements of NVO-325, as well as State and Federal regulations. Analyses and the respective analytical methods used for these analyses are presented in the Sampling and Analysis plan (Ref. 32). Radiological analysis will be performed using FQCI-406, "Uranium Determination by Gamma Spectroscopy."

2.2.3. Disposal

Results from the analyses will be used to segregate waste containers as follows:

- Waste that contains only hazardous components identified or listed in 40 CFR will be sent to a commercial Treatment, Storage, and Disposal Facility (TSDF).
- Waste that is mixed waste will be sent to a DOE designated site other than NTS for treatment and disposal.
- Waste that is LLW will be sent to the NTS.
- Refuse will be sent to a local disposal site.

3. WASTE STREAM INFORMATION

3.1. Waste Stream Identification Numbers

Low-level waste generated will be shipped to the NTS by the following waste streams:

- BGAT-000000003, consisting of radioactive, LLW solid process products and by-products, solid trash (lab. coats, shoe covers, wipes, etc.), construction debris, and radioactive contaminated discarded equipment and parts.
- BGAT-000000004, consisting of radioactive, low-level waste in the form of stabilized process liquid waste, soot, HEPA filters, and stabilized thorium nitrate.
- BGAT-000000005, consisting of radioactive low-level waste in the form of solid QC laboratory waste containing the following waste substreams: 1) vacuum pump oil, and 2) Davies-Gray titration waste.

3.2. Waste Type

The waste to be shipped to the NTS is solid, low-level waste.

3.3. Solid Waste, BGAT-000000003

3.3.1. Waste Description

This waste stream consists of three waste substreams:

- Fuel compacts, particles, and kernels (waste substream 3-1)
- Irradiated fuel and solid waste from cesium/fission gas release testing (waste substream 3-2)
- Trash, construction debris, equipment and equipment parts (waste substream 3-3)

3.3.1.1. Fuel Compacts, Particles and Kernels (Waste Substream 3-1)

This waste substream consists of surplus kernels, particles, and compacts made with uranium, thorium and zirconium oxide/zirconium silicate that were declared waste.

The only significant impurity is iron, which is not a hazardous substance. Chemicals used to manufacture kernels, particles, and compacts were purchased according to NQA-1 requirements.

Kernels, particles, and compacts are made with uranium and thorium, and are, therefore, radioactive, but do not contain volatile organics or any other hazardous materials per 40 CFR and 22 CCR.

Compacts and particles were made at temperatures of 1100°C to 1800°C, thus precluding the possibility of aromatic or aliphatic hydrocarbons remaining in the fuel matrix. The high temperature environment assured the complete destruction or evaporation of all such constituents.

3.3.1.2. Cesium/Fission Gas Release Testing Solid Waste (Waste Substream 3-2)

This waste substream was generated in the testing of compacts and fuel particles according to GA Doc. 910502, "Test Plan for the Testing of As-Manufactured Fuel." As-manufactured TRISO coated particles and compacts were fissioned in the TRIGA reactor to produce a ^{137}Cs inventory. The particles were then subjected to high temperature heating to characterize the ^{137}Cs time release characteristics of the respective fuels.

3.3.1.3. Trash (Waste Substream 3-3)

The majority of this waste substream consists of equipment, construction debris, lab coats, shoe covers, paper wipes, graphite parts, metal, glassware, empty plastic containers, cardboard, etc. All these wastes come from controlled areas operated according to standard operating procedures. It contains only solid, radioactive contaminated, low-level waste. Noncompactable waste such as equipment and construction debris will be packaged according to FMP-1828, "Packaging Solid Waste in Building 39." Compactable waste will be packaged to reduce volume with a compactor per NWPF-WI-3.27, "Compacting and Baling Procedure." During this operation, trained GA observers will remove any items that are likely to contain hazardous materials or liquids per procedure NWPF-WI-3.32, "Package Content Verification" or FMP-1828, "Packaging Solid Waste in Building 39."

Fuel manufacturing furnaces, coater, liners and other contained equipment replacement parts will be cut into pieces where practical for volume reduction. The graphite liners did not contain any toxic material when they were purchased and during their useful life have been in contact only with nonhazardous fuel materials and nitrogen argon, hydrogen, propylene and acetylene. Nuclear fuel is radioactively contaminated, but is not hazardous per 40 CFR and 22 CCR. Therefore, discarded liners are, by process knowledge, low-level waste.

Discarded pipes, components, conduits, electrical, etc., will be inspected according to FMP-1828, "Packaging Solid Waste in Building 39" and NWPF-WI-3.32, "Package Content Verification." Transformers, mercury switches and other hazardous materials (if any) will be removed by trained waste observers. The balance will be reduced in volume and sent to NTS as LLW.

3.3.2. Waste Certification Flow Diagram

Figure 3-1 is the waste certification flow diagram describing the logic of the certification program and the hold points in the certification process requiring documented acceptance or rejection. Nonconformances are addressed at the hold points. The flow diagram shows points of quality activities of inspection, analysis, and surveillance, as well as points where waste certifications are performed.

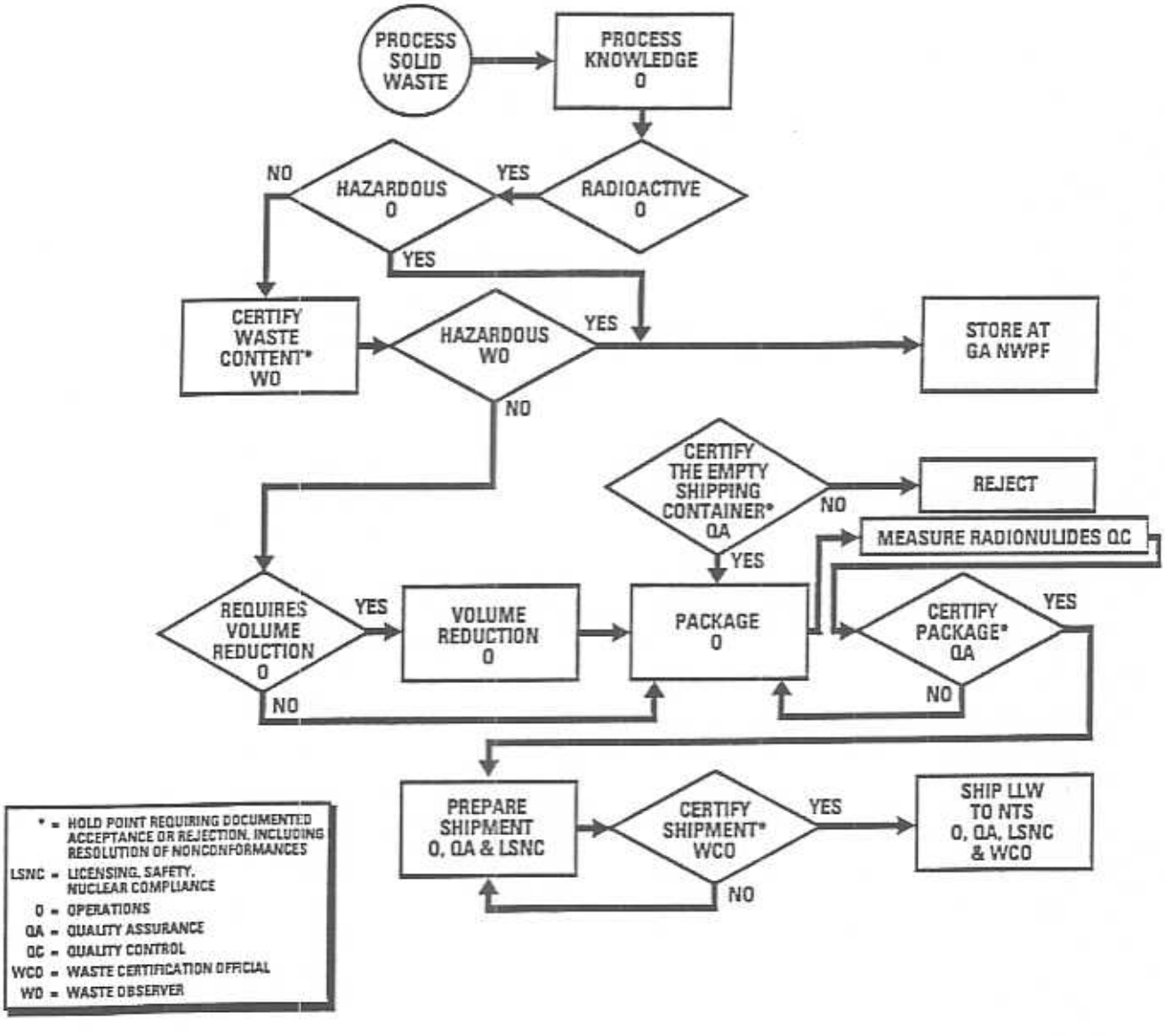

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Figure 3-1—BGAT-000000003 Solid Waste Flow Diagram

Appendix A, "Low-Level Waste Certification Program Plan," Section 3 describes in more detail the waste certification process and shows the areas of responsibility for Operations, QA, QC, LSNC, and the Waste Certification Official.

3.3.3. Waste Acceptance Criteria

The generator certifies that waste stream BGAT-000000003 consists solely of solid, LLW meeting the NTS waste acceptance criteria as stated below. Except as otherwise specified below, compliance with the WAC is determined by process knowledge as discussed in Section 2 and certified as discussed in Section 4. Radionuclide contents in each package will be a measured value. DOE Order 5820.2a states, "Low-level waste is waste that contains radioactivity and is not classified as high-level waste, transuranic, or spent nuclear fuel or 11e(2) by-product material as defined by this Order. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as LLW, provided the concentration of transuranic is less than 100 nCi/g."

The fuel at GA is not high-level, is not TRU, and is not spent nuclear fuel as defined by the Order. The fuel may be classified as LLW under the test material inclusion even though it may not have been irradiated.

During packaging the waste will be separated into two waste streams. One will be LLW, the other mixed waste according to FMP-1828, "Packaging Solid Waste in Building 39," NWPF-WI-3.27, "Compacting and Baling," and NWPF-WI-3.32, "Package Content Verification." Execution of these procedures, and instructions provided in the appropriate waste substream characterization report will be the basis for the waste observer and the waste certification official waste certification.

3.3.3.1. Transuranics

LLW must have a transuranic nuclide concentration of less than 100 nCi/g.

Compliance Method: Process knowledge. Various controls were in place to prevent prohibited hazardous materials from entering any of the waste streams. Controls include personnel access control to Buildings. All the buildings are located inside a fenced area with gates that are either manned by a security guard, or are operated by card key. The buildings are secured facilities with access controlled by way of posted personnel access lists.

Only Project personnel are authorized to have unescorted access to the controlled areas. This includes only trained workers who have a need to be in the controlled area because of work assignments. This allows personnel access to an area to be kept to a minimum.

Only workers trained in procedures related to waste are allowed to handle waste. Similarly, when developing and manufacturing fuel, only trained personnel could manufacture fuel according to approved procedures.

Only virgin uranium was used. The only waste substream that was irradiated was fuel and solid waste from cesium/fission gas release

testing (waste substream 3-2). Calculations are performed to assure that the 100nCi/g are not exceeded.

This waste stream does not contain transuranics because project personnel did not deliberately form or introduce transuranics into the waste stream and because controls prevented unintended contamination of the waste with transuranics.

3.3.3.2. Hazardous Waste Components

LLW shall not exhibit any characteristics of, or contain materials listed as hazardous waste, as identified in 40 CFR 261, "Identification and Listing of Hazardous Waste," or state-of-generation hazardous waste regulations.

Compliance Method: Process knowledge. LLW does not contain listed hazardous waste and does not exhibit hazardous waste characteristics as defined in 40 CFR 261 and CCR Title 22, Division 4.5, Chapter 11, Section 66261. Materials known to have hazardous characteristics or listed substances will be segregated by process knowledge and sent to another DOE designated site. Experienced GA Waste Observers will inspect the solid waste per NWPF-WI-3.32, "Package Content Verification." Personnel responsible for identifying, characterizing, and certifying low-level waste shall receive training on the Federal and State of California characteristics and listed hazardous wastes.

3.3.3.3. Free Liquids

LLW disposed at the NTS waste management sites shall contain as little free liquid as reasonably possible, and in no case will the liquid equal or exceed 0.5% of the volume of the external waste container.

Compliance Method: This requirement is fulfilled by waste segregation, visual verification, and evaluation per FMP-1828, "Packaging Solid Waste in Building 39," NWPF-WI-3.32, "Package Content Verification" and NWPF-WI-3.27, "Compacting and Baling." If necessary, absorbent will be added in accordance with the requirements of NVO-325. Free liquids will not be present in this waste stream in excess of or equal to 0.5% of the volume of the external waste container.

3.3.3.4. Particulates

Fine particulate wastes shall be immobilized so that the waste package does not contain more than 1 wt % of less that 100 micrometer diameter particles, or 15 wt % of less than 200 micron diameter particles. When immobilization is not practical, other acceptable packaging methods shall be used.

Compliance method: LLW is evaluated by process knowledge. All containers in this waste stream will be inspected per FMP-1828, "Packaging Solid Waste in Building 39," NWPF-WI-3.32, "Package Content Verification" and NWPF-WI-3.27, "Compacting and

Bailing." Any waste stream suspected of having particulates will be double-bagged and placed inside a steel drum or metal box.

3.3.3.5. Gases

LLW shall be stabilized or absorbed so that gaseous pressure within the waste container does not exceed 1.5 atm at 20°C.

Compliance method: Compliance is achieved through process knowledge and visual observation according to procedures FMP-1828, "Packaging Solid Waste in Building 39," NWPF-WI-3.32, "Package Content Verification," and NWPF-WI-3.27, "Compacting and Baling." This waste stream does not contain gases because aerosol cans, if any, will be punctured and crushed, and compressed gas cylinders will be emptied and the valves removed.

3.3.3.6. Stabilization

Where practical, waste shall be treated to reduce volume, promote waste minimization, and provide a more structurally and chemically stable waste form.

Compliance method: This waste stream consist of solids, or stabilized particulates (double-bagged) contaminated with radionuclides and is an inherently stable waste form. Waste does not contain free or entrapped gases. Waste will not significantly react with the packaging during normal storage, shipping, and handling.

3.3.3.7. Etiological Agents

LLW containing pathogens, infectious wastes, or other etiological agents as defined in 49 CFR 173.386 will not be accepted for disposal at NTS.

Compliance Method: Process knowledge. Various controls were in place to prevent prohibited hazardous materials from entering any of the waste streams. See details in Section 3.3.3.1.

Etiological agents were not added to any processing steps or waste. This waste stream does not contain etiological agents, because the project did not form or introduce etiological agents into the waste stream and because controls prevented unintended contamination of the waste with etiological agents.

3.3.3.8. Chelating Agents

LLW containing chelating or complexing agents at concentrations greater than 1 wt % will not be accepted at NTS.

Compliance Method: Process knowledge. Various controls were in place to prevent prohibited hazardous materials from entering any of the waste streams. For details see Section 3.3.3.1.

Chelating agents were not added to any of the processing or waste handling steps. This waste stream does not contain chelating agents because the project did not form or introduce them into the waste stream and because controls prevented unintended contamination of the waste with chelating agents.

3.3.3.9. Polychlorinated Biphenyls (PCBs)

PCB contaminated LLW will not be accepted at NTS unless the PCB concentration meets the municipal solid waste disposal levels of 50 ppm or less.

Compliance Method: Process knowledge. Various controls were in place to prevent prohibited hazardous materials from entering any of the waste streams. For details see Section 3.3.3.1.

PCBs were not included into any processing or waste handling steps. This waste stream does not contain PCBs because the project did not form or introduce them into the waste stream and because controls prevented unintended contamination of the waste with PCBs.

3.3.3.10. Explosives and Pyrophorics

LLW containing explosives and/or pyrophoric material in a form that may spontaneously explode or combust if the container is breached will not be accepted at NTS.

Compliance Method: Process knowledge. Various controls were in place to prevent prohibited hazardous materials from entering any of the waste streams. For details see Section 3.3.3.1.

Neither explosives nor pyrophorics were formed or added to any manufacturing or development process. This waste stream does not contain explosives or pyrophorics because the project did not deliberately form or introduce them into the waste stream and because controls prevented unintended contamination of the waste with explosives or pyrophorics.

3.4.1.5. HEPA Filters (Waste Substream 4-5)

The filters are approximately 2' by 2' by 1'. The filters are made of: corrugated paper media with fine silicon-boron fibers, plywood, galvanized metal, and a neoprene rubber seal. The fresh filters have no hazardous or radioactive components. All ventilation exhausts from various buildings pass through these filters before being discharged to the atmosphere. During service, the filters may have picked up minor amounts of uranium and possibly some hazardous materials which were used during operations. A review of the chemicals that were used indicates that the filters are potentially toxic, but are not corrosive, reactive, or ignitable. Each of the HEPA filters will be sampled and characterized according to PC-000460, "Waste Certification Program Sampling and Analysis Plan." Results of the analysis will dictate if the waste is shipped to NTS as LLW, or elsewhere as MW.

3.4.1.6. Stabilized Thorium Nitrate Waste (Waste Substream 4-6)

High-purity thorium nitrate was the feedstock for fertile kernels used in some of the high temperature gas reactor fuel. At present, GA has 5494 kg of surplus thorium nitrate owned by the DOE. Process knowledge and analytical results show that thorium nitrate is radioactive and corrosive, but not reactive, ignitable or toxic. Thorium nitrate will be dissolved in water by following procedure NWPF-WI-3.29, "Dissolution of Thorium Nitrate Tetrahydrate," and then neutralized and stabilized according to procedure NWPF-WI-3.4, "Liquid and Sludge Neutralization and Stabilization." Stabilized thorium nitrate will be tested for free liquids.

3.4.2. Waste Certification Flow Diagram

Figure 3-2 is the waste certification flow diagram describing the logic of the certification program and the hold points requiring documented acceptance or rejection. Nonconformances are addressed at the hold points. The flow diagram shows points of quality activities of inspection, analysis, and surveillance, as well as points where waste certifications are performed.

Appendix A, "Low-Level Waste Certification Program Plan," Section 3, describes in more detail the waste certification process and shows the areas of responsibility for Operations, QA, QC, LSNC, and the Waste Certification Official.

3.4.3. Waste Acceptance Criteria

The generator certifies that waste stream BGAT-000000004 consists solely of LLW meeting the NTS waste acceptance criteria (WAC). Compliance with the WAC is determined by a combination of process knowledge and sampling and analysis.

3.4.3.1. Transuranics

LLW must have a transuranic nuclide concentration of less than 100 nCi/g.

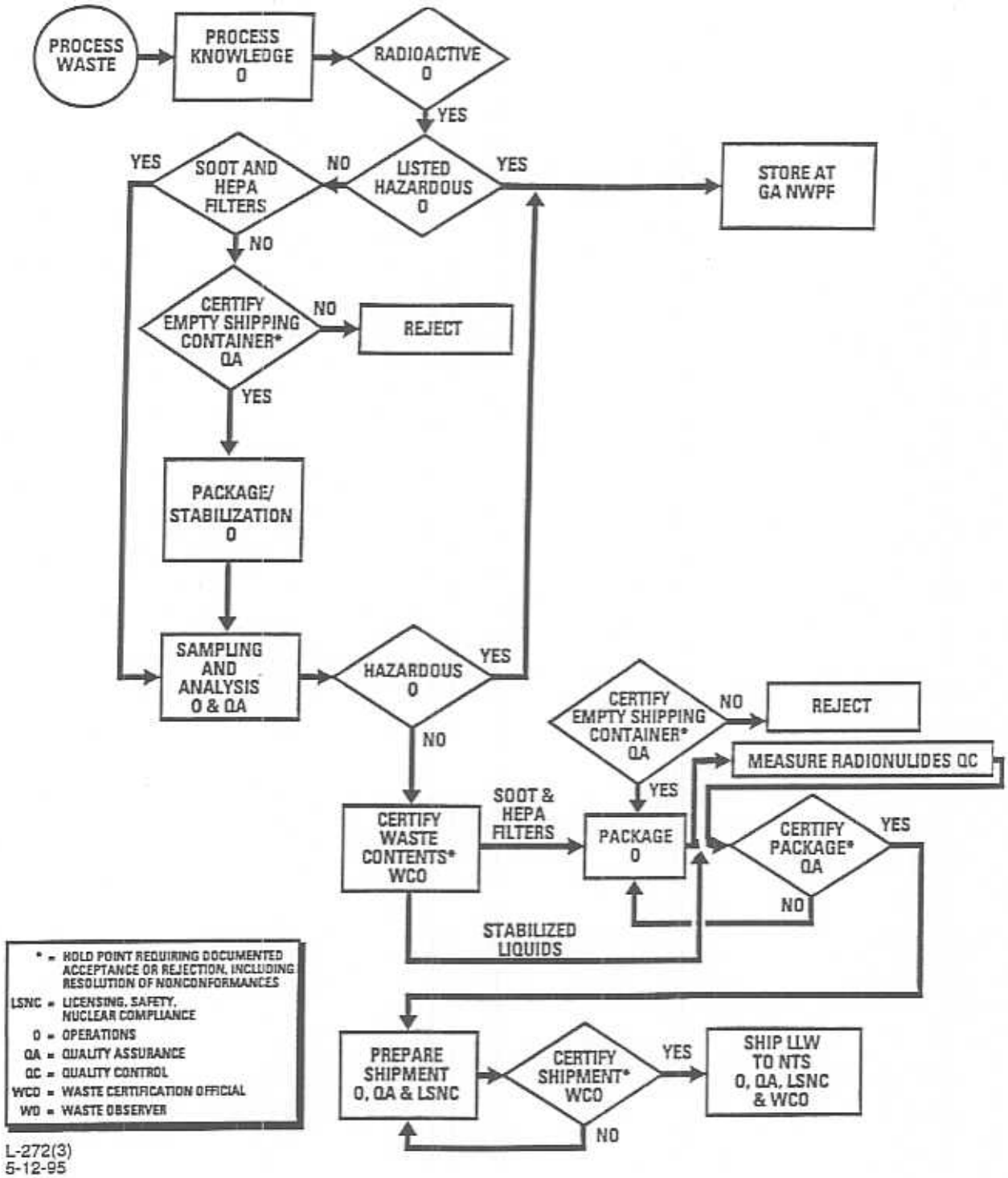

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Figure 3-2—BGAT-000000004 Stabilized Process Liquids and Material Waste Flow Diagram

Compliance Method: Process knowledge. Various controls were in place to prevent prohibited hazardous materials from entering any of the waste streams. Controls include personnel access control to buildings. All the buildings are located inside a fenced area with gates that are operated by card key.

Only Project personnel are authorized to have unescorted access in the controlled area because of work assignments. This allows personnel access to controlled areas to be kept to a minimum.

Only workers trained in procedures related to waste are allowed to handle waste. Similarly, during development and manufacturing, only personnel trained in operating procedures were used. A complete list of procedures used to control waste handling is shown in Section 7. Only virgin uranium was used.

This waste stream does not contain transuranics because project personnel did not form or introduce transuranics into the waste stream and because controls prevented unintended contamination of the waste with transuranics.

3.4.3.2. Hazardous Waste Components

LLW shall not exhibit any characteristics of, or contain materials listed as hazardous waste, as identified in 40 CFR 261, "Identification and Listing of Hazardous Waste," or state-of-generation hazardous waste regulations.

Compliance Method: The "Waste Certification Program Sampling and Analysis Plan," (Ref. 32) describes the methodology used to verify the absence of hazardous material. It is expected that after neutralization and stabilization this waste stream will not contain listed hazardous waste and will not exhibit hazardous waste characteristics as defined in 40 CFR 261 and CCR Title 22, Division 4.5, Chapter 11, Section 66261.

Personnel responsible for identifying, characterizing, and certifying low-level waste will receive training in the Federal and State of California characteristics and listed hazardous wastes. The analytical data will be validated by GA Operations and QA personnel according to procedure NWPF-WI-3.14, "Data Validation Procedure."

3.4.3.3. Free Liquids

LLW disposed at the NTS waste management sites shall contain as little free liquids as reasonably possible, and in no case will the liquid equal or exceed 0.5% of the volume of the external waste container.

Compliance Method: All liquid waste substreams will be neutralized and stabilized per NWPF-WI-3.4, "Liquid and Sludge Waste Neutralization and Stabilization." The absence of free liquids from soot and HEPA filters will be verified per NWPF-WI-3.32, "Package Content Verification."

These requirements are evaluated in accordance with PC-000460, "Waste Certification Program Sampling and Analysis Plan." If necessary, absorbent will be added in accordance with the requirements of NVO-325. Free liquids will not be present in this waste stream in excess of 0.5% of the volume of the external waste container.

3.4.3.4. Particulates

Fine particulate wastes shall be immobilized so that the waste package does not contain more than 1 wt % of less than 10 micron diameter particles, or 15 wt % of less than 200 micron diameter particles. When immobilization is not practical, other acceptable packaging methods shall be used.

Compliance Method: The stabilized liquid waste stream does not contain particulates. Soot and HEPA filters will be double-bagged and placed inside metal boxes or steel drums.

3.4.3.5. Gases

LLW shall be stabilized or absorbed so that gaseous pressure within the waste container does not exceed 1.5 atm at 20°C.

Compliance Method: Process knowledge. There are no gases in any of the substreams.

3.4.3.6. Stabilization

Where practical, waste shall be treated to reduce volume, promote waste minimization, and provide a more structurally and chemically stable waste form.

Compliance Method: This waste stream consists of solid stabilized liquids, soot, and HEPA filters that are inherently stable. Waste does not contain free or entrapped gases. Waste will not significantly react with the packaging during normal storage, shipping, or handling.

3.4.3.7. Etiological Agents

LLW containing pathogens, infectious wastes, or other etiological agents as defined in Title 49 CFR 173.386 will not be accepted for disposal at NTS.

Compliance Method: Process knowledge. Various controls were in place to prevent prohibited hazardous materials from entering any of the waste streams. See details in Section 3.4.3.1.

Etiological agents were not added to any processing step or waste. This waste stream does not contain etiological agents, because the projects did not form or introduce etiological agents into the waste stream and because controls prevented unintended contamination of the waste with etiological agents.

3.4.3.8. Chelating Agents

LLW containing chelating or complexing agents at concentrations greater than 1 wt % will not be accepted at NTS.

Compliance Method: Process knowledge. Various controls were in place to prevent prohibited hazardous materials from entering any of the waste streams. For details see Section 3.4.3.1.

Chelating agents were not added to any of the processing or waste handling steps. This waste stream does not contain chelating agents because the project did not deliberately form or introduce them into the waste stream and because controls prevented unintended contamination of the waste with chelating agents.

3.4.3.9. Polychlorinated Biphenyls (PCBs)

PCB contaminated LLW will not be accepted at NTS unless the PCB concentration meets the municipal solid waste disposal levels of 50 ppm or less.

Compliance Method: Process knowledge. Various controls were in place to prevent prohibited hazardous materials from entering any of the waste streams. For details see Section 3.4.3.1.

PCBs were not included into any processing or waste handling steps. This waste stream does not contain PCBs because the project did not form or introduce them into the waste stream and because controls prevented unintended contamination of the waste with PCBs.

3.4.3.10. Explosives and Pyrophorics

LLW containing explosives and/or pyrophoric material in a form that may spontaneously explode or combust if the container is breached will not be accepted at NTS.

Compliance Method: Process knowledge. Various controls were in place to prevent prohibited hazardous materials from entering any of the waste streams. For details see Section 3.4.3.1.

Neither explosives nor pyrophorics were formed or added to any fuel manufacturing or fuel development process. This waste stream does not contain explosives or pyrophorics because the project did not form or introduce them into the waste stream and because controls prevented unintended contamination of the waste with explosives or pyrophorics.

3.5. QC Waste, BGAT-000000005

3.5.1. Waste Description

Waste stream BGAT-000000005 consists of miscellaneous QC waste containing the following waste substreams:

- Vacuum pump oil (waste substream 5-1)
- Davies-Gray titration waste (waste substream 5-2)

3.5.1.1. Vacuum Pump Oil (Waste Substream 5-1)

The vacuum pump oil waste was generated during mercury pycnometry and mercury porosimetry of uranium fuel. It is known to have uranium contamination and is therefore classified as radioactive waste. It may also have mercury contamination. This waste will be stabilized per NWPF-WI-3.4, "Liquid and Sludge Waste Neutralization and Stabilization." Sampling and analysis will establish if this waste is LLW or MW.

3.5.1.2. *Davies-Gray Titration Waste (Waste Substream 5-2)*

Liquids containing enriched and depleted uranium are analyzed for uranium concentration per FQCI-401, "Determination of Uranium by NBL-Modified Davies-Gray Titration." The titration produces a liquid waste that is collected in 1 gallon containers. This aqueous waste contains enriched uranium (93% ^{235}U), nitric acid, phosphoric acid, sulfuric acid, potassium dichromate, and a vanadium catalyst.

The waste will be neutralized and stabilized according to NWPF-WI-3.4, "Liquid and Sludge Waste Neutralization and Stabilization." The stabilized waste will be analyzed according to PC-000460, "Waste Certification Program Sampling and Analysis Plan." If the analyses show that the waste is non hazardous per 40 CFR, then it will be shipped to the NTS, otherwise it will be stored at GA.

3.5.2. Waste Certification Flow Diagram

Figure 3-3 is the waste certification flow diagram describing the logic of the certification program and hold points requiring documented acceptance or rejection. Nonconformances are addressed at the hold points. The flow diagram shows the quality activities of inspection, analysis, and surveillance, as well as points where waste certifications are performed.

Appendix A, "Low-Level Waste Certification Program Plan," Section 3, describes in more detail the waste certification process and shows the areas of responsibility for Operations, QA, QC, LSNC, and the Waste Certification Official.

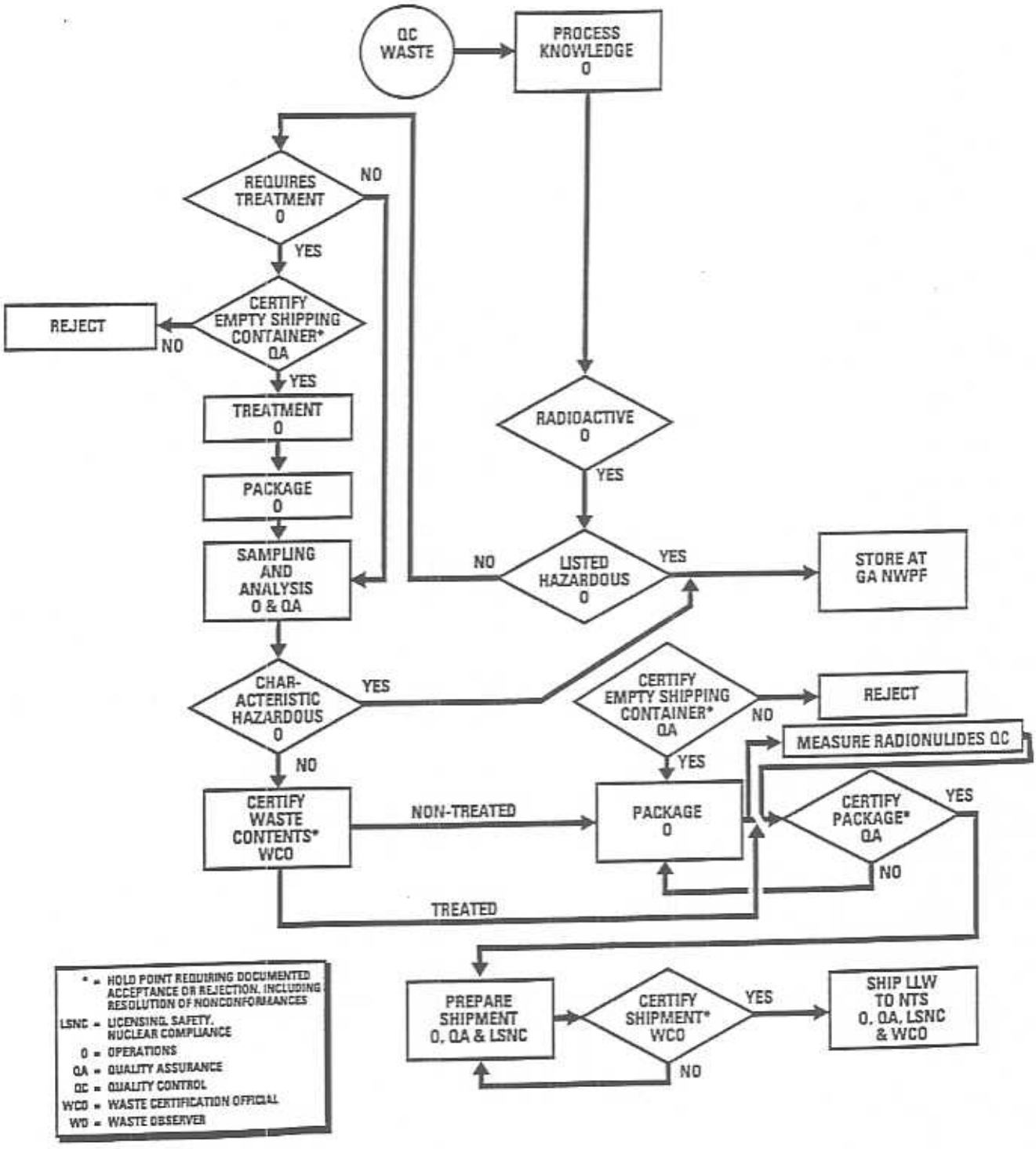

Figure 3-3—BGAT-000000005 QC Waste Flow Diagram

3.5.3. Waste Acceptance Criteria

The generator certifies that waste stream BGAT-000000005 consists solely of LLW meeting the NTS waste acceptance criteria. Compliance with the WAC is determined by a combination of process knowledge and sampling and analysis.

3.5.3.1. Transuranics

LLW must have a transuranic nuclide concentration of less than 100 nCi/g.

Compliance Method: Process knowledge. Various controls were in place to prevent prohibited hazardous materials from entering any of the waste streams. Controls include personnel access control to Buildings. The buildings are located inside a fenced area with a gate that is operated by card key.

Only Project personnel are authorized to have unescorted access to the controlled areas. This includes only trained workers that have a need to be in the controlled area because of work assignments. This allows personnel access to an area to be kept to a minimum.

Only workers trained in procedures related to waste are allowed to handle waste. Similarly, when the project was developing and manufacturing fuel only trained personnel could manufacture fuel according to approved procedures. A complete list of procedures used to control waste handling is shown in Section 7.

Only virgin uranium was used. This waste stream does not contain transuranics because the project did not deliberately form or introduce transuranics into the waste stream and because controls prevented unintended contamination of the waste with transuranics.

3.5.3.2. Hazardous Waste Components

LLW shall not exhibit any characteristics of, or contain materials listed as hazardous waste, as identified in 40 CFR 261, "Identification and Listing of Hazardous Waste," or state-of-generation hazardous waste regulations.

Compliance Method: LLW will not contain listed hazardous waste and will not exhibit hazardous waste characteristics as defined in 40 CFR 261 and CCR Title 22, Division 4.5, Chapter 11, Section 66261. PC-000460, "Waste Certification Program Sampling and Analysis Plan," describes the methodology used to verify the absence of hazardous material.

Personnel responsible for identifying, characterizing, and certifying low-level waste will receive training in the Federal and State of California characteristics and listed hazardous wastes. The analytical data will be validated by GA Operations and QA personnel according to NWPF-WI-3.14, "Data Validation Procedure."

3.5.3.3. Free Liquids

LLW disposed at the NTS waste management sites shall contain as little free liquids as reasonably possible, and in no case will the liquid equal or exceed 0.5% of the volume of the external waste container.

Compliance Method: This requirement is evaluated by waste segregation, visual verification, and evaluation in accordance with PC-000460, "Waste Certification Program Sampling and Analysis Plan." If necessary, absorbent will be added in accordance with the requirements of NVO-325. Free liquids will not be present in this waste stream in excess of 0.5% of the volume of the external waste container.

3.5.3.4. Particulates

Fine particulate wastes shall be immobilized so that the waste package does not contain more than 1 wt. % of less than 10 micrometer diameter particles, or 15 wt. % of less than 200 micron diameter particles. When immobilization is not practical, other acceptable packaging methods shall be used.

Compliance Method: LLW is evaluated by sampling and analysis in accordance with the PC-000460, "Waste Certification Program Sampling and Analysis Plan." Any waste stream suspected of having particulates will be double-bagged inside a steel drum or metal box.

3.5.3.5. Gases

LLW shall be stabilized or absorbed so that gaseous pressure within the waste container does not exceed 1.5 atm at 20°C.

Compliance Method: Process knowledge and visual observation according to procedure NWPF-WI-3.32, "Package Content Verification." This waste stream does not contain gases because aerosol cans, if any, will be punctured in a manner visible by real time radiography.

3.5.3.6. Stabilization

Where practical, waste shall be treated to reduce volume, promote waste minimization, and provide a more structurally and chemically stable waste form.

Compliance Method: This waste stream consists of solids or stabilized liquids contaminated with radionuclides and is an inherently stable waste form. Waste does not contain free or entrapped gases. Waste will not significantly react with the packaging during normal storage, shipping, and handling.

3.5.3.7. Etiological Agents

LLW containing pathogens, infectious wastes, or other etiological agents as defined in Title 49 CFR 173.386 will not be accepted for disposal at NTS.

Compliance Method: Process knowledge. Various controls were in place to prevent prohibited hazardous materials from entering any of the waste streams. See details in Section 3.5.3.1.

Etiological agents were not added to any processing step or waste. This waste stream does not contain etiological agents, because the project did not form or introduce etiological agents into the waste stream and because controls prevented unintended contamination of the waste with etiological agents.

3.5.3.8. Chelating Agents

LLW containing chelating or complexing agents at concentrations greater than 1 wt % will not be accepted at NTS.

Compliance Method: Process knowledge. Various controls were in place to prevent prohibited hazardous materials from entering any of the waste streams. For details see Section 3.5.3.1.

Chelating agents were not added to any of the processing or waste handling steps. This waste stream does not contain chelating agents because the project did not form or introduce them into the waste stream and because controls prevented unintended contamination of the waste with chelating agents.

3.5.3.9. Polychlorinated Biphenyls (PCBs)

PCB contaminated LLW will not be accepted at NTS unless the PCB concentration meets the municipal solid waste disposal levels of 50 ppm or less.

Compliance Method: Process knowledge. Various controls were in place to prevent prohibited hazardous materials from entering any of the waste streams. For details see Section 3.5.3.1.

PCBs were not included into any processing or waste handling steps. This waste stream does not contain PCBs because the project did not form or introduce them into the waste stream and because controls prevented unintended contamination of the waste with PCBs.

3.5.3.10. Explosives and Pyrophorics

LLW containing explosives and/or pyrophoric material in a form that may spontaneously explode or combust if the container is breached will not be accepted at NTS.

Compliance Method: Process knowledge. Various controls were in place to prevent prohibited hazardous materials from entering any of the waste streams. For details see Section 3.5.3.1.

Neither explosives nor pyrophorics were formed or added to any fuel manufacturing or fuel development process. This waste stream does not contain explosives or pyrophorics because the project did not form or introduce them into the waste stream and because controls prevented unintended contamination of the waste with explosives or pyrophorics.

3.6. General Regulatory Waste Package Criteria

This section applies to all waste streams. Waste packages shipped to NTS will meet all applicable DOE, EPA, and DOT requirements specified in NVO-325. These include the requirements of DOE Order 1540.1, "Materials Transportation and Traffic Management," 49 CFR 173.474, "Quality Control for Construction of Packaging," and 49 CFR 173.475, "Quality Control Requirements Prior to Each Shipment of Class 7 (Radioactive) Materials." Specific procedural requirements are defined in NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS," and NWPF-SOP 2.2, "General Operating Procedure—NWPF." The "GA Radioactive Waste Shipments to NTS Verification and Checklist" out of NWPF-WI-3.41 provides an item-by-item verification of compliance with these requirements.

3.6.1. Design

Strong, tight packages used for shipping low specific activity (LSA) radioactive materials as specified by 49 CFR 173.427 must be constructed so that they will not leak during normal transportation and handling conditions.

Compliance Method: This waste stream is solid, low-level radioactive waste. The waste is packaged in strong tight, metal boxes, sealand containers and/or steel drums according to procedure NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS." Packages are constructed so that they will not leak during normal transportation and handling conditions.

The manufacturer of the boxes and drums certifies that they are strong, tight packages. GA specifications for procurement of waste packages require that they be strong and tight containers and require that the supplier certify in writing that they meet that criteria or equivalent as required per 49 CFR. Periodic audits of the waste package supplier and receiving inspection of incoming boxes and drums are performed.

3.6.2. Nuclear Safety

The quantity of fissile radioactive material shall be limited so that an infinite array of such packages will remain subcritical. This quantity shall be determined on the basis of specific nuclear safety analysis, considering credible accident situations and taking into consideration actual materials in the waste.

Compliance Method: By process knowledge, GA knows that ^{235}U is the only fissile radionuclide introduced into these waste streams. All fissile materials are accounted for by procedure control. NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS," limit the amount of ^{235}U per container to $\leq$100 g of ^{235}U. GA has calculations showing that an infinite array of strong, tight packages with $\leq$175 g ^{235}U will remain subcritical (Ref. 36)."

3.6.3. Nuclear Heating

The quantity of radioactive materials shall be limited for each waste package so that the effect of nuclear decay heat will not adversely affect the physical or chemical stability of the contents or package integrity. See 49 CFR 173.442, "Thermal Limitations," for temperature limits of accessible external package surfaces.

Compliance Method: NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS," limits the amount of ^{235}U per container to $\leq$100 g of ^{235}U. GA has calculated that the temperature increase caused by 100 g of ^{235}U in a strong, tight package is negligible (Ref. 37). All other radioactive materials or combination of materials will be calculated for nuclear decay heating on a case by case basis.

3.6.4. Radiation Levels

The external radiation levels for packages shall not exceed 200 millirem per hour on contact during handling, shipment, and disposal, unless specifically excepted by DOT regulations as stated in 49 CFR 173.441, "Radiation Level Limitations."

Compliance Method: NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS," instructs operators to obtain a complete radiation measurement survey for every package and record its result on the manifest. The same procedure establishes radiation level limits of $\leq$200 millirem per hour on contact during handling, shipment, and disposal.

3.6.5. External Contamination

Packages at arrival to the NTS site shall be within DOE contamination levels per 49 CFR 173.443, "Contamination Control."

Compliance Method: NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS" instructs operators to obtain a wipe check for external contamination from a Health Physics technician and record the result on the manifest. The same procedure establishes contamination level limits that are consistent with 49 CFR 173.443.

3.6.6. Activity Limits

The activity limits listed in 49 CFR 173.431, "Activity Limits for Type A and Type B Packages," shall be met. Wherever applicable, the activity limits of Titles 49 CFR 173.421, "Limited Quantities of Excepted Packages for Class 7 (Radioactive) Materials," and 49 CFR 173.427, "Transport Requirements for Low Specific Activity (LSA) Class 7 (Radioactive) Materials and Surface Contaminated Objects," shall be met for strong, tight packages.

Compliance Method: GA will ship in strong, tight containers or as required by the latest revision of 49 CFR 173.421, 49 CFR 173.427 and 49 CFR 173.431 using exclusive shipments according to procedure NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS." Activity limits will be ascertained to meet the requirements of the above CFRs and those of NVO-325.

3.6.7. Multiple Hazards

Waste containing multiple hazards shall be packaged according to the level of hazard defined in 49 CFR 173.2a, "Classification of Material Having More than One Hazard."

Compliance Method: This section is not applicable. None of the metal boxes or 55-gallon drums contain any hazard other than low-level radioactivity.

3.7. NTS SPECIFIC PACKAGE CRITERIA

This section applies to all waste streams. Properly designed packages produced by a GA-qualified vendor and certified to meet NTS requirements are used to minimize the chance of radiological or occupational safety occurrences during transportation, handling, and disposal.

3.7.1. Closure

The package closure shall be sturdy enough that it will not be breached under normal handling conditions and it will not serve as a weak point for package failure.

Compliance Method: Waste boxes used are fitted with clipped lids. When the lids are secured, the lids can only be removed by distorting the clips. Certification test results demonstrate that waste package closure would not be breached under normal handling conditions and would not serve as a weak point for waste package failure. Drums, sealand containers and boxes are metal, strong tight packages and will not be breached under normal handling conditions.

3.7.2. Strength

Except for bulk waste, waste packaged in steel drums, or sealand containers, the waste package shall be capable of supporting a uniformly distributed load of 4000 lb/ft^2. This is required to support other waste packages and earth cover during stacking and covering operations.

Compliance Method: Waste boxes are manufactured by a GA-qualified vendor who certifies test results demonstrating that waste packages being shipped to Area 5 Radioactive Waste Management Site (RWMS) are capable of supporting a uniformly distributed load of 4000 lb/ft^2, which ensures that the waste package will support other waste packages and earth cover without crushing during stacking and covering operations.

3.7.3. Handling

All waste packages shall be provided with permanently attached skids, cleats, offsets, rings, handles, or other auxiliary lifting devices to allow handling by means of forklift, cranes, or similar handling equipment.

Compliance Method: The GA-approved design for boxes and sealand containers, contain permanently welded metal skids and the drums have rolling hoops. The metal skids and the rolling hoops are provided for handling by forklift.

3.7.4. Size

1.2 x 1.2 x 2.1 m (4 x 4 x 7 ft) or 1.2 x 0.6 x 2.1 m (4 x 2 x 7 ft) (width, height, length) boxes or 208-liter (55-gallon) drums are required to be used. While these sizes allow optimum stacking efficiency in disposal cells, other dimensions are acceptable with approval from DOE/NV on a case-by-case basis.

Compliance Method: The waste packages vary slightly in size from the dimensions specified in NVO-325. The outside dimensions of B-25 boxes are 4.3 x 3.9 x 6.1 ft. and Container Products Corp., Type 4 boxes, which meet the

NVO-325 requirements of 4 x 4 x 7 ft, will be used when the present inventory of B-25 boxes have been depleted. Drums are standard sized 55-gallon drums, 24 in. in diameter and 35 in. in height. In addition, 83-gallons drums will be used as overpacks for the 55-gallon drums if necessary.

3.7.5. Weight

In addition to the weight limits set for specific packaging designs, the NTS imposes a limit of 9000 lb per box and 1200 lb per 55-gallon drum. Packages exceeding this weight limit must be approved by BECHTEL/WMD prior to shipment. Shipments of this type must be in a removable-top or removable-side trailer.

Compliance Method: Procedure NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS," limits the weight of B-25 and Type 4 boxes, to $\leq$9000 lb, and the weight of a 55-gallon drum to $\leq$ 1200 lb.

3.7.6. Loading

Waste packages should be loaded to ensure that interior volume is as efficiently and compactly loaded as practical. High density loading will allow efficient utilization of space and provide a more stable waste form that will reduce subsidence and enhance the long term performance of the disposal site.

Compliance Method: Procedures NWPF-WI-3.4, "Liquid and Sludge Waste Neutralization and Stabilization," and NWPF-WI-3.19, "Low-Level Waste Packaging at the NWPF," instruct the operators to minimize void spaces.

3.7.7. Nonstandard Type A Packaging

Use of DOT Type A packages not previously evaluated under the DOT Type A Package Certification Program will not be permitted.

Compliance Method: The waste will be shipped in LSA, or IP containers.

3.7.8. Package Protection

1. The pre-shipment storage environment shall be controlled to avoid any adverse influence from weather or other factors on the containment capability of the waste packaging during handling, storage, and transport. The generator shall take precautions to preclude the accumulation of moisture on, or in packages prior to the arrival at the NTS.

   Compliance Method: Treatment areas, where waste will be neutralized, stabilized, compacted, repackaged, etc., are located indoors, inside Buildings 39 and 41. Drums are stored outdoors and covered with plastic tarps. LSA boxes have water shedding lids and are stored outside without additional cover.

2. A form of tamper-indicating device shall be applied to each waste package once certification actions have been completed.

   Compliance Method: Procedures FMP-1828, "Packaging Waste in Building 39," NWPF-WI-3.4, "Liquid and Sludge Waste Neutralization and

Stabilization," and NWPF-WI-3.19, "Low-Level Waste Packaging at the NWPF," instructs operators to tamper-seal all drums and boxes.

3. Each waste package shall be prepared for shipment so as to minimize damage during transit.

   Compliance Method: To have control of the entire cargo, procedure NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS" requires exclusive use of the vehicle. The same procedure requires bracing packages in such a manner as to prevent load shifting under normal transportation conditions per 40 CFR 173.425.

3.7.9. Marking and Labeling

Each waste package shall have the following information. Except for DOT labels, NV-211 labels, and bar codes, characters used will be at least 1.5 in. in height:

1. Marking and labeling as required in 49 CFR 172, Subparts D and E.

   Compliance Method: All waste packages will be marked and labeled in accordance with 49 CFR 172, Subparts D and E. Refer to procedure NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS."

2. Signed NV-211, "Packaging Certification" label (revision date January 27, 1989) [see Fig. 8, page 76 of NVO-325]. If the waste is unpacked bulk, a signed NV-211 label must accompany the shipment papers. These labels can be obtained from BECHTEL/WMD.

   Compliance Method: An NV-211, "Packaging Certification" label will be completed and signed by the Waste Certification Official and affixed to each container. Refer to procedure NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS."

3. Shipment number in the following sequence: Two alpha-character generator site designator code assigned by BECHTEL/WMD [see Appendix D in NVO-325]; one alpha-character for type of waste—L for LLW, M for MW, T for TRU, or X for TRU MW; two numeric characters for current fiscal year; three numeric characters for shipment sequence. Example MDL90001 would mean a shipment from EG&G Mound of low-level waste in fiscal year 1990 and the first shipment.

   Compliance Method: The shipment number shall consist of eight characters. The first two characters will be "B" and "G" (assigned by BECHTEL/WMD); the third character will be "L" for low-level waste; the fourth and fifth characters will represent the fiscal year (i.e., 96); and the last three characters will be the shipment number, consecutively numbered from the first shipment made by GA to the NTS each fiscal year. Example: BGL96001. Refer to procedure NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS."

4. Container number shall be six characters (alpha, numeric, or combination) with no duplication within that shipment.

   Compliance Method: The container number shall be six numerical characters. The first two numbers will represent the fiscal year of the generation of the container and the remaining characters will be numbers

representing the container sequence assigned by GA personnel. Example: 960001. Refer to procedure NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS."

5. Approved 13-digit waste stream identification number [see Section 5.1 in the NVO-325].

   Compliance Method: The waste stream identification number shall be 13 characters in length. The first four characters will be the DOE-assigned WMIS generator code and the remaining nine characters are the generator-assigned waste stream code.

6. Package weight in units of pounds and kilograms [NVO-325, Section 5.5.1.3.I].

   Compliance Method: The package weight will be marked on the package in both pounds and kilograms in characters at least 1.5 in. in height. Refer to procedure NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS."

3.7.10. Barcoding

The shipment, package, and waste stream identification numbers shall be barcoded according to the following standards:

1. Code 39.
2. Medium to high density, high density preferred.
3. One inch high barcode.
4. Human readable interpretation (HRI) 0.50 in. high printed below the barcode.
5. Spacing between barcode and HRI will be 0.10 in.
6. Minimum left and right margin (quiet zones) will be at least 0.25 in.
7. All barcodes and HRI will be stacked with a minimum separation of 0.50 in. and in the following order: shipment number, package number, and waste stream identification number.
8. A total of two barcode labels shall be placed on each box or nonstandard package near the top and on opposite sides. Drums will have a total of two barcode labels, one on top of the drum lid and one on the side near the top.
9. A sample barcode must be submitted to BECHTEL/WMD prior to the first shipment to ensure that BECHTEL/WMD equipment can be used to read the barcode [NVO-325, Section 5.5.1.3.J].

Compliance Method: GA barcoding is regulated by procedure NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS," and will comply with DOE/NV requirements and meet the following requirements:

1. Code 39.
2. High density.
3. Barcode will be 1.0 in. high.

4. Human readable interpretation (HRI) 0.50 in. high will be printed below the barcode.
5. Spacing between barcodes and HRI will be 0.10 in.
6. Left and right margins will be at least 0.25 in.
7. Barcodes and HRI will be stacked with a minimum separation of 0.50 in. in the following order:
   a. Shipment number.
   b. Container number.
   c. Waste stream identification number.
8. For each drum, a barcode label will be placed on the top of the drum lid and one on the side near the top. For each box, a barcode label will be placed near the top and on the opposite side.
9. A sample barcode well be submitted to BECHTEL/WMD prior to the first shipment.

3.7.11. On-Site Transfer

Not applicable.

3.8. Additional Criteria for Mixed Waste

No mixed waste will be shipped to NTS.

3.9. Additional Criteria for Transuranic/Mixed Waste

No transuranic mixed waste will be shipped to NTS.

3.10. Additional Criteria for Bulk Waste

Bulk waste will be packaged in sealand containers which are 8 x 8 x 20 ft. These strong tight containers may be top or end loaded and are forklift compatible for removal from the transport at the disposal site. Bulk containers will not be returned for reuse. Bulk packaging and labeling will meet the requirements of NVO-325 (Rev. 1) and Title 49 CFR.

3.11. Additional Criteria for Case-By-Case Waste

Not applicable.

3.12. Waste Stream Characterization Data Sheet

The characteristics of waste streams BGAT-000000003, BGAT-000000004 and BGAT-000000005, respectively, are summarized on Figure 3-4, Figure 3-5 and Figure 3-6. The radionuclide concentration in each waste substream was calculated based on Table AIII-1 of Safety Series No. 37, IAEA Safety Guide. Isotopes contributing more than 1% of the total activity are listed as major radionuclides. Detailed information is provided in the Level 1 packages.

3.13. Three Year Waste Shipment Forecast

Table 3-1, Table 3-2 and Table 3-3, respectively, show the three year waste forecast for Waste Streams BGAT-000000003, BGAT-000000004, and BGAT-000000005. The forecasts will be updated every six months (August 15 and February 15).

3.14. Packaging and Shipping Information

Radioactive material of low specific activity, N.O.S., 7; UN 2912.

3.15. Waste Security Information

The waste generated does not contain restricted or classified materials.

WASTE STREAM CHARACTERIZATION DATA SHEET

1. Waste Stream No.: BGAT-000000003

2. Waste Description:

   a. Physical Characteristics: Uranium contaminated solid process by-products, solid trash and discarded equipment. This stream contains no free liquids.

   b. Special Handling/Disposal Requirements: Handle as LLW with no special requirements.

3. Basis for Characterization:

   a. Process Knowledge: X b. Analytical Knowledge: _____

   c. Both: _____

   If b or c, attach Standardized Data Reporting Forms as necessary. Hazardous analysis will be performed after the sampling and analysis plan is approved.

4. Radioactive Characteristics:

   a. Is Waste > NRC Class-C (see Title 10 CFR 61.55)?: No

   b. WIMS Nuclide Category (circle): 1 (2) 3 4 5 NA 7 8

   (Choose the highest predominant nuclide. The number 6 is not an option.)

   c. Radioactive Constituents:

   Specific Activity Range of Waste Stream

	Nuclide	Chemical Forms	Low	Mean	High	Units
(1)	^{235}U	UO_3, UO_2, UCO	7.4×10^{-8}	2.6×10^{-6}	5.2×10^{-6}	Ci/kg
(2)	^{238}U	UO_3, UO_2, UCO	8.8×10^{-10}	2.8×10^{-5}	3.8×10^{-5}	Ci/kg
(3)	^{234}U	UO_3, UO_2, UCO	1.3×10^{-10}	7.5×10^{-5}	1.5×10^{-4}	Ci/kg
(4)	^{236}U	UO_3, UO_2, UCO	8.8×10^{-10}	7.5×10^{-7}	1.5×10^{-6}	Ci/kg
(5)	^{232}Th	ThO_2, ThC_2, $(Th,U)C_2$	2.1×10^{-9}	2.4×10^{-2}	9.6×10^{-5}	Ci/kg
(6)	^{230}Th	"	2.0×10^{-10}	3.5×10^{-6}	1.4×10^{-5}	Ci/kg
(7)	^{228}Th	"	1.7×10^{-9}	2.4×10^{-5}	9.5×10^{-5}	Ci/kg
(8)	^{228}Ra	"	1.5×10^{-9}	2.4×10^{-5}	9.6×10^{-5}	Ci/kg

5. Hazardous Components (for mixed waste):

   a. Basis for identifying as Mixed Waste (circle): (1) Ignitable (2) Reactive (3) Corrosive (4) TCLP (5) Listed Waste

   b. List the applicable EPA waste code, the chemical name, the treatment performed (if applicable) and the Regulatory/Treatment Standard. Attach Standardized Data Forms.

EPA Hazardous Waste No.	Chemical Name	Treatment Performance	Regulatory Threshold/ Treatment Standard Results
(1) None			
(2)			

Figure 3-4—BGAT-000000003 waste stream characterization data sheet

WASTE STREAM CHARACTERIZATION DATA SHEET

1. Waste Stream No.: B G A T - 0 0 0 0 0 0 0 0 4

2. Waste Description:

   a. Physical Characteristics: This waste consists primarily of stabilized process liquid waste, thorium nitrate, soot and HEPA filters. The treatment associated with this stream is neutralization with either NaOH or HCl and stabilization with either Portland cement or Fluid Tech solidification agents. The final form will be solids, dry, with no free liquid. Soot and HEPA filters will be double-bagged inside metal boxes or steel drums.

   b. Special Handling/Disposal Requirements: Handle as LLW with no special requirements.

3. Basis for Characterization:

   a. Process Knowledge: _____ b. Analytical Knowledge: _____

   c. Both: X

   If b or c, attach Standardized Data Reporting Forms as necessary. Hazardous analysis will be performed after the sampling and analysis plan is approved.

4. Radioactive Characteristics:

   a. Is Waste > NRC Class-C (see Title 10 CFR 61.55)?: No

   b. WIMS Nuclide Category (circle): 1 (2) 3 4 5 NA 7 8

   (Choose the highest predominant nuclide. The number 6 is not an option.)

   c. Radioactive Constituents:

   Specific Activity Range of Waste Stream

	Nuclide	Chemical Forms	Low	Mean	High	Units
(1)	^{235}U	UO_3, UO_2, UCO	4×10^{-13}	6×10^{-7}	1.2×10^{-6}	Ci/kg
(2)	^{238}U	UO_3, UO_2, UCO	9.4×10^{-11}	6.5×10^{-10}	1.2×10^{-9}	Ci/kg
(3)	^{234}U	UO_3, UO_2, UCO	6×10^{-12}	1.9×10^{-5}	3.8×10^{-5}	Ci/kg
(4)	^{236}U	UO_3, UO_2, UCO	4×10^{-13}	7.5×10^{-8}	1.5×10^{-7}	Ci/kg
(5)	^{232}Th	$Th(NO_3)_4$-$4H_2O$	2.46×10^{-5}	4.93×10^{-5}	5.39×10^{-5}	Ci/kg
(6)	^{230}Th	$Th(NO_3)_4$-$4H_2O$	2.46×10^{-5}	4.93×10^{-5}	5.39×10^{-5}	Ci/kg
(7)	^{228}Th	$Th(NO_3)_4$-$4H_2O$	1.69×10^{-6}	3.40×10^{-6}	3.74×10^{-6}	Ci/kg

5. Hazardous Components (for mixed waste):

   a. Basis for identifying as Mixed Waste (circle): (1) Ignitable (2) Reactive (3) Corrosive (4) TCLP (5) Listed Waste

   b. List the applicable EPA waste code, the chemical name, the treatment performed (if applicable) and the Regulatory/Treatment Standard. Attach Standardized Data Forms.

EPA Hazardous Waste No.	Chemical Name	Treatment Performed	Regulatory Threshold/ Treatment Standard Result

   (1) None

Figure 3-5—BGAT-000000004 waste stream characterization data sheet

WASTE STREAM CHARACTERIZATION DATA SHEET

1. Waste Stream No.: B G A T - 0 0 0 0 0 0 0 0 5

2. Waste Description:

   a. Physical Characteristics: Uranium contaminated miscellaneous QC waste consisting of vacuum pump oil, and Davies-Gray waste. When required this waste will be neutralized with either NaOH or HCl and stabilized with either Portland Cement or Fluid Tech solidification agents. The final form will be solid, dry, with no free liquid.

   b. Special Handling/Disposal Requirements: Handle as LLW with no special requirements.

3. Basis for Characterization:

   a. Process Knowledge: _____ b. Analytical Knowledge: _____

   c. Both: X

   If b or c, attach Standardized Data Reporting Forms as necessary. Hazardous analysis will be performed after the sampling and analysis plan is approved.

4. Radioactive Characteristics:

   a. Is Waste > NRC Class-C (see Title 10 CFR 61.55)?: No

   b. WIMS Nuclide Category (circle): 1 (2) 3 4 5 NA 7 8

   (Choose the highest predominant nuclide. The number 6 is not an option.)

   c. Radioactive Constituents:

   Specific Activity Range of Waste Stream

	Nuclide	Chemical Forms	Low	Mean	High	Units
(1)	^{235}U	UO_3, UO_2, UCO	1.8×10^{-11}	4×10^{-7}	8×10^{-7}	Ci/kg
(2)	^{238}U	UO_3, UO_2, UCO	1.5×10^{-9}	8×10^{-9}	1.6×10^{-8}	Ci/kg
(3)	^{234}U	UO_3, UO_2, UCO	2.6×10^{-10}	1.25×10^{-5}	2.5×10^{-5}	Ci/kg
(4)	^{230}U	UO_3, UO_2, UCO	1.8×10^{-11}	5×10^{-8}	1×10^{-7}	Ci/kg

5. Hazardous Components (for mixed waste):

   a. Basis for identifying as Mixed Waste (circle): (1) Ignitable (2) Reactive (3) Corrosive (4) TCLP (5) Listed Waste

   b. List the applicable EPA waste code, the chemical name, the treatment performed (if applicable) and the Regulatory/Treatment Standard. Attach Standardized Data Forms.

EPA Hazardous Waste No.	Chemical Name	Treatment Performed	Regulatory Threshold/ Treatment Standard Result

   (1) None

Figure 3-6—BGAT-000000005 waste stream characterization data sheet

Table 3-1—3 Year Waste Shipment Forecast—BGAT-000000003

Generator: General Atomics Date: August 1996

Prepared By: Michael B. Dolphin

Forecast Period	Waste Stream #	Waste Type	Container			# Shipments	Total Volume, m^3
			Type	Size	# Containers		
FY 1997	BGAT-000000003						
10/1-12/30					0	0	0
1/1-3/30					0	0	0
4/1-6/30		LLW	Metal Box	1.2x1.2x2.1m	15	1	45
7/1-9/30		LLW	Metal Drum	208 liters	2	1	1
FY 1998	BGAT-000000003				0	0	0
FY1999	BGAT-000000003				0	0	0

Table 3-2—3 Year Waste Shipment Forecast—BGAT-000000004

Generator: General Atomics Date: August 1996

Prepared By: Michael B. Dolphin

Forecast Period	Waste Stream #	Waste Type	Container			# Shipments	Total Volume, m^3
			Type	Size	# Containers		
FY 1997	BGAT-000000004						
10/1-12/30		LLW	Metal Drum	208 Liters	80	2	17
1/1-3/30		LLW	Metal Drum	208 Liters	26	1	6
4/1-6/30					0	0	0
7/1-9/30					0	0	0
FY 1998	BGAT-000000004				0	0	0
FY1999	BGAT-000000004				0	0	0

Table 3-3—3 Year Waste Shipment Forecast—BGAT-000000005

Generator: General Atomics Date: August 1996

Prepared By: Michael B. Dolphin

Forecast Period	Waste Stream #	Waste Type	Container			# Shipments	Total Volume, m^3
			Type	Size	# Containers		
FY 1997	BGAT-000000005						
10/1-12/30					0	0	0
1/1-3/30					0	0	0
4/1-6/30		LLW	Metal Drum	208 liters	TBD	TBD	TBD
7/1-9/30					0	0	0
FY 1998	BGAT-000000005				0	0	0
FY1999	BGAT-000000005				0	0	0

4. WASTE CERTIFICATION PLAN

The waste certification plan is described in Appendix A, "Low-Level Waste Certification Program Plan."

5. WASTE TRANSFER

Waste shipments to the NTS will be made in accordance with applicable DOE, DOT, state and local hazardous waste regulations, and NVO-325.

5.1. Shipping Arrangements

Waste shipped to the NTS will follow procedure NWPF-WI-3.41, "GA Radioactive Waste Shipment to the NTS." This procedure dictates the following:

1. Prior to departure, seals will be affixed to all access doors of the transport vehicle.
2. All shipments are made by "Exclusive Use Vehicle."
3. Applicable placards will be located on transport vehicle.
4. Shipment data will be entered on the computer, as input to the PSDR (Previously known as RE-0166) information for the NTS computer program. The computer will generate a hard copy of the PSDR equivalent manifest that will be sent with the shipment.
5. Shipment data will include:
   a. DOE/NRC Form 741 (If applicable).
   b. Radioactive Material Removal Record GA 558.
   c. Bill of Lading.
   d. Low-Level Waste Certification Statement.
   e. Emergency Response Information Document.
   f. PSDR equivalent form.
   g. GA-211, "Shipping Order."
   h. NWF-7712, "Maintenance of Exclusive Use and Emergency Instructions.
6. The NWPF Manager or his designee will forward to the NTS all electronic data information.
7. FAX a copy of DOE/NRC Form 741 to 1-702-295-6392.
8. The NWPF Manager or his designee will contact Bechtel Traffic Section by modem ATDT 9, 17022956375 with the following information:
   a. Time of departure from shipping point and estimated time of arrival at the NTS.
   b. Carrier and trailer numbers, and seal numbers.
   c. Description of load.
   d. Bill of Lading number.
   e. Special handling requirements.
   f. Waste type.

5.2. Waste Records

Waste records are addressed in the Shipping Arrangements section and will not be repeated in this section.

5.3. Disposition of Noncompliance Conditions

GA will cooperate with NTS RWMS to resolve any nonconformance condition that may be noted after a GA shipment arrives at the NTS.

6. EXEMPTION REQUEST

None.

7. PROCEDURES AND SUPPORTING DOCUMENTS

Due to their volume, certification-related procedures and Quality Assurance documents are not provided with this document. A complete list of those procedures and documents is provided for reference in this section.

Number	Title
Quality Assurance	
QAPD-7658-567	Quality Assurance Program Document –MHR Closeout Tasks 5, 6, &7
QAPD-9009	Decontamination and Decommissioning of the TRIGA Fuel Fabrication, Building 22
QAPD-9009-1	Decontamination and Decommissioning of the Radiochemistry Bunker, Building 27-1
QAPD-9445	Quality Assurance Program Document—Nuclear Waste Processing Facility (NWPF)
QAM	Quality Assurance Manual
Characterization	
NWPF-WI-3.6	Liquid Waste Sampling with the COLIWASA Tube
NWPF-WI-3.10	Sample Packaging and Shipping
NWPF-WI-3.13	Compositing of Samples
NWPF-WI-3.14	Data Validation Procedure
NWPF-WI-3.34	Chain-of-Custody
FQCI-401	Determination of Uranium by NBL-Modified Davies-Gray Titration
FQCI-406	Uranium Determination by Gamma and Thorium Spectroscopy
FQCI-407	Measurement of Solution pH
FQCI-610	Radionuclide Content Measurements of Low-Level Radioactive Waste Containers by Gamma Spectroscopy
Waste Control Procedures	
FMP-1802	Dumping of Waste Liquids in Non-Safe Containers—Building 39
FMP-1820	Hazardous and Mixed Waste Accumulation Control for Satellite Waste Collection Points
FMP-1824	Collecting, Packaging, and Shipping Items from Building 39
FMP-1830	Tamper-Safing
FMP-1860	Transferring Liquids Containing Depleted Uranium to Storage Barrels
NWPF-WI-3.1	Radioactive Material Transfer Request (RMTR)
NWPF-SOP-2.2	General Operating Procedure—NWPF

Number	Title
Treatment and Packaging	
NWPF-WI-3.3	Radioactive Waste Packaging
NWPF-WI-3.4	Liquid and Sludge Waste Neutralization and Stabilization
NWPF-WI-3.9	Waste Liquid Neutralization
NWPF-WI-3.19	Low-Level Waste Packaging at the NWPF
NWPF-WI-3.27	Compacting and Baling
NWPF-WI-3.29	Dissolution of Thorium Nitrate Tetrahydrate
NWPF-WI-3.32	Package Content Verification
FMP-1828	Packaging Solid Waste in Building 39
FMP-1829	Packaging Liquid Waste in Building 39
FQCI-601	Pre-Loading Inspection of "Sea-Van" Containers for Bulk LSA Waste Shipments to the Nevada Test Site (NTS)
Shipment	
NWPF-WI-3.41	GA Radioactive Waste Shipments to the NTS
NWPF-SOP-2.3	Computer Terminal Input Instructions for DOE Waste Shipments
FQCI-603	QC Inspection—Shipment of Low-Level Radioactive Waste to the Nevada Test Site
HP-16	Off-Site Shipments—Individual Removal of Radioactive Materials
HP-47	Radioactive Material Removal Record

8. REFERENCES

1. NVO-325, "Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements," Rev. 1, dated June 1992
2. DOE Order 5820.2A, "Radioactive Waste Management"
3. HP-16, "Off-site Shipments—Individual Removal of Radioactive Materials" *
4. DOE Order 5400.1, "General Environmental Protection Program"
5. DOE Order 5400.3, "Hazardous and Radioactive Mixed Waste Program"
6. PC-000408, "Nuclear Waste Processing Facility (NWPF) Waste Minimization Plan," *
7. NWPF-AP-1.1, "NWPF System of Controlling Documents" *
8. NWPF-WI-3.19, "Low-Level Waste Packaging at the NWPF" *
9. NWPF-WI-3.32, "Package Content Verification" *
10. FQCI-605 , "Survey for ^{235}U Using SAM-2 Portable Gamma Ray Detector" *
11. NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS" *
12. FQCI-603, "QC Inspection—Shipment of Low-Level Radioactive Waste to the Nevada Test Site" *
13. HP-47, "Radioactive Material Removal Record." *
14. Code of Federal Regulations, Title 49, Transportation, 4/1/96
15. Code of Federal Regulations, Title 40, Protection of Environment, 7/1/94
16. SW-846, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," (EPA)
17. Code of Federal Regulations, Title 10, Energy, 1/1/95
18. California Code of Regulations, Title 22, Department of Toxic Substances Control, 5/24/96
19. GA Doc. 910502, "Test Plan for the Testing of As-Manufactured Fuel" *
20. NWPF-SOP-2.3, "Computer Terminal Input Instructions for DOE Waste Shipments" *
21. NWPF-WI-3.27, "Compacting and Baling" *
22. GA Doc. 910748, "Preliminary Waste Characterization "*
23. NWPF-WI-3.9, "Waste Liquid Neutralization" *
24. NWPF-WI-3.14, "Data Validation Procedure" *
25. NWPF-WI-3.4, "Liquid and Sludge Waste Neutralization and Stabilization" *
26. PC-000462, "Fuel Pilot Plant Facility MHR Closeout Activities Waste Minimization Plan"
27. PC-000391, "Low-Level Waste Certification Program Plan" *
28. FMP-1105, "NP-MHTGR 240 mm Development Coater Operating Procedure" *
29. PC-000363, "Sampling and Analysis Plan for Characterization of Containerized Materials at the MWMF Scrubber Waste Stream," *
30. NWPF-WI-3.29, "Dissolution of Thorium Nitrate Tetrahydrate" *
31. FMP-1000, "Fuel Manufacturing Procedure Control" *
32. PC-000460, "Waste Certification Program Sampling and Analysis Plan" *
33. FQCI-401, "Determination of Uranium by NBL-Modified Davies-Gray Titration" *

34. DOE Order 1540.1, "Materials Transportation and Traffic Management"
35. NWPF-SOP 2.2, "General Operations Procedure—NWPF" *
36. Malakhof, V., NS-95:VM:446, "Reduced Mass Limits for Drums and Barrels," April 4, 1995 *
37. Malakhof, V., NS-93VM-349, "Heating Rate of Low-Level Packages," October 19, 1993 *
38. QAM, "Quality Assurance Manual" *
39. NWPF-WI-3.6, "Liquid Waste Sampling With the COLIWASA Tube" *
40. NWPF-WI-3.10, "Sample Packaging and Shipping" *
41. NWPF-WI-3.13, "Compositing of Samples" *
42. NWPF-WI-3.34, "Chain-of-Custody" *
43. FQCI-406, "Uranium Determination by Gamma and Thorium Spectroscopy" *
44. FQCI-407, "Measurement of Solution pH" *
45. FMP-1802, "Dumping of Waste Liquids in Non-Safe Containers—Building 39" *
46. FMP-1830, "Tamper-Safing" *
47. FMP-1828, "Packaging Solid Waste in Building 39" *
48. FMP-1829, "Packaging Liquid Waste in Building 39" *
49. FMP-1820, "Hazardous and Mixed Waste Accumulation Control for Satellite Waste Collection Points" *
50. FQCI-610, "Radionuclide Content Measurement of Low-Level Radioactive Waste Content by Gamma Spectroscopy" *

* GA Internal Document

PC-000391/2

GENERAL ATOMICS WASTE GENERATOR APPLICATION

APPENDIX A

LOW-LEVEL WASTE CERTIFICATION PROGRAM PLAN

PREPARED FOR

NEVADA TEST SITE

OCTOBER 1996

GENERAL ATOMICS

GENERAL ATOMICS

GA 2175 (REV. 9/89)

PROJECT CONTROL ISSUE SUMMARY

DOC. CODE	PROJECT	DOCUMENT NO.	REV
PPM	0000	PC-000391	2

TITLE:

Low-Level Waste Certification Program Plan

CM APPROVAL/ DATE	REV	PREPARED BY	APPROVAL(S) RESOURCE/ SUPPORT	APPROVAL(S) PROJECT	REVISION DESCRIPTION/ W.O. NO.
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ACRONYMS

ASL	Approved Suppliers List
ASME	American Society of Mechanical Engineers
CAR	Corrective Action Request
CCR	California Code of Regulations
CFR	Code of Federal Regulations
CP	Company Procedures in GA CPM
CPM	GA Company Policy Manual
CRSC	Criticality and Radiation Safety Committee
D&D	Decontamination and Decommissioning
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EP	Engineering Procedure in GA PRPM
EPA	Environmental Protection Agency
FQCI	Fuel Quality Control Instruction
GA	General Atomics
GT-MHR	Gas Turbine Modular Helium Reactor
HP	Health Physics
HSWA	Hazardous and Solid Waste Amendments of 1984
HWA	Hazardous Work Authorization
LLW	Low-Level (Radioactive) Waste
LSA	Low Specific Activity
LSNC	Licensing, Safety, and Nuclear Compliance
MRB	Material Review Board
NPR	New Production Reactor
NR	Nonconformance Report
NRC	U.S. Nuclear Regulatory Commission
NTS	Nevada Test Site
NVO	DOE-Nevada Field Office
NWPF	GA Nuclear Waste Processing Facility
OSHA	Occupational Safety and Health Administration
PC	Production Control
PRPM	GA Program/Resource Procedures Manual
QA	Quality Assurance
QAL	Quality Assurance Level
QAM	GA Quality Assurance Manual
QAPD	Quality Assurance Program Document
QAPI	Quality Assurance Program Index
QARC	GA Quality Assurance Records Center
QC	Quality Control
QDI	GA Quality Division Instructions
QE	Quality Engineer
QP	Quality Procedure in QAM
R&D	Research and Development
RCRA	Resource Conservation and Recovery Act
RWP	Radiological Work Permit
SVA	Sorrento Valley Building A (Fuel Fabrication Facility)
TDR	Test Data Report
TFFF	TRIGA Fuel Fabrication Facility
TPL	Test Plan
TRU	Transuranic
WA	Work Authorization
WAC	Waste Acceptance Criteria

WCO	Waste Certification Official
WCPP	Waste Certification Program Plan

1. INTRODUCTION

The Low-Level Waste Certification Program Plan (WCPP) provides General Atomics (GA) with guidelines to meet the requirements for waste stream characterization and waste acceptance criteria (WAC) for waste form, packaging, certification, and transfer, as established in U.S. Department of Energy (DOE) Nevada Field Office (NVO) document NVO-325, "Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements," (Rev. 1) and associated quality assurance requirements. This WCPP is part of "General Atomics Waste Generator Application," PC-000390.

GA's management of Low-Level Waste (LLW) complies with the Nevada Test Site (NTS) criteria, DOE Order 5820.2A, and other regulatory requirements to ensure a safe, low-risk operation. This plan does not address mixed waste. GA has established procedures and guidelines to ensure that waste identified as low-level is not mixed, as defined in this document, and is not subject to regulation in accordance with the Environmental Protection Agency Resource Conservation and Recovery Act of 1976 (RCRA); the Hazardous and Solid Waste Amendments of 1984 (HSWA); or the State of California, Environmental Protection Agency California Hazardous Waste Control law.

1.1 Definition of Low-Level Waste

This Waste Certification Program Plan (WCPP) addresses the disposal of low-level radioactive waste. GA defines LLW as waste which meets the following criteria.

- Contains radioactive material as defined in Title 10, Code of Federal Regulations (CFR).
- Can be classified as: a Low Specific Activity (LSA) waste as defined in 49 CFR 173.403; a limited quantity of radioactive material as defined in 49 CFR 173.403; a quantity of radioactive material not exceeding Type A or B package limits as defined in 49 CFR 173.431; or as defined in DOE Order 5820.2A.
- Is not classified as high-level waste, transuranic (TRU) waste, uranium mill tailing, mixed waste, or spent nuclear fuel.

Waste with transuranic nuclides in concentrations under 100 nCi/g will be considered as LLW in accordance with DOE Order 5820.2A and NVO-325.

1.2 Purpose of the Low-Level Waste Certification Plan

The purpose of the WCPP is to describe how LLW from GA is certified for shipment to the NTS in accordance with Section 6 of NVO-325. This plan:

- Satisfies the requirements detailed in NVO-325 and the associated quality assurance requirements.
- Applies to all activities associated with LLW certification at GA for shipment to NTS.

1.3 Overview of General Atomics Operations

GA operates several programs for commercial and government applications. Major programs at GA which have produced LLW that has been or that will be shipped to the NTS include development and manufacturing of fuel for the NPR and MHR Programs, decontamination and decommissioning (D&D) of the SVA Fuel Fabrication Facility, TRIGA Fuel Fabrication Facility (TFFF), TRIGA Reactor Facility, Radiochemistry Bunker Facility, and cleanup of general use laboratories. Operations that are currently producing or processing waste planned for shipment to NTS will be added to this list as waste streams

are identified for disposition. This LLW Certification Program Plan only addresses waste from GA that will be shipped to NTS.

1.4 Purpose of Low-Level Waste Characterization

The WCPP is intended to demonstrate that policy, procedures, and practices are in place to control the generation, characterization, handling and packaging of LLW in accordance with applicable regulations, and the waste will meet the criteria for certification and acceptance at the NTS. Approved State and Federal waste characterization procedures will be used to demonstrate that the waste does not contain hazardous constituents.

Waste minimization activities are addressed in PC-000408, "Nuclear Waste Processing Facility (NWPF) Waste Minimization Plan" and PC-000462, "Fuel Pilot Facility MHR Close-out Activities Waste Minimization Plan." Other facilities will follow the requirements outlined in PC-000408, or develop their own waste minimization plan if required.

2. LOW-LEVEL WASTE DESCRIPTION

This WCPP describes the generator's proposed plan for certification and disposal of LLW resulting from process development, manufacturing and decommissioning activities. This plan addresses three waste streams directly but will have additional waste streams added as addenda when identified. The three waste streams are: (1) BGAT-000000003, consisting of radioactive, LLW, solid process byproducts, solid process trash (lab coats, shoe covers, wipes, etc.), construction debris and radioactively contaminated equipment and parts; (2) BGAT-000000004, consisting of radioactive LLW in the form of stabilized (solidified) process liquid waste, soot and thorium nitrate, and HEPA filters; and (3) BGAT-000000005, consisting of miscellaneous Quality Control (QC) laboratory LLW containing the following waste streams: (a) solidified vacuum pump oil, and (b) solidified Davies-Gray titration waste.

This WCPP is for all low-level waste streams generated at GA and planned for shipment to NTS. The sources of this waste are numerous activities at GA involving the use of radioactive materials and irradiated materials. These activities include production, research and development, analysis, TRIGA Reactor operation, program close out, facility safe shut down, waste storage, waste treatment, waste shipment, and facility D&D.

Most of the waste to be generated in the future will come from program closeout and D&D activities. New waste streams will be added as addenda to this WCPP and the Waste Generator Application. The primary sources of these new waste streams are from programs and facilities including: Building 39 D&D, TRIGA Fuel Fabrication D&D, Thermionics, Radiochemistry Bunker D&D, TRIGA Reactor, Sorrento Electronics, Fusion, Nuclear Material Accountability Storage, Analytical Chemistry, Nuclear Waste Processing Facility, and general site clean up.

3. WASTE CERTIFICATION

3.1 Waste Certification Flow Diagram

Figure 3-1, Figure 3-2, and Figure 3-3 in document PC-000390 respectively show the logic of the certification program and hold points requiring documented acceptance or rejection for waste streams BGAT-000000003, BGAT-000000004 and BGAT-000000005.

These figures also show the groups that are major participants in either treatment or packaging activities, or decision points such as certifying waste content of a drum.

3.2 Certify Empty Package

Packaging materials in the form of metal boxes, Sea-Land Containers, 55-gallon drums, and 83-gallon drums are purchased by GA according to specifications dictated by 49 CFR Part 178 and NVO-325. A QA engineer reviews and approves each procurement requisition to ensure compliance with U. S. Department of Transportation (DOT) and NVO-325 requirements.

When packaging materials arrive at the GA site, they are inspected by a member of the QA organization to ensure that they comply with specifications appearing on the procurement requisition. Only QA-accepted containers will be used for packaging waste.

Nonconforming items are handled according to the Quality Assurance Manual.

3.3 Certify Waste Content

Waste is certified to NVO-325 requirements according to process knowledge only, or process knowledge and sampling and analysis.

General Atomics Document No. PC-000460, "Waste Certification Program Sampling and Analysis Plan," describes the required analyses and the acceptance, or rejection criteria as LLW for waste streams characterized according to process knowledge and sampling and analysis.

Waste that is nonhomogeneous, or is difficult to sample because of physical form (like equipment, solid trash, or graphite liners), will be characterized for hazardous materials by process knowledge and verification of package contents. Package contents will be verified by experienced GA waste observers who will remove any items that may be hazardous according to 40 CFR 266 per NWPF-WI-3.32, "Package Content Verification," or NWPF-WI-3.19, "Low-Level Waste Packaging at the NWPF", or NWPF-WI-3.27, "Compacting and Baling," or FMP-1828, "Packaging Solid Waste in Building 39," or FMP-1829, "Packaging Liquid Waste in Building 39."

Qualified laboratories will be used for nuclide content measurements and hazardous characterization.

Nonconformances are handled according to procedures appearing in the Quality Assurance Manual.

3.4 Certify Waste Package

Operations is responsible for properly packaging waste in QA-accepted containers and closing, sealing, labeling, and marking containers according to approved procedures (NWPF-WI-3.4, "Liquid and Sludge Waste Neutralization and Stabilization," NWPF-WI-3.32, "Package Content Verification," NWPF-WI-3.19, "Low-Level Waste Packaging at the NWPF," NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS," and FMP-1828, "Packaging Solid Waste in Building 39") that comply with NVO-325 and DOT requirements.

The Waste Certification Official, who is a member of the GA-QA organization, is responsible for making sure that the waste meets all NVO-325 requirements. In addition, QA/QC engineers have the traditional oversight activities of ensuring that approved procedures are followed, that personnel are trained and qualified, and instruments are calibrated.

Members of the Licensing, Safety, and Nuclear Compliance (LSNC) organization have the oversight responsibility of monitoring packaging operations to ensure that all activities are in compliance with the Nuclear Regulatory Commission (NRC), State Licenses and regulations, and are carried out in a safe manner. In addition, a Health Physics technician checks that there is no external contamination on the packages.

Nonconformances are handled in accordance with the Quality Assurance Manual.

3.5 Certify Waste Shipment

The NWPF is responsible for obtaining services from a trucking company, loading trucks, preparing shipping papers, and placing placards on trucks according to procedure NWPF-WI-3.41, "GA Radioactive Waste Shipments to the NTS," except where shipments are made from areas other than the NWPF. In that case, the responsibility for these tasks lies with the manager of the cognizant project.

The Waste Certification Official certifies that the shipment meets all NVO-325 requirements. In addition, the QA organization has the oversight responsibility of ensuring that shipping operations follow approved procedures, that personnel are properly qualified and use calibrated instruments.

LSNC is responsible for monitoring compliance with industrial hygiene and nuclear safety, and the NRC and State licenses. In addition, a Health Physics technician will measure external truck activity levels to make sure that they are below regulatory limits.

Nonconformances are handled in accordance with the Quality Assurance Manual.

4. QUALITY ASSURANCE PLAN

4.1 Organization

4.1.1 The GA Organization for waste generation and certification activities is shown in Figure 4-1.

4.1.2 The D&D Projects Manager, reporting to the Facilities Director, is also the Facility Manager as defined in NVO-325. He has overall responsibility for the NWPF and most D&D activities at GA, as well as for shipment of waste from the NWPF and most other GA locations.

4.1.3 The Manager of Nuclear Fuel Fabrication (NFF) which generated the waste in GA Building 39 (Fuel Pilot Plant Facility) reports to the Power Reactor Group Senior Vice President and is the Facility Manager as defined in NVO-325, for Building 39. He has overall responsibility to direct MHR-Closeout Project activities in Building 39 and shipment of waste from Building 39.

4.1.4 The NWPF Manager, reporting to the D&D Projects Manager, directs the NWPF activities in accordance with contractual and regulatory requirements, and this WCPP. He is responsible for NWPF waste storage, processing, packaging and shipping operations and for assuring that project personnel are properly trained in applicable requirements.

4.1.5 The cognizant Task Managers, report to the cognizant Manager and are responsible for technical activities in their respective areas, including waste processing, waste characterization, arranging for laboratory services, and data validation.

4.1.6 Waste Observers report to the cognizant Task Manager and are responsible for performing 100% in-process observation of all waste packaging activities and for preparation of waste documentation.

4.1.7 The Director of LSNC is responsible for implementing the Company policies and regulatory requirements for radiological, nuclear and environmental safety, including compliance with RCRA. LSNC provides administration for GA licenses and permits which cover the receipt, use, storage, and transport of radioactive materials, and storage and processing of mixed waste. The Director of LSNC is responsible for communications with the NRC and the State of California regarding all activities under these licenses and permits.

4.1.8 The Director of Quality Assurance is responsible for developing, directing, and implementing an effective company-wide Quality Assurance Program. The QA Director is at the same or a higher organizational level as the managers directly responsible for performing activities affecting quality. He has knowledge and experience in the areas of quality assurance and management, and he is independent of undue cost and schedule influences. The QA Director has direct access to the Chairman of GA for all areas concerning the implementation of the QA Program.

4.1.9 The Manager of Environmental Quality Assurance reports to the Director of Quality Assurance and is responsible for implementing and managing QA programs for environmental and nuclear waste-related projects.

4.1.10 The Manager of Quality Systems reports to the Director of Quality Assurance and is responsible for company-wide audits, calibration, and QA document control.

4.1.11 The Quality Engineer, reporting to the Manager of Environmental Quality Assurance, is responsible for quality engineering functions.

4.1.12 The Waste Certification Official (WCO) reports to the Manager, Environmental Quality Assurance and has direct reporting access to the Facility Managers (see Figure 4-1). He is responsible for certifying that all waste packages and documentation shipped to NTS comply with NVO-325.

4.1.13 The Alternate Waste Certification Official has the same reporting lines as the WCO and is responsible for performing the duties of the WCO when the WCO is not available.

4.1.14 The Training Coordinators are assigned by the cognizant Managers and are responsible for administering the training program for each project or work area. At the NWPF, this function is currently performed by the WCO.

4.1.15 Support work, such as corporate records management and purchasing, is provided through various support organizations, as required.

4.1.16 Quality Assurance personnel have sufficient authority, access to work areas, and organizational freedom to: (1) identify quality problems; (2) initiate, recommend, or provide solutions to quality problems through designated channels; (3) verify implementation to solutions; and (4) assure that further processing, delivery, installation, or use is controlled until proper disposition of a nonconformance, deficiency, or unsatisfactory condition has occurred.

4.1.17 Authority to stop work is assigned to the Director of QA and is delegated down through all levels of the QA organization. This authority includes the right to stop or control unsatisfactory work or further processing of unsatisfactory material. Individual workers have authority to stop work on work assigned.

4.1.18 Verification activities performed by personnel who are not part of the formal Quality Assurance organization (that is, they are part of another organization) are subject to direction and/or overview by the Quality Assurance organization.

4.2 Quality Assurance Program

4.2.1 Requirements

4.2.1.1 NVO-325, Appendix C, requires a Quality Assurance Program that complies with the applicable requirements of ASME NQA-1, "Quality Assurance Program Requirements for Nuclear Facilities."

4.2.1.2 The Code of Federal Regulations, Title 10, Part 71 (10 CFR 71), "Packaging and Transportation of Radioactive Materials," requires compliance with 10 CFR 71 Subpart H, "Quality Assurance." NRC Regulatory Guide 7.10, "Establishing Quality Assurance Programs for Packaging Used in the Transport of Radioactive Material," provides NRC interpretation for compliance with 10 CFR 71, Subpart H.

4.2.1.3 Appendix F of 10 CFR 20, "Requirements for Low-Level Waste Transfer for Disposal at Land Disposal Facilities and Manifests," requires any generating licensee who transfers radioactive waste to a land disposal facility to have a QA Program that assures compliance with

10 CFR 61.55, "Waste Classification," and 10 CFR 61.56, "Waste Characteristics."

4.2.2 Implementation

4.2.2.1 The GA company-wide QA Program is described in the GA Quality Assurance Manual (QAM). The QAM defines procedures for implementing the applicable requirements of ASME NQA-1, 1989 edition, through the NQA-1c-1992 addenda and all supplements, and of 10 CFR 71 Subpart H.

4.2.2.2 The GA QA Program as it applies to radioactive material packages, was reviewed and approved by the NRC Transportation and Storage Inspection Section, Spent Fuel Project Office, Nuclear Material Safety and Safeguards, Approval No. 0030, Revision 6, dated July 9, 1996, expiration date June 30, 2001.

4.2.2.3 The GA QA Program implemented specifically for the certification of waste sent to NTS is described in this WCPP. The WCPP invokes the GA QA Manual, establishes the authority for quality assurance and waste certification activities, and satisfies the requirements listed in 4.2.1 above. This WCPP will be supplemented by Quality Assurance Program Documents (QAPDs) that will be prepared for each major project at GA.

4.2.2.4 Applicable quality assurance requirements are integrated into the implementing procedures listed in 4.2.2.5 through 4.2.2.9 below.

4.2.2.5 Detailed instructions for NWPF activities are described in NWPF Procedures. Other facilities will follow similar procedures developed specifically for their purpose as needed.

4.2.2.6 Detailed instructions for the Quality Assurance organization are described in Quality Division Instructions (QDIs).

4.2.2.7 Detailed instructions for Health Physics activities are described in GA Health Physics (HP) procedures.

4.2.2.8 Detailed instructions for Building 39 activities are described in Fuel Manufacturing Procedures (FMPs) and Fuel Quality Control Instructions (FQCIs).

4.2.2.9 Detailed instructions for engineering activities are provided in the Program/Resource Procedures Manual (PRPM).

4.2.2.10 Procedures, instructions, and other documents used to implement the quality assurance requirements for the Waste Certification Program are listed in Table 4-1, Quality Assurance Program Index (QAPI), as they apply to each of the 19 Requirements of NVO-325, Appendix C. The order of precedence of GA quality assurance documents for waste certification are the QAPDs, the QAM, and the procedures listed in 4.2.2.5 through 4.2.2.9 above.

4.2.3 Graded QA Program

4.2.3.1 Consistent with the QA Manual and NRC Regulatory Guide 7.10, Appendix A, the QA Program is applied to the various waste certification activities in a graded approach; i.e., the quality assurance effort extended on an activity is commensurate with its importance to safety and its impact on compliance with NVO-325, project goals and financial risk to GA.

4.2.3.2 Items and activities important to nuclear safety are designated Quality Assurance Level I (QAL-1 items) and are subdivided into three categories: QAL 1A, 1B, and 1C, for critical, major and minor impact on public health and safety, respectively.

4.2.3.3 For QAL IA items, the QAM requirements that are specified for QAL I, II, and III shall be applied. For QAL 1B items, the QAM requirements that are specified for QAL I, QAL II and QAL III shall be applied, except that procurement of materials and services may be from a qualified supplier who is not on the QA-Approved Suppliers List, but whose QA Program was verified by the Project QE to be commensurate with the items or services ordered. For QAL 1C items, the QAM requirements that are specified for QAL III shall be applied, except that procurement of materials and services may require a qualified supplier who is on the QA-Approved Suppliers List. Since only LLW will be sent to NTS, there will be very few, if any, QAL 1A items or activities.

4.2.3.4 Items and activities with major impact on industrial and chemical safety of public and project personnel, compliance with non-nuclear requirements of NVO-325, and special environmental matters are designated QAL II. For QAL II items, the QAM requirements that are specified for QAL II and QAL III shall be applied.

4.2.3.5 QAL III items and activities are those with a non-critical application. For QAL III items, the QAM requirements that are specified for QAL III shall apply.

4.3 Design Control

4.3.1 The requirements of QAM QP-3 do not apply since there are no significant planned hardware design activities associated with waste certification activities.

4.3.2 Calculations supporting nuclear shipments and any incidental hardware design shall be in accordance with EP-4000 series procedures of the PRPM. Revisions to processing equipment drawings may also be made per Section 4.6.4.

4.3.3 Computer programs shall be controlled as stated in Section 4.11.5.

4.4 Procurement Document Control

4.4.1 All Procurement Requisitions for items and services (and Service Requests for in-house procured items and services) shall be reviewed and approved, prior to issue, by the Quality Engineer (QE), or his designee.

4.4.2 Procurement documents for waste packages shall include applicable DOT and disposal site requirements.

4.5 Instructions, Procedures, and Drawings

4.5.1 Work instructions and procedures shall clearly prescribe how to perform specific tasks and shall be reviewed and approved prior to use.

4.5.2 Work Authorizations

4.5.2.1 Work involving radioactive material shall be performed in accordance with a valid Work Authorization (WA) or Radiological Work Permit (RWP).

4.5.2.2 Work Authorizations shall be reviewed and approved by LSNC in accordance with Health Physics Procedure 172, "Preparation and Issuance of a Work Authorization." RWPs shall be reviewed and approved by Health Physics.

4.5.2.3 The Manager of Nuclear Safety shall review all procedures involving potential nuclear criticality concerns. If required, the Criticality and Radiation Safety Committee (CRSC) shall also review the procedures.

4.5.2.4 Work involving hazardous chemicals/gases or enough kinetic and/or potential energy that, if inadvertently released, may cause irreversible injury or illness to persons involved, shall be performed in accordance with a Hazardous Work Authorization (HWA).

4.5.2.5 HWAs shall be reviewed and approved by the cognizant Manager and GA's LSNC organization.

4.6 Document Control

4.6.1 The preparation, issue, and change of GA documents shall be in accordance with the existing GA document control procedures, and QP-6 of the QAM.

4.6.2 NWPF and other facility procedures shall be controlled in accordance with Procedure NWPF AP-1.1, "NWPF System of Controlling Documents." FMPs shall be controlled in accordance with FMP-1000, and FQCIs in accordance with FQCI-101.

4.6.3 Project control and design documents shall be controlled in accordance with the PRPM. All project control and design documents shall be approved by the author, Quality Assurance and the cognizant Manager. Additional approvals shall be at the discretion of the cognizant Manager.

4.6.4 Research & Development (R&D)-released drawings for processing equipment may be red-lined to incorporate field changes during fabrication. The drawings shall be revised to incorporate the field changes within 60 calendar days from the first field change. Any extensions shall be justified in a memorandum approved by the cognizant Manager. A copy of the memorandum shall be sent to corporate Configuration Management, the WCO, and the Manager of Environmental QA.

4.7 Control of Purchased Items and Services

4.7.1 Purchased items shall be inspected and/or tested, if appropriate, prior to use to assure conformance with specified Purchase Order requirements, in accordance with QP-7 of the QAM.

4.7.2 Analytical laboratories shall not be used for performing EPA-required analyses unless they are state-certified, have been evaluated by QA, and placed on the QA Approved Suppliers List (ASL).

4.8 Identification and Control of Items

4.8.1 Items shall be identified as required by the controlling procedure and/or the Purchase Order, using methods and materials which provide legible markings that are not detrimental to the item.

4.8.2 Identification shall be maintained either on the item or in documents traceable to the item, or in a manner which assures that identification is established and maintained.

4.8.3 The requirements of QAM QP-8 shall also apply to samples. Sample custody shall be documented for sample collection, shipping, analysis, and disposal in accordance with Procedure NWPF- WI-3.34, "Chain of Custody."

4.9 Control of Processes

4.9.1 The requirements of QAM QP-9 that are applicable to waste certification activities shall be implemented.

4.9.2 NWPF procedures shall be prepared and approved for processing, neutralizing and solidifying waste and for other activities important to waste certification, as required. The NWPF procedures shall provide the specific information required to set up and perform the special process activities.

4.10 Waste Observation, Inspection and Radiological Surveys

4.10.1 The requirements of QAM QP-10 shall apply. Waste certification activities that have acceptance criteria shall be inspected and surveyed to verify conformance to requirements. Results of these inspections and surveys shall be documented. Table 4-2 shows waste observation, inspection, and radiological survey responsibility and procedures that support waste certification.

4.10.2 Personnel selected for performing waste observation, inspection and radiological surveys shall have experience or training commensurate with the scope, complexity, or special nature of the activity.

4.10.3 Personnel performing inspections shall be independent from the individual or group performing or directly supervising the activity being inspected.

4.10.4 The WCO or his designee shall perform receiving inspection of all waste containers to be used for waste shipments to verify that waste containers comply with requirements of the disposal site and specifications described in the procurement documents.

4.10.5 A QA Inspector shall inspect all waste containers for damage, including visible cracks, holes, significant corrosion, or other damage that could compromise integrity, prior to use, and after packages have been loaded for shipment. He shall verify that each closure device of the packaging, including any required gasket is properly installed, secured, and free of defects. He shall also review waste container certifications to verify that all waste containers comply with waste container criteria of the disposal site.

4.10.6 Waste Observers shall perform 100% in-process visual observations of all waste container loading activities to verify that waste (a) is packaged in accordance with the applicable procedure, (b) complies with the disposal site acceptance criteria for proper waste form, and (c) excludes dangerous waste as defined by Environmental Protection Agency (EPA), State of California and the State of Nevada.

4.10.7 The WCO or his designee shall verify that applicable NTS acceptance criteria and DOT regulatory requirements are satisfied during waste certification activities.

4.10.8 The WCO or his designee shall verify prior to shipment to the NTS that all applicable requirements have been satisfied.

4.11 Test Control

4.11.1 Testing shall be performed in accordance with approved procedures.

4.11.2 For tests conducted by outside suppliers, applicable test procedures shall be specified in procurement documents.

4.11.3 Tests shall be conducted by appropriately trained and qualified personnel.

4.11.4 Development test activities shall be planned and controlled. Prior to starting any major development activity, a Test Plan or Test Specification/Procedure shall be prepared and released in accordance with the PRPM, Procedure NWPF-AP-1.1, or FMP-1000, as appropriate. Development test activities may be performed to standard GA laboratory practices with the development data recorded in GA laboratory notebooks. Control of GA laboratory notebooks to the "general guidelines" provided in Procedure CP-203 is required.

4.11.5 Computer programs used in the waste certification process shall be tested and verified in accordance with NQA-1 Requirement 11S-2. The test requirements for each program shall be documented in a Test Plan (TPL). The verification results shall be documented in a Test Data Report (TDR). The TPL and TDR shall address the applicable requirements of NQA-1, Supplement 11S-2, Sections 3 and 5, respectively and shall be released in accordance with Procedure EP-4060 of the PRPM (R&D Release).

4.12 Control of Measuring and Test Equipment

4.12.1 Gages, instruments, measuring, recording, and testing devices, and special tooling used for inspection and acceptance shall be calibrated and controlled in accordance with QP-12 of the QAM.

4.12.2 When test and measuring equipment (i.e., scales or health physics survey instruments) are found to be out-of- tolerance by the GA Calibration Lab or outside calibration suppliers, the WCO shall be notified immediately. The WCO is responsible for assuring that an evaluation is performed using a GA Nonconformance Report to control and document the reinspection or resurvey of items that were inspected or surveyed with the specific out-of-tolerance test and measuring equipment.

4.13 Handling, Storage, and Shipping

4.13.1 Low-level radioactive waste shall be processed and packaged for disposal in accordance with applicable procedures, loading plans, and checklists.

4.13.2 Mixed waste shall be labeled and controlled in designated mixed waste accumulation areas. Mixed waste cannot be sent to the NTS.

4.13.3 The WCO or the Alternate WCO shall sign the certification statement for each waste container to be shipped to NTS.

4.13.4 Checklists shall be used by waste shipping personnel to ensure that each shipment of low-level radioactive waste has been accomplished in accordance with the applicable procedure. Checklists shall identify required activities and the organization(s) responsible for each activity, and include a location for sign-off for each activity by the responsible organization(s). Before a waste shipment can leave the GA site, checklists shall be reviewed for completeness and signed off by the WCO, or the Alternate WCO.

4.13.5 The WCO is responsible for assuring that all waste containers shipped to NTS are properly marked and labeled in accordance with DOT regulations and the requirements of NVO-325.

4.13.6 Waste shipped to the NWPF from other GA organizations shall comply with Procedures NWPF-WI- 3.1 "Radioactive Material Transfer Request (RMTR)" and NWPF-WI-3.3, "Radioactive Waste Packaging," as a minimum.

4.13.7 Nuclear Material Accountability shall be notified before making any shipments with nuclear materials.

4.14 Inspection, Test, and Operating Status

The requirements of QAM QP-14 shall apply with the following exception: Green "Accept" tags are not required on drums and LSA boxes that are in storage, provided the drum/box is uniquely identified with a Production Control (PC) number and/or a serial number and is on the list of accepted drums/boxes provided by QA.

4.15 Control of Nonconforming Items

4.15.1 The requirements of QAM QP-15 shall apply, with the following clarifications.

4.15.2 Nonconforming items, including empty waste containers that do not comply with purchase order requirements or exhibit damage, weld defects, or other quality problems shall be documented on a Nonconformance Report (NR). NRs shall also be used for loaded waste packages that are rejected prior to shipment.

4.15.3 The Material Review Board (MRB) shall consist of the WCO who shall act as the Chairman of the MRB and of the cognizant Manager, as a minimum.

4.15.4 Health Physics and/or the cognizant Engineer, shall approve the location of all nonconforming items prior to segregation to preclude inadvertent exposure, cross contamination and RCRA noncompliance. Segregated materials which are contaminated shall be effectively isolated.

4.16 Corrective Action

4.16.1 Significant quality problems shall be promptly identified, documented, and corrected in accordance with QP-16. Corrective Action Requests (CARs) shall be prepared, processed, and closed-out in accordance with QDI 16-5, "Corrective Action Request Preparation."

4.16.2 The following conditions shall be considered to be significant quality problems: failure of responsible organizations to establish and implement the Waste Certification Program and procedures; deficiencies in requirements, plans, or procedures which remain uncorrected after formal reviews (i.e., audits and assessments); continuing or repetitive procedural deviation, nonconformance, or noncompliance, and the failure of responsible organizations to provide proper direction, overview, and correction; any deficiency detected after formal review, verification, and acceptance that could have an adverse effect on safety; and failure of responsible organizations to take prompt and effective action to identify and correct deficiencies.

4.16.3 Affected organizations and subcontractors shall be notified of the need for response as to cause, corrective action taken, and action to prevent recurrence.

4.16.4 Action taken shall be followed-up by the WCO, or designee to assess its effectiveness. The follow-up shall be documented and reported to appropriate levels of management in accordance with QP-16 of the QA Manual.

4.16.5 Quality information, such as audit reports, assessment reports, surveillance reports, nonconformance reports, corrective action reports, and other deficiency documents, shall be analyzed at least annually by the WCO or designee to identify quality trends. Quality trends shall be evaluated and significant adverse quality trends shall be reported to the responsible organization for corrective action. Trend reports shall be distributed to upper management per QP-16.

4.17 Quality Assurance Records

4.17.1 Records listed in Table 4-3 shall be collected, stored, maintained, and indexed in accordance with QP-17 of the QAM.

4.17.2 All records listed in Table 4-3 shall be maintained for at least five years after the completion of the applicable project, or as otherwise required by 10 CFR 70.51.

4.17.3 Waste shipment folders shall contain sufficient information, traceable to each shipment and shipping container, to identify the waste stream, sampling and analysis results, package contents, supporting calculations, receipt inspection of the shipping container, and shipping documentation.

4.17.4 Procedures shall specify records that need to be generated for the work covered by the procedure.

4.18 Quality Assurance Audits and Surveillances

4.18.1 QA shall audit waste certification activities at least once per year in accordance with QP-18 of the QAM to evaluate effective implementation of the Quality Assurance Program and to assess performance of the Waste Certification Program.

4.18.2 QA surveillances shall be conducted periodically to verify compliance with procedures and other governing documents. Surveillance reports shall be distributed to the WCO, the cognizant Manager, and the Manager of Environmental QA.

4.19 Training

4.19.1 GA shall maintain a training program that focuses on safety, knowledge of applicable regulations and technical requirements. The training program shall comply with the training requirements specified by the NRC in 10 CFR 19.12 and 10 CFR 71.105(d); by the Occupational Safety and Health Administration (OSHA) in 29 CFR 1910.120(e) and 29 CFR 1910.1200(h); by the EPA in 40 CFR 265.16; by CAL-EPA in CCR 22-66265.16; and by the DOT in 49 CFR 172.704.

4.19.2 The Training Program shall be implemented in accordance with Procedure NWPF-AP-1.2, "Nuclear Waste Processing Facility Training Program" or similar procedure. Special training requirements will be specified in individual NWPF or similar procedures, as appropriate. Equipment operators shall be certified in accordance with Procedure NWPF-SOP-2.4, "NWPF Operator Qualification Procedure," or FMP-1119, "Operator Training and Qualification Program," when required.

4.19.3 Responsibility for training at other locations shall be defined in the applicable QAPD.

4.19.4 The cognizant Managers are responsible for assuring that all personnel in their respective organizations are properly trained.

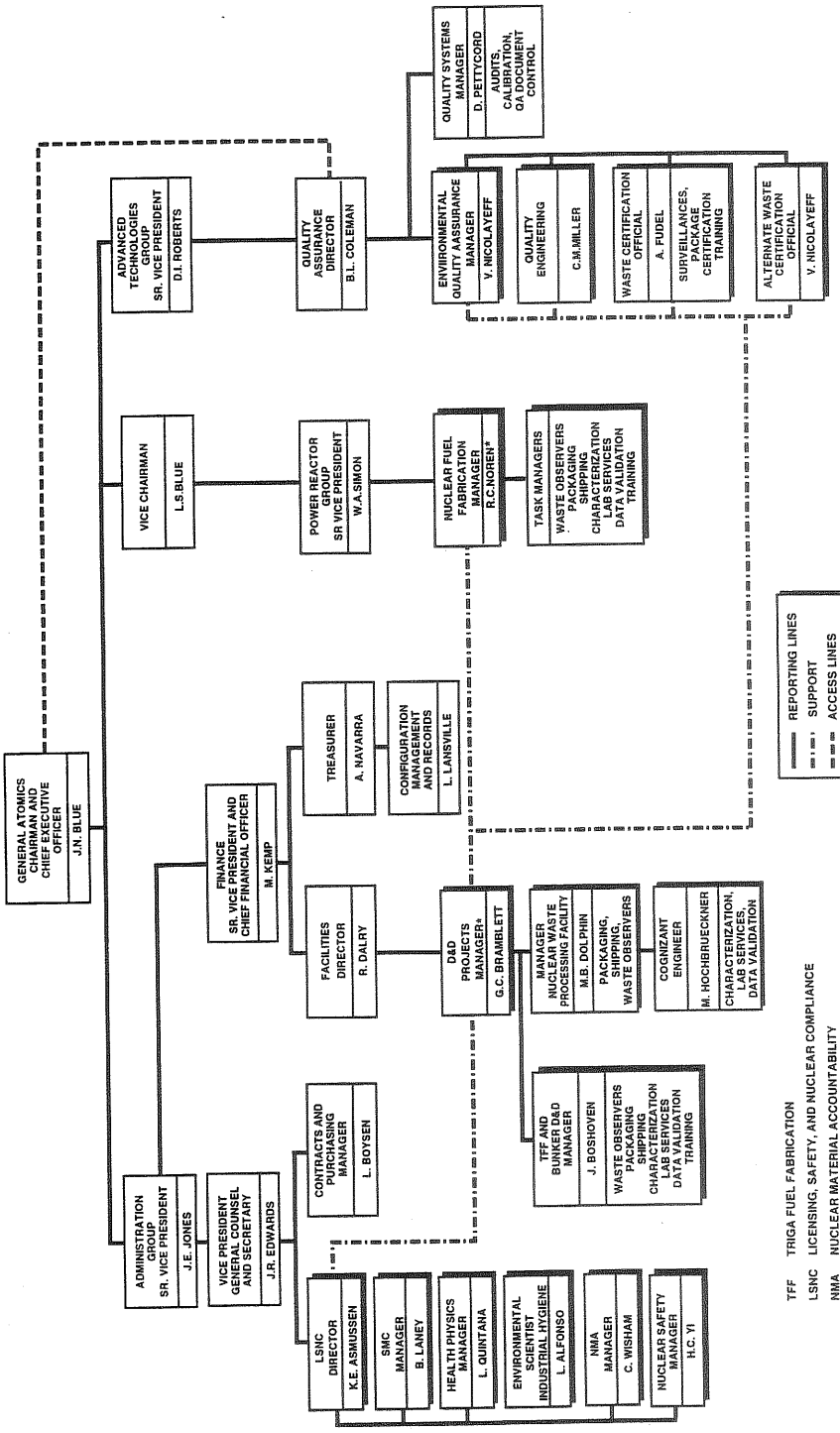

Figure 4-1—GA Organization for Waste Generation

Table 4-1—Quality Assurance Program Index

This Quality Assurance Program Index (QAPI) sets forth the procedures, instructions, and other documents which will be used to implement the Quality Assurance Program for Waste Certification Activities.

Definition:	QAM:	Quality Assurance Manual
	QP:	Quality Procedure in QAM
	QAPD:	Quality Assurance Program Document
	QDI:	Quality Division Instructions
	NWPF:	Nuclear Waste Processing Facility Procedure
	PRPM:	Program/Resource Procedures Manual
	CP:	Company Policy Manual Procedure
	FMP:	Fuel Manufacturing Procedure
	FQCI:	Fuel Quality Control Instructions

NVO-325 Ap. C Section	Title	WCPP Section	GA Document
1.	Organization	4.1	QAM-QP-1/QAPD
2.	Quality Assurance Program	4.2	QAM-QP-2/QAPD
3.	Design Control	4.3	PRPM/QAPD
4.	Procurement Document Control	4.4	QAM-QP-4/QDI 4-1, 4-2/QAPD
5.	Instructions, Procedures, and Drawings	4.5	QAM-QP-5/QDI 5-1/NWPF-SOP-2.2/QAPD
6.	Document Control	4.6	QAM-QP-6/PRPM/QDI 6-1, NWPF-AP-1.1, CP-203/FMP-1000/FQCI-101/QAPD
7.	Control of Purchased Items and Services	4.7	QAM-QP-7/QDI 7-2, 7-5/QAPD
8.	Identification and Control of Items	4.8	QAM-QP-8/QDI 8-1, 8-2/QAPD
9.	Control of Processes	4.9	QAM-QP-9/NWPFs/QAPD
10.	Inspection	4.10	QAM QP-10/QDI 10-1, QDI 2-6/FQCI/ QAPD
11.	Test Control	4.11	QAM-QP-11/PRPM/QAPD
12.	Control of Measuring and Test Equipment	4.12	QAM-QP-12/QDI 12-8, 12-11/FQCI/QAPD
13.	Handling, Storage, and Shipping	4.13	QAM QP-13/NWPFs/QAPD
14.	Inspection, Test, and Operating Status	4.14	QAM-QP-14/QDI 14-2/FQCI/FMP/QAPD
15.	Control of Nonconforming Items	4.15	QAPD/QAM-QP-15/QDI 15-1/QAPD
16.	Corrective Action	4.16	QAPD/QAM-QP-16/QDI 16-5/QAPD
17.	Quality Assurance Records	4.17	QAPD/QAM-QP-17/QDI 17-3/NWPF/FMP/ FQCI/QAPD
18.	Audits/Surveillances	4.18	QAPD/QAM-QP-18/QDI 10-2, 18-2, 18-3/ QAPD
19.	Training	4.19	QAM-QP-2/QDI 2-9, NWPF-AP-1.2, QDI 2-6, NWPF-SOP-2.4/FMP-1119/FQCI-105/QAPD

Table 4-2—Summary of Inspection, Observation, and Survey Responsibilities to Support Waste Certification

Title	Responsibilities	Controlling Documents
QA Inspector	• Inspection of empty waste containers, sealing surface/gasket and loaded waste packages. • Inspection of waste package shipping preparation, loading, and transport.	• QDI 10-1, NWPF/ Facility Procedures & FQCIs
Waste Observer	• Visual observation of waste container loading activities to verify that waste contents are in strict compliance with the applicable procedure and contain no dangerous wastes. • Waste documentation is completed for each waste package per the applicable waste packaging procedure.	• NWPF/Facility Procedures
Health Physics Technician	• Radiological survey to support characterization, packaging and transport of waste packages. • Radiological survey of transport vehicle prior to shipment.	• NWPF/Facility Procedures and Health Physics Procedures
Quality Engineer/Waste Certification Official (or Alternate)	• Scheduled and unscheduled assessments/surveillances of above listed responsibilities to verify compliance with applicable controlling document.	• NWPF/Facility Procedures • QDI 10-2
Waste Certification Official (or Alternate)	• Review waste shipment folder prior to approving each waste shipment. • Final approval of all waste shipments. Signs Waste Certification papers.	• NWPF/Facility Procedures

Table 4-3—Quality Assurance Records Retention Responsibilities[1]

	Record Type	Record Form	Storage Responsibility	Transmittal To Storage Responsibility
1.	Quality Assurance Program Document	Microfilm	QARC	Quality Systems
2.	Quality Assurance Manual	Microfilm	QARC	Quality Systems
3.	Project Control and Design Documents as defined in PRPM	Microfilm	Corporate Records Management	Corporate Configuration Management
4.	Inspection Records	Microfilm	QARC	Quality Engineer
5.	Surveillance Plans and Reports	Microfilm	QARC	Quality Engineer
6.	Nonconformance Reports and Supplier's Disposition Requests	Microfilm	QARC	Quality Engineer
7.	Personnel Training and Indoctrination Records[2]	Microfilm	QARC	Quality Systems
8.	QA Audit Reports	Microfilm	QARC	Quality Systems
9.	Corrective Action Requests	Microfilm	QARC	Quality Systems
10.	Personnel Qualification Records[2]	Microfilm	QARC	Quality Systems
11.	Evaluations of Suppliers	Microfilm	QARC	Quality Systems
12.	Waste Shipment Folders	Microfilm	QARC	WCO
13.	NWPF/Facility Procedures	Microfilm	QARC	D&D Records Mgmt. Coordinator

Notes:

[1] All records shall be maintained for at least 5 years after the completion of the applicable project, or as otherwise required by 10 CFR 70.51.

[2] Except for Health Physics records which shall be stored by Health Physics in accordance with Health Physics procedures.

GENERAL ATOMICS

Title: QUALITY ASSURANCE PROGRAM DOCUMENT - NEW PRODUCTION REACTOR WASTE DISPOSAL

Doc. No. QAPD-3632		**Page** 1 **of** 36

ISSUE SUMMARY

Issue	**Date**	**Prepared by**	**Department Approvals**	**Purpose of Issue/ Sections Changed**
J				Previous issue summary is available in QA Records Center (QARC)
K	JUL 2 0 1995	C. M. Miller	See Page 2	Update Org. Chart, Waste Flow Diagrams, and Training

QUALITY ASSURANCE PROGRAM DOCUMENT
FOR THE
NEW PRODUCTION REACTOR WASTE DISPOSAL PROJECT

LITCO SUBCONTRACT C90-102940

PREPARED BY: C. M. Miller
C. M. Miller, Quality Assurance Project Engineer

APPROVED BY: Anthony Fudel
A. Fudel, Waste Certification Official

APPROVED BY: V. Nicolayeff
V. Nicolayeff, Manager, Environmental Quality Assurance

APPROVEDBY: for
R. C. Noren, Director, Nuclear Fuel Fabrication

APPROVEDBY: B. L. Coleman
B. L. Coleman, Director, Quality Assurance

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FIGURES, TABLES, EXHIBITS, AND APPENDICES

1. GENERAL

1.1 Purpose

This Quality Assurance Program Document (QAPD) comprises the Quality Assurance (QA) Plan and establishes the QA requirements implemented by General Atomics (GA) for the New Production - Modular High Temperature Gas-Cooled Reactor (NP-MHTGR) Waste Handling and Disposal Project, hereinafter referred to as the "NPR Waste Disposal Project." The QAPD invokes the GA Quality Assurance Manual (QAM) for use on this project and identifies project-specific and contract-imposed special QA requirements.

1.2 Scope of Work

1.2.1 The NPR-Waste Disposal work at GA is performed under GA Project No. 3974 and is defined in subcontract No. C90-102940 from Lockheed Idaho Technologies Company (LITCO). It includes characterization, processing, handling, certification, and disposal of low-level radioactive waste and mixed waste generated by GA and GA subcontractor Babcock and Wilcox (B&W), on previous NPR Fuel projects (The original Project No. was 3632) under subcontract from EG&G Idaho, Inc. (EG&G). NOTE: Mixed waste is waste containing both radioactive components subject to regulation under the Atomic Energy Act of 1954 and also hazardous components subject to regulation under 40CFR261.

1.2.2 Disposal of GA-generated low-level radioactive waste will be at the Nevada Test Site. This waste must comply with the requirements of DOE Document NVO-325, "Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements," Rev. 1, June 1992. This disposal will be coordinated with DOE-Oakland (formerly DOE-San Francisco) and DOE-Nevada.

1.2.3 Disposal of GA-generated mixed waste will be at a disposal site determined by LITCO.

1.2.4 Disposal of B&W-generated low-level radioactive waste will be at Chem Nuclear Inc., Barnwell, SC. Disposal site for B&W-generated mixed waste has not yet been determined.

1.3 Application

1.3.1 The requirements of this QAPD are mandatory for all organizations within GA where work is conducted for the NPR-Waste Disposal Project.

1.3.2 For work subcontracted by GA to outside suppliers, applicable QA requirements consistent with this QAPD shall be specified in the procurement documents.

2. ORGANIZATION

2.1 GA Organization

2.1.1 The GA organization for the NPR Waste Disposal Project is shown in Figure 1. It complies with the requirements of NVO-325 for waste characterization and certification, and reflects QA and Waste Certification Official (WCO) independence.

2.1.2 The Director of Nuclear Fuel Fabrication Division (NFFD), which generated the waste, is the NPR Waste Disposal Project Director. He is also the Facility Manager as defined in NVO-325, Rev. 1, and has overall responsibility to direct the NPR-Waste Disposal Project in accordance with contractual requirements, the GA Company Policy Manual (CPM), this QAPD and the QAM. He is the primary project interface with the Customer. He is also responsible for assuring that personnel involved in the project are properly trained in applicable requirements.

2.1.3 The Manager of the NPR Waste Disposal Project, reporting to the Project Director, directs and coordinates work within the project to ensure that it is accomplished within budget, scope, quality, performance, and schedule requirements and is in compliance with this QAPD and the QAM. He also reviews and approves project control and top level design documents and prepares budgets, schedules, and reports for the project.

2.1.4 The Waste Disposal Task Leader, reporting to the Project Manager, has the responsibility to plan, direct, and control the technical activities at GA in accordance with the LITCO contract, NVO-325, and the requirements of this QAPD.

2.1.5 The Manager of the Nuclear Waste Processing Facility (NWPF), reporting to the Project Director is responsible for GA Waste Processing, Packaging, and Shipping Operations.

2.1.6 The Waste Observers, reporting to the Manager of the NWPF, are responsible for performing 100% in-process observations of all waste packaging activities. For waste packaged for shipment to the Nevada Test Site, the Waste Observers verify that only dry low-level radioactive waste is accepted and loaded into the waste containers in accordance with NVO-325, Section 5.5.1.1. "General Waste Form Criteria."

2.1.7 The Quality Control Inspectors reporting to the Manager, Quality Control, are responsible for verifying that applicable DOE and DOT regulatory requirements are satisfied during waste characterization and certification activities. For waste packages to be shipped to the Nevada Test Site, this includes verifying that waste packages are design-certified to meet "NTS Specific Package Criteria" for closure, strength, handling, size, weight, and loading. GA Quality Control Inspectors also verify that limitations for nuclear safety, nuclear heating, radiation levels, external contamination, and activity limits are not exceeded in accordance with NVO-325, Section 5.5.1.2. "General Regulatory Waste Package Criteria."

2.1.8 The Director of Licensing, Safety, and Nuclear Compliance (LSNC) is responsible for implementing the Company policies and regulatory requirements for radiological and nuclear safety and for compliance with the Resource Conservation and Recovery Act (RCRA). LSNC provides administration for GA licenses which cover the receipt, use, and transport of radioactive materials. The Director of LSNC is responsible for communications with the NRC regarding all activities under these licenses and under the Certificates of Compliance for shipping containers.

2.1.9 Support work, such as configuration management, records management, and purchasing, is provided through various support organizations, as required.

2.1.10 The Director of Quality Assurance is responsible for developing, directing, and implementing an effective company-wide Quality Assurance program. The Director is at the same or a higher organizational level as the managers directly responsible for performing activities affecting quality. He has knowledge and experience in the areas of Quality Assurance and management, and he is independent of undue cost and schedule influences. The QA Director has direct access to the Chairman of GA for all areas concerning the implementation of the QA program.

2.1.11 The Manager of Environmental Quality Assurance, reporting to the Director of Quality Assurance, works directly with the Project Director and is responsible for implementing and managing the QA program described in this QAPD. He is independent of the project management, engineering/technical and support organizations, and is the prime interface on quality matters between GA and the Customer.

2.1.12 The Manager of Quality Systems, reporting to the Director of Quality Assurance, is responsible for company-wide audits, calibration, and QA document control.

2.1.13 The Project Quality Engineer (PQE), reporting to the Manager of Environmental Quality Assurance, works with the Task Leader, and is responsible for implementing and/or monitoring the QA program described in this QAPD. He is independent of the project management, engineering/technical and support organizations, and is the prime interface on quality matters between GA and its subcontractors and suppliers, including B&W and analytical laboratories.

2.1.14 The Waste Certification Official (WCO), reporting to the Manager of Environmental Quality Assurance, has direct access per NVO-325 to the Facility Manager (see Figure 1). He is responsible for assuring that all waste packages and documentation shipped to Nevada Test Site comply with NVO-325 requirements. Specific NVO-325 responsibilities include: signing GA's application certifying that the information is correct and that the waste stream(s) will meet the Nevada Test Site Waste Acceptance Criteria; signing a certification statement, to be included with the shipping papers for each waste shipment, indicating that the shipment meets DOE and EPA requirements per Title 49 CFR 172.204, "Shipper's Certification;" signing the "Radioactive Low-Level Waste Certification Statement," as required in NVO-325; and affixing each waste

container to be shipped to NTS with a signed (stamp is not acceptable) "Packaging Certification" label, (i.e., DOE/NV Form NV-211). The WCO is also responsible for ensuring the performance of internal audits, inspections and surveillances, and for ensuring timely identification of deficiencies and effective corrective action.

2.1.15 The Training Coordinator, reporting to the Manager of Fuel QC, works with the Project Manager and is responsible for maintaining the training matrix for project personnel, as described in Section 4.1.

2.1.16 The Chemistry/Radiochemistry (Bldg. 27) Manager, reporting administratively to the Advanced Technologies Systems Engineering Director, is one of the waste generators on this project and will also provide analytical chemistry support during the waste certification process.

2.2 Authority of QA Personnel

2.2.1 Quality Assurance personnel have sufficient authority, access to work areas, and organizational freedom to: (1) identify quality problems; (2) initiate, recommend, or provide solutions to quality problems through designated channels; (3) verify implementation of solutions; and (4) assure that further processing, delivery, installation, or use is controlled until proper disposition of a nonconformance, deficiency, or unsatisfactory condition has occurred.

2.2.2 Authority to stop work is assigned to the Director of QA and is delegated down through all levels of the QA organization. This authority includes the right to stop or control unsatisfactory work or further processing of unsatisfactory material.

2.2.3 Verification activities performed by personnel who are not part of the formal Quality Assurance organization (that is, they are part of another organization) are subject to direction and/or overview by the Quality Assurance organization.

2.3 External Interfaces

2.3.1 Figure 2 shows the relationship between GA, LITCO, B&W, DOE, the State of California, and the State of Nevada.

2.3.2 DOE-Headquarters has overall authority and responsibility for the project. It will provide overall project direction and policies to DOE offices and LITCO.

2.3.3 DOE-Oakland Operations Office is the cognizant field office for the tasks related to the disposal of the wastes located at GA.

2.3.4 DOE-Idaho Operations Office is the cognizant field office for the tasks related to the wastes located at B&W in Lynchburg, VA.

2.3.5 DOE-Nevada Test Site is the disposal site for the wastes located at GA.

2.3.6 LITCO

2.3.6.1 As prime contractor to DOE, LITCO is responsible for managing the activities at GA and B&W, and for serving the role of an interface between GA and the various DOE Field Elements. The interface activities also include those required by the States of California and Nevada.

2.3.6.2 The LITCO Project Manager is responsible for overall management of the NPR waste disposal project. This responsibility includes being the ultimate point of contact with organizations external to the LITCO project staff and resolving conflicts within and outside of the project organization.

2.3.6.3 All GA correspondence to DOE offices will be channeled through the LITCO Project Manager.

2.3.7 Babcock & Wilcox, under subcontract to GA, is responsible for characterization and disposal of waste generated by B&W during production of NPR fuel.

3. QUALITY ASSURANCE PROGRAM

3.1 The procedures that comprise the GA QA program are contained in the GA Quality Assurance Manual. These procedures comply with ASME NQA-1-1989, "Quality Assurance Program Requirements for Nuclear Facilities," with the NQA-1c-1992 Addenda, including all supplements. Additional quality assurance requirements specific to the NPR-Waste Disposal Project are given in this QAPD. They specifically address contractual QA requirements and applicable requirements of DOE Document NVO-325, "Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements," Revision 1, dated June 1992.

3.2 Detailed instructions for engineering and support organizations are described in the Program/Resource Procedures Manual (PRPM). The PRPM complies with the QAM.

3.3 Detailed instructions for the QA Organization are described in Quality Division Instructions (QDIs). The QDIs comply with the QAM.

3.4 Detailed instructions for Quality Control activities associated with the manufacture of fuel and waste handling are described in Fuel Quality Control Instructions (FQCIs). The FQCIs comply with the QAM.

3.5 Detailed instructions for manufacture of fuel, including waste handling in the manufacturing area, are described in the Fuel Manufacturing Procedures (FMPs). The FMPs comply with the QAM.

3.6 Detailed instructions for project administrative activities are described in the Fuel Project Procedures (FPPs). The FPPs comply with the QAM.

3.7 Detailed instructions for processing and shipping nuclear, hazardous, and mixed waste are described in Nuclear Waste Processing Facility Procedures (NWPFPs). The NWPFPs comply with the QAM.

3.8 QA requirements for packaging radioactive materials, that fall under the requirements of 10CFR71, are given in QAPD-9176-NMS, Packaging Radioactive Materials for Shipment (10CFR71).

3.9 Figure 3 illustrates the relationship of the QA documents applicable to this project. The QAPD does not repeat requirements that are already in the QAM, the PRPM, the QDIs, the FQCIs, the FMPs, the NWPFPs, and/or the FPPs. Procedures, instructions, and other documents used to implement the QA requirements for this project are listed in the Quality Assurance Program Index (QAPI), Table 1. The order of precedence of GA QA documents for the NPR-Waste Disposal Project is this QAPD; the QAM; and the PRPM, QDIs, FQCIs, FMPs, NWPFPs, and FPPs.

3.10 Specific procedures applicable to this project will be listed in GA Document PC-000352, Handling, Disposal, and Storage Plan for the NPR Fuel Program Waste.

4. SPECIFIC QUALITY ASSURANCE REQUIREMENTS

4.1 Indoctrination and Training

4.1.1 Indoctrination and training shall be performed in accordance with QP-2 of the QAM.

K 4.1.2 The GA NPR Waste Disposal Project Manager is responsible for determining the project-specific training requirements for all project personnel. The NWPF Manager is responsible for all training related to operations in the NWPF. Generic training of support personnel (e.g.,

Health Physics and Quality Assurance), is the responsibility of the parent organization. The NPR Waste Project Training Coordinator will be cognizant of all project-specific training requirements for all project personnel.

4.1.3 The extent of indoctrination and training shall be commensurate with the scope, complexity, and nature of the activity with appropriate consideration of the education, experience, and proficiency of the person. Training requirements, and training status for each person, shall
K be recorded on the Waste Yard Training Matrix, Exhibit 1 by the NWPF Training Coordinator. A similar training matrix is maintained separately for project-specific personnel by the NPR Waste Project Training Coordinator.

4.1.4 GA project personnel shall be indoctrinated in the following basic subjects as they relate to the NPR Waste Disposal Project: Radiation Safety Training; task responsibilities and authority; general and specific procedures that apply to assigned work tasks; EPA and state regulations related to hazardous waste activities; and quality assurance program elements as defined by this QAPD. For GA personnel involved in packaging and shipping waste to the NTS, this indoctrination shall be supplemented by training in the "NPR Program, Defense Waste Generator Application." All persons associated with the NVO-325 waste management and certification program, including personnel providing only occasional help, shall be trained to the applicable requirements of NVO-325 on an annual basis.

4.1.5 Training courses in waste certification shall be prepared according to instructions provided or approved by the NWPF Manager. Personnel retraining shall be conducted for each revision of an applicable procedure or annually as a minimum.

K 4.1.6 Records of indoctrination and training activities shall be maintained by the NWPF Training Coordinator for personnel working at the NWPF or the NPR Waste Project Training Coordinator for Bldg. 39 and project-specific personnel. Both training coordinators are appointed by the NFFD Director.

4.1.7 Indoctrination and training shall be documented on attendance sheets, training logs, or personnel training records.

4.1.8 Completed indoctrination and training records shall be submitted to the QA Records Center
K by the Training Coordinators, except that Health Physics Records shall be stored by Health Physics. These records shall be readily available.

4.2 Design Control

4.2.1 Drawings, specifications, and supporting design documents for shipping containers and waste processing activities shall be controlled as design activity documents to the requirements of the QAM, Quality Procedure No. 3 (QP-3), and as described in more detail in the PRPM. Quality Assurance shall review and approve all such documents before they are information-issued (per PRPM EP-4030) or production-released (per PRPM EP-4040).

4.2.2 Design and test documents which are used for design verification activities shall be controlled as Design Verification and Support (DV&S) activity documents to the requirements of the QAM, QP-3, and as described in more detail in the PRPM. Quality Assurance shall review and approve all such documents before they are information-issued (per PRPM EP-4030) or production-released (per PRPM EP-4040).

4.2.3 Development activity test documents which are used in the development of waste process specifications and all documents for non-deliverable equipment shall be controlled as Research and Development (R&D) activity documents to the requirements of the PRPM. Quality Assurance shall review and approve all such documents before they are information-issued (per PRPM EP-4030) or R&D released (per PRPM EP-4060). Activities that are associated strictly with development, not associated with the processing of waste, may be performed to standard GA laboratory practices with the development data recorded in GA laboratory notebooks. Control of GA Laboratory Notebooks to the "general guidelines" provided in Procedure No. CP-203 is required. Where development data in laboratory notebooks contains data which are deliverable, copies of the notebook pages may be provided to complete the deliverable data package.

4.2.4 The Quality Assurance Level (QAL) classification shall be consistent with the QAM and the PRPM. The QAL shall be indicated on all documents that require classification per the PRPM, and shall also be listed in the Engineering Data Base (EDB) maintained by Configuration Management. For 10CFR71 shipping containers, the QALs shall comply with QAPD-9176-NMS. The "Quality Category" system per Issues A through F of this QAPD shall no longer be used. Existing design documents need not be revised only to change the "Quality Category" to "QAL," however, the QAL system shall be implemented beginning with the issue/release of any new or revised design document.

4.2.5 Test plans for this project shall be identified with a document type code of "TSP" (test specification/procedure) and processed as a design document in accordance with PRPM EP-Series 4000.

4.2.6 Changes to design documents shall comply with QP-3 of the QAM and EP-Series 4000 of the PRPM except that changes to released test procedures and to the procedure section of test specifications/procedures (TSPs) may also be made by marking-up and signing the working copy of the test procedure (or the TSP) in accordance with QP-11 of the QAM.

4.2.7 The Design Document system as defined in the PRPM will be used to control computer programs, as stated in Section 4.12.5.

4.3 Procurement Document Control

4.3.1 All product-related Inquiry Requisitions (IRs), Procurement Requisitions (PRs), Service Requests (SRs), Letter Contracts, and Subcontracts shall be reviewed and approved by the PQE or Fuel QC Manager, or their designees, to ensure appropriate technical and quality assurance requirements are included. For the same reason, the technical supervision/management shall review and approve IRs, PRs, and SRs. The QAL shall be noted on the PRs for QAL-I items only, as required by QP-4 of the QAM.

4.3.2 For work subcontracted by GA to outside suppliers, applicable technical and QA requirements consistent with this QAPD shall be specified in the procurement documents.

4.3.3 GA purchase orders for calibration of measuring and test equipment, including radiological survey instruments, shall contain the name and telephone number of the PQE and the following contract clause: "Supplier shall notify the GA PQE, by telephone, if a GA instrument is out-of-tolerance upon receipt."

4.4 Instructions, Procedures and Drawings

4.4.1 Activities affecting quality shall be prescribed by and performed in accordance with documented instructions, procedures, or drawings as required in QP-5 of the QAM. Work instructions and procedures shall clearly prescribe how to perform specific tasks and shall be reviewed and approved prior to use.

4.4.2 This QAPD and other applicable documents listed in Table 1 shall be appropriately revised whenever changes are adopted. In addition, this QAPD shall be reviewed annually to assure that it is kept current with the LITCO contract, NVO-325 and applicable codes, standards, and DOE orders.

4.5 Work Authorizations

4.5.1 GA shall perform work involving radioactive material in accordance with a valid Work Authorization (WA) or Radiological Work Permit (RWP).

4.5.2 Work Authorizations shall be reviewed and approved by the Licensing, Safety and Nuclear Compliance (LSNC) Group in accordance with the Work Authorization approval process. RWPs shall be reviewed and approved by Health Physics.

4.5.3 The Manager of Nuclear Safety shall review all procedures involving potential nuclear criticality concerns. If required, the Criticality and Radiation Safety Committee (CRSC) shall also review the procedures.

4.5.4 GA shall perform work in accordance with a Hazardous Work Authorization (HWA) if the work deals with hazardous chemicals/gases or enough kinetic and/or potential energy that, if inadvertently released, may cause irreversible injury or illness to persons involved.

4.5.5 Hazardous Work Authorizations shall be reviewed and approved by the operating organization's management and GA's Safety Department as described in GA's Accident Prevention Program Manual's "Special Permit Program."

4.6 Document Control

4.6.1 Procedures for control of various documents are listed in Table 1, Requirement No. 6. In addition to the elements identified in the QAM, the FMPs, FQCIs, NWPFPs, and the PRPM, the control system for document preparation, review, approval, and issuance shall include:

- Access by reviewing organizations to pertinent background data or information to assure a complete review.

- Documentation and retention of review comments and resolutions for FMPs, FQCIs, NWPFPs, FPPs, and Project Control documents.

4.6.2 Review and approval requirements for design documents, given in Section EP-Series 4000 of the PRPM, and for project control documents, given in Section PP-2012 of the PRPM, shall be superseded by the requirements given in Table 2.

4.6.3 Receipt acknowledgement and obsolete-document control is required for the QAM, PRPM, QDIs, and this QAPD.

4.6.4 Laboratory notebooks shall be controlled per Company Policy Manual, Procedure CP-203.

4.6.5 FMPs and FQCIs prepared specifically for this project shall be reviewed and approved by the Manager of Environmental Quality Assurance in addition to the regular reviews and approvals called out in FMP-1000 and FQCI-101, respectively.

4.6.6 Documents that require review and approval by the customer shall be handled in accordance with FPP-004, "NPR Fuel Project - Document Transmittal to LITCO."

4.6.7 All released documents will be filed under Project 3632 for continuity and traceability.

4.7 Control of Purchased Items and Services

4.7.1 The procurement of items and services shall be controlled to assure conformance with specified requirements in accordance with QP-7 of the QAM. Such control provides for the following, as appropriate: Source evaluation and selection, evaluation of objective evidence of quality furnished by the supplier, source inspection, audit, and examination of items or services upon delivery or completion.

4.7.2 Certificates of Conformance, if required by GA Quality Assurance for procured items, shall be signed or otherwise authenticated by a person who is responsible for this quality assurance function.

4.7.3 Analytical laboratories shall not be used for performing EPA-required analyses unless they are state-certified and have been evaluated by QA. Further, non-GA laboratories must also be on the non-safety-related QA Approved Suppliers List (ASL).

4.8 Identification and Control of Items

4.8.1 Controls to assure that only correct and accepted items are used or installed and identification of items shall comply with QP-8 of the QAM.

4.8.2 Identification shall be maintained either on the item or in documents traceable to the item, or in a manner which assures that identification is established and maintained.

4.9 Control of Processes

4.9.1 Figures 4 through 6 provide the process flow diagrams for each waste stream. Hold points indicating required inspections are also specified.

4.9.2 GA shall prepare and maintain NWPFPs, FMPs, and FQCIs for processing, neutralizing and solidifying waste and for other activities important to waste certification. The FQCIs, FMPs, and NWPFPs shall provide the specific information required to set up and perform the special processes or activities.

4.9.3 Parameter sheets used on this project shall be prepared and signed by the cognizant engineer, and shall be reviewed and signed by a peer of the cognizant engineer.

4.10 Inspection

4.10.1 Waste processing, packaging, and shipping activities that have acceptance criteria and are performed by QC inspectors, health physics, and Quality Assurance shall be inspected and surveyed to verify conformance to specific requirements. As a minimum, activities specified in

Figures 4 through 6 as critical inspection "hold" points in the certification process will require documented acceptance or rejection.

4.10.2 Personnel selected for performing waste observations, inspections, and radiological surveys shall have experience or training commensurate with the scope, complexity, or special nature of the activity. Inspectors shall be certified in accordance with QDI 2-6, "Inspector Certification." Fuel QC inspection personnel shall also be certified in accordance with FQCI-105, "Fuel Quality Control Personnel Qualification."

4.10.3 Personnel performing inspections shall be independent from the individual or group performing or directly supervising the activity being inspected.

4.10.4 Waste observations, inspections, and radiological surveys shall be planned and specific methods to be used shall be identified.

4.10.5 The results of waste observations, inspections, and radiological surveys shall be documented.

4.10.6 The Waste Observers shall perform 100% in-process visual observations of all waste container loading activities to verify compliance with procedure NVO-325, Section 5.5.1.1, "General Waste Form Criteria." Specifically, LLW shall not exhibit any characteristics of, or be listed as, hazardous waste, as identified in Title 40 CFR 261, "Identification and Listing of Hazardous Waste"; LLW shall not contain free liquids; waste container shall not contain fine particulates unless specially packaged as permitted by NVO-325; waste containers shall not contain compressed gases (e.g., unpunctured aerosol cans); LLW shall have structural stability; LLW shall not contain pathogens, infectious wastes, or other etiological agents as defined in Title 49 CFR 173.386; LLW shall not contain chelating or complexing agents; and LLW shall not contain Polychlorinated Biphenyls (PCBs).

4.10.7 The Quality Control Inspectors shall inspect all waste containers for damage prior to use and after packages have been loaded and shall verify that the containers comply with the requirements of NVO-325, Section 5.5.1.3, "NTS Specific Package Criteria," for closure, strength, handling, size, weight, and loading.

4.10.8 The Quality Control Inspectors shall also verify prior to shipment to NTS that all waste containers meet the following requirements of NVO-325, Section 5.5.1.2, "General Regulatory Waste Package Criteria": Compliance with nuclear safety limits for the quantity of radioactive material, per Title 49 CFR 173.451; compliance with nuclear heating limits, per Title 49 CFR 173. 442; waste containers shall not have external radiation levels exceeding 200 millirem per hour on contact, per Title 49 CFR 173.441; waste containers shall be within DOE external contamination limits, per DOE Order 5480.11; waste containers shall satisfy activity limits, per 49 CFR 173.431, 49 CFR 173.421, and 49 CFR 173.425.

4.10.9 The Waste Certification Official shall verify prior to shipment to the Nevada Test Site that all applicable requirements have been satisfied. A checklist shall be used to document this verification. Specific WCO responsibilities as required by NVO-325, Section 6.2, "Waste Certification Officials, Statements, and Labels," include: Signing GA's application certifying that the information is correct and that the waste stream(s) will meet the Nevada Test Site Waste Acceptance Criteria; signing a certification statement, to be included with the shipping papers for each waste shipment, indicating that the shipment meets DOT and EPA requirements per Title 49 CFR 172.204, "Shipper's Certification;" signing the "Radioactive Low-Level Waste Certification Statement," as required in NVO-325; and affixing each waste container to be shipped to NTS with a signed (stamp is not acceptable) "Packaging Certification" label, (i.e., DOE/NV Form NV-211).

4.11 Source Inspection by LITCO

Waste processing and disposal activity will be subject to LITCO's source inspection. LITCO retains the right to perform any additional source inspection, as may be deemed reasonable in accordance with the contract standard terms and conditions. GA shall notify LITCO at least five working days prior to performance of work requiring a LITCO source inspection.

4.12 Test Control

4.12.1 All design verification tests shall comply with QP-11 of the QAM. Test specifications, procedures, and drawings shall be prepared and released per the PRPM before start of tests.

4.12.2 Development test activities shall be planned and controlled. Prior to starting any development activity, a Test Plan or Test Specification/Procedure shall be prepared and released. Development test activities may be performed to standard GA laboratory practices with the development data recorded in GA laboratory notebooks. Control of GA Laboratory Notebooks to the "general guidelines" provided in Procedure CP-203 is required.

4.12.3 Tests shall be conducted by appropriately trained and qualified personnel.

4.12.4 QAL I scientific and engineering computer programs, if used on this project, shall be controlled in accordance with Procedure EP-4070 of the PRPM.

4.12.5 Non-QAL I computer programs and software utilized in the waste certification process shall be tested and verified in accordance with NQA-1 Requirement 11-S-2. The test requirements for each program shall be documented in a Test Plan (TPL). The verification results shall be documented in a Test Data Report (TDR). The TPL and TDR shall address the applicable requirements of NQA-1, Supplement 11S-2, Section 3 and 5, respectively and shall be R&D released in accordance with Procedure EP-4060 of the PRPM.

4.13 Control Measuring and Test Equipment

4.13.1 Tools, gages, instruments, and other measuring and test equipment used for activities affecting quality shall be controlled, calibrated, and adjusted in accordance with QP-12 of the QAM.

4.13.2 When test and measuring equipment (i.e., health physics survey instruments) are found to be out-of-tolerance by the GA Calibration Lab or outside calibration suppliers, the GA Quality Assurance Project Engineer shall be notified immediately. The GA Quality Assurance Project Engineer is responsible for assuring that an evaluation is performed using a GA Nonconformance Report to control and document the reinspection or resurvey of items that were inspected or surveyed with the specific out-of-tolerance measuring and test equipment.

4.14 Handling, Storage, and Shipping

4.14.1 Radioactive waste shall be processed and packaged for disposal in accordance with the requirements of NVO-325.

4.14.2 Radioactive waste shall be staged in designated controlled areas. Measures shall be implemented in these areas to control the spread of contamination, limit radiation levels, and prevent unauthorized access, unauthorized material removal, tampering, and moisture accumulation.

4.14.3 Packaged radioactive waste shall be transported to an authorized radioactive waste disposal site in accordance with DOT (Title 49 CFR Parts 171-177), NRC (Title 10 CFR), and EPA (Title 40 CFR Parts 262 and 263) regulations and the requirements of NVO-325 and the State of California.

4.14.4 The WCO is responsible for approving all waste shipments to the Nevada Test Site. The Quality Control Inspectors are responsible for assuring that all waste containers shipped to the Nevada Test Site are marked, labeled, and barcoded by NWPF personnel in accordance with NVO-325.

4.14.5 Checklists shall be used by all GA personnel to ensure that each shipment of low-level radioactive waste has been accomplished in accordance with the applicable procedure. Checklists shall identify required activities and the organization(s) responsible for each activity, and shall include a location for sign-off for each activity by the responsible organization(s). Before a radioactive waste shipment can leave the GA site, the checklists for that shipment shall be reviewed for completeness and signed off by the WCO or the Waste Certification Alternate.

4.15 Inspection, Test and Operating Status

4.15.1 Inspection status of purchased and fabricated items shall be indicated with dated stamps and/or tags on the item or documents traceable to the item in accordance with QP-14 of the QAM.

4.15.2 Physical identification and material segregation shall be used to the maximum extent possible to identify and control low-level radioactive, nonradioactive, mixed waste, and hazardous materials and areas.

4.16 Control of Nonconforming Items

4.16.1 Nonconforming and "potentially nonconforming" items shall be identified, tagged, and segregated in accordance with QP-15 of the QAM. Tags shall be prepared in accordance with QP-8 of the QAM and QDI 8-1, "Quality Status Tags." Nonconforming items can be damaged waste containers, nonconforming wastes, nonconforming M&TE, or any out-of-specification or noncompliance item which could adversely affect waste certification.

4.16.2 Nonconformances shall be documented and dispositioned per QP-15 of the QAM and QDI 15-1. The Material Review Board (MRB) shall consist of the Manager of Environmental Quality Assurance (or his designee) who shall act as Chairman of the MRB, the Waste Disposal Task Leader, and, when appropriate, the Manager of NWPF. The MRB may include the Test Engineer, the Manufacturing Engineer, and/or Supplier Representative as nonvoting members.

4.16.3 Nonconformances to design requirements dispositioned "use-as-is" or "repair" shall also be reviewed by the same organizations/individuals who reviewed the original design document. This review shall be documented by signature of these individuals on the Nonconformance Report/Supplier Disposition Request, or on an attachment to these documents.

4.16.4 Deviations from LITCO design or procurement documents shall be documented by GA on a GA Nonconformance Report and on Form LITCO 544, "Supplier's Disposition Request," and submitted to LITCO for disposition.

4.17 Corrective Action

4.17.1 Significant quality problems shall be promptly identified, documented, and corrected in accordance with QP-16 of the QAM. Corrective Action Requests (CARs) are prepared, processed, and closed out in accordance with QDI 16-5, "Corrective Action Request Preparation."

4.17.2 The following conditions shall be considered to be significant quality problems. Failure of responsible organizations to establish and implement appropriate program requirements, plans, or procedures; deficiencies in requirements, plans, or procedures which remain uncorrected after formal reviews (i.e., audits and surveillances); continuing or repetitive procedural deviation, nonconformance, or noncompliance, and the failure of responsible organizations to provide proper direction, overview, and correction; any deficiencies detected after formal review, verification, and acceptance that could have an adverse effect on safety; and failure of responsible organizations to take prompt and effective action to identify and correct deficiencies.

4.17.3 Affected organizations and subcontractors shall be notified of the need for response as to cause, corrective action taken, and action to prevent recurrence.

4.17.4 Action taken shall be followed-up by the Quality Assurance Project Engineer to assess its effectiveness. The follow-up shall be documented and reported to appropriate levels of management, in accordance with QP-16 of the QAM.

4.17.5 Quality information, such as audit reports, surveillance reports, nonconformance reports, corrective action reports, and other deficiency documents, shall be analyzed at least annually to identify quality trends. Quality trends shall be evaluated and significant adverse quality trends shall be reported to the responsible organization for corrective action. Trend reports shall be distributed to upper management per QP-16.

4.18 Control of Records

4.18.1 GA shall collect, index, and store records that demonstrate compliance with waste certification criteria. The types of records required for the project are specified in Table 3, along with the records storage responsibility, and the responsibility for transmitting the records to the organization responsible for storage. The retention period for QA records will be lifetime for microfilm, and ten years from contract completion for original hard copy.

4.18.2 The person/organization responsible for transmitting the records to storage shall assure that the records are accurate, complete, legible, and reproducible; that all changes/corrections are initialed and dated; and that unnecessary documentation such as informal review comments or rough drafts are removed from the records package prior to submittal.

4.18.3 The applicable specifications, procurement documents, test procedures, operational procedures and other documents shall specify the records to be generated, supplied or maintained by or for GA.

4.18.4 During the temporary storage of records in QARC or Vellum Center, while awaiting microfilm processing, the records shall be stored in a container that bears a UL label (or equivalent), certifying one hour fire protection.

4.18.5 Original hard copy quality records requested by LITCO shall be turned over to LITCO after they are microfilmed.

4.19 Audits

4.19.1 The NPR Waste Disposal Project shall be audited by GA QA at least annually in accordance with QP-18 of the QAM. These audits will be supplemented by the annual audits of generic QA controls in the supporting organizations such as Configuration Management, Contracts, Purchasing, QA, and the Power Reactor Group.

4.19.2 GA QA shall also perform a triennial audit and annual evaluation of B&W. The audits and evaluations may be done in conjunction with LITCO.

4.19.3 Analytical laboratories used in the certification process shall be audited annually.

4.20 Surveillances

4.20.1 Surveillances shall be performed by the GA Quality Assurance Project Engineer and by the WCO or their designees typically once a month to assess performance of the GA Waste Certification Program against NVO-325 requirements.

4.20.2 Surveillances shall evaluate activities by personnel from the following GA organizations: Nuclear Waste Processing Facility , Quality Control, Health Physics, Nuclear Material Accountability, and Analytical Chemistry.

4.20.3 Surveillances shall be conducted in accordance with QDI 22-41. Surveillances shall be planned and listed on a surveillance schedule which shall be prepared and updated quarterly by the PQE.

5. QUALITY ASSURANCE RESPONSIBILITIES

5.1 The Quality Assurance organization responsibilities for this project are:

a. Quality assurance program management, which includes defining the QA role, developing schedules, determining manhour needs, maintaining and controlling this QAPD and the included QAPI, managing quality assurance activities, managing/coordinating quality control activities, and interfacing with customers and with suppliers.

b. Project management support, which includes advising on quality-related inquiries from external and internal sources, providing input for responses, participating in the

identification of external interfaces, and reporting the results of QA activities to the project management.

c. Performance of audits, surveillances, and surveys, which includes conducting internal audits to assure compliance with the contract, the CPM, this QAPD, the QAM, and the PRPM; conducting surveillances of on-going activities at GA, its subcontractors and suppliers; conducting audits/surveys of suppliers and subcontractors; approving the resolution of audit deficiencies and associated corrective actions; and maintaining the Approved Suppliers List.

d. Design document review and approval, which includes reviewing documents for conformance with quality requirements, providing quality-related input to those documents, and providing direction for complying with this QAPD, the QAM, and the PRPM to the personnel assigned to this project.

e. Procurement document review and approval, which includes reviewing inquiry requisitions, procurement requisitions, letter contracts, subcontracts, and service requests for conformance with quality requirements, and providing quality-related input to those documents.

f. Verification of compliance with design, procurement, process, and test requirements, which includes inspection of items fabricated in-house or furnished by suppliers; verification of test setups; witnessing of operations and tests; reviewing data for compliance with design drawings, specifications, and procedures.

g. Chairing the Material Review Board (MRB) to disposition nonconformances.

h. Certifying each waste shipment.

i. Other services, which may include dimensional inspection, nondestructive examination, helium leak testing, and calibration of measuring and test equipment.

j. Review, approval, release, distribution, and storage of FMPs, FQCIs, NWPFs, and FPPs.

k. Quality assurance records control, which includes compiling, filing, and maintaining those QA records for which QA has storage responsibility.

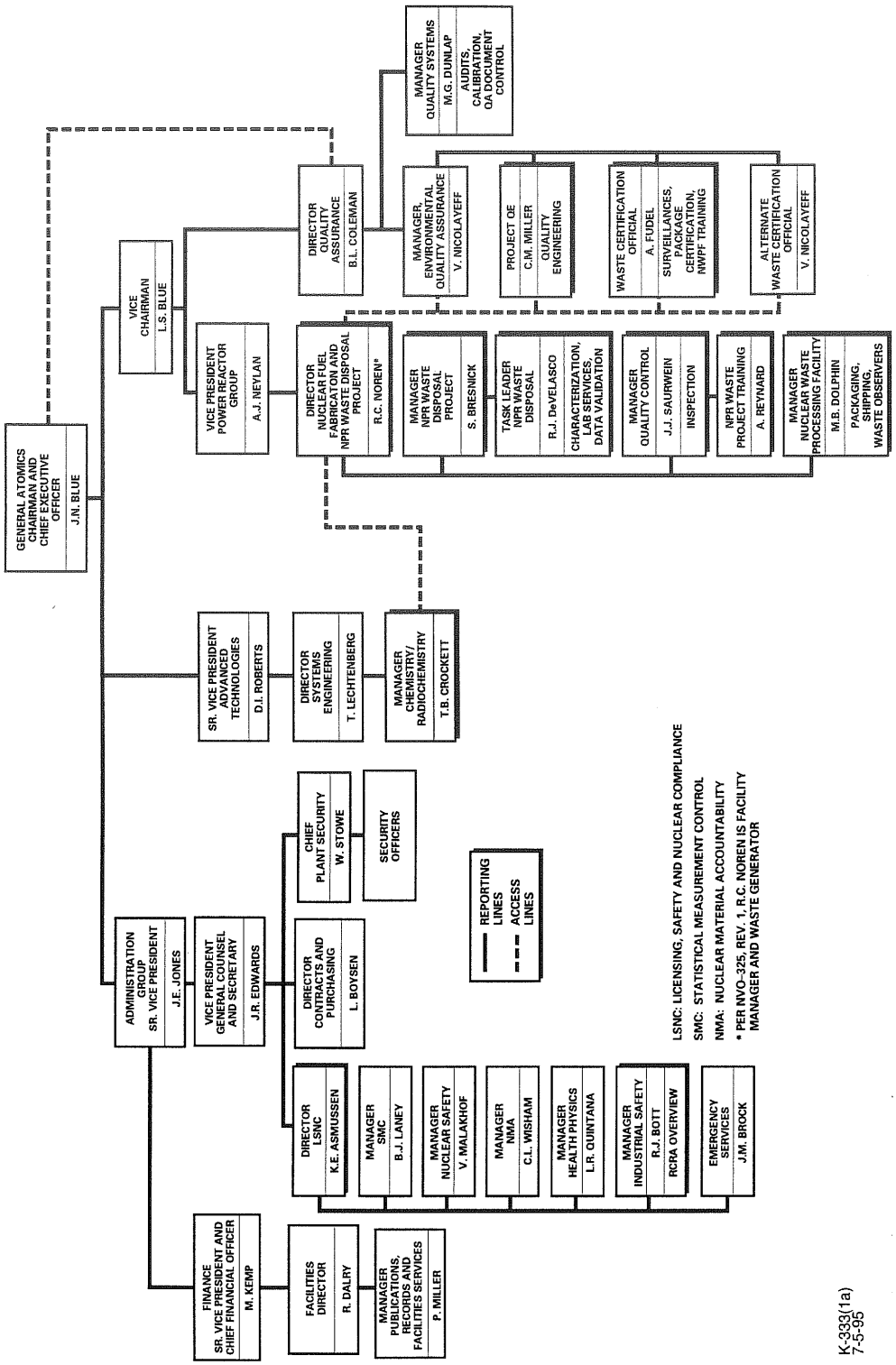

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Fig. 1 - General Atomics Organization for the NPR Waste Disposal Project

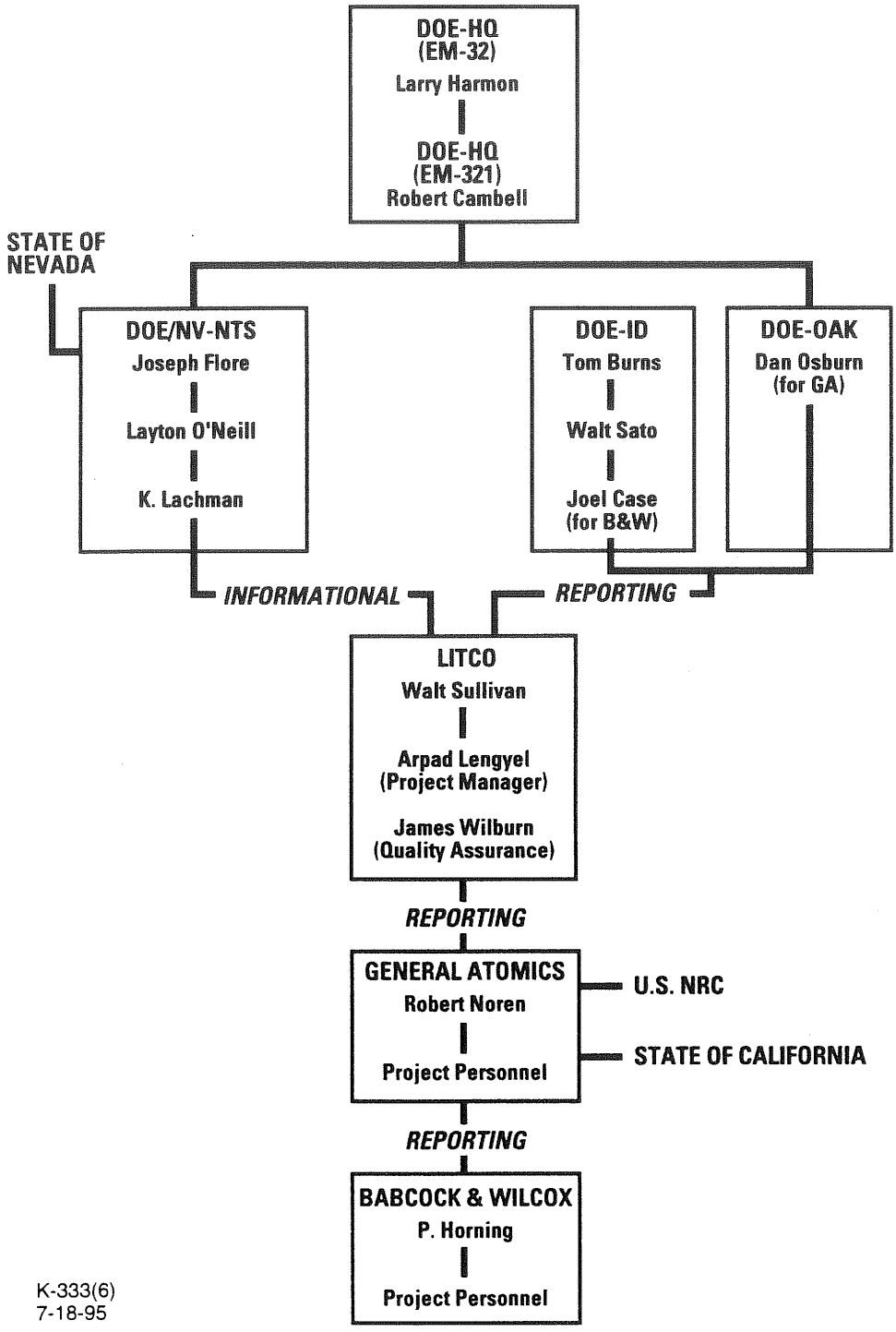

Fig. 2 - External Interfaces for the NPR Waste Disposal Project

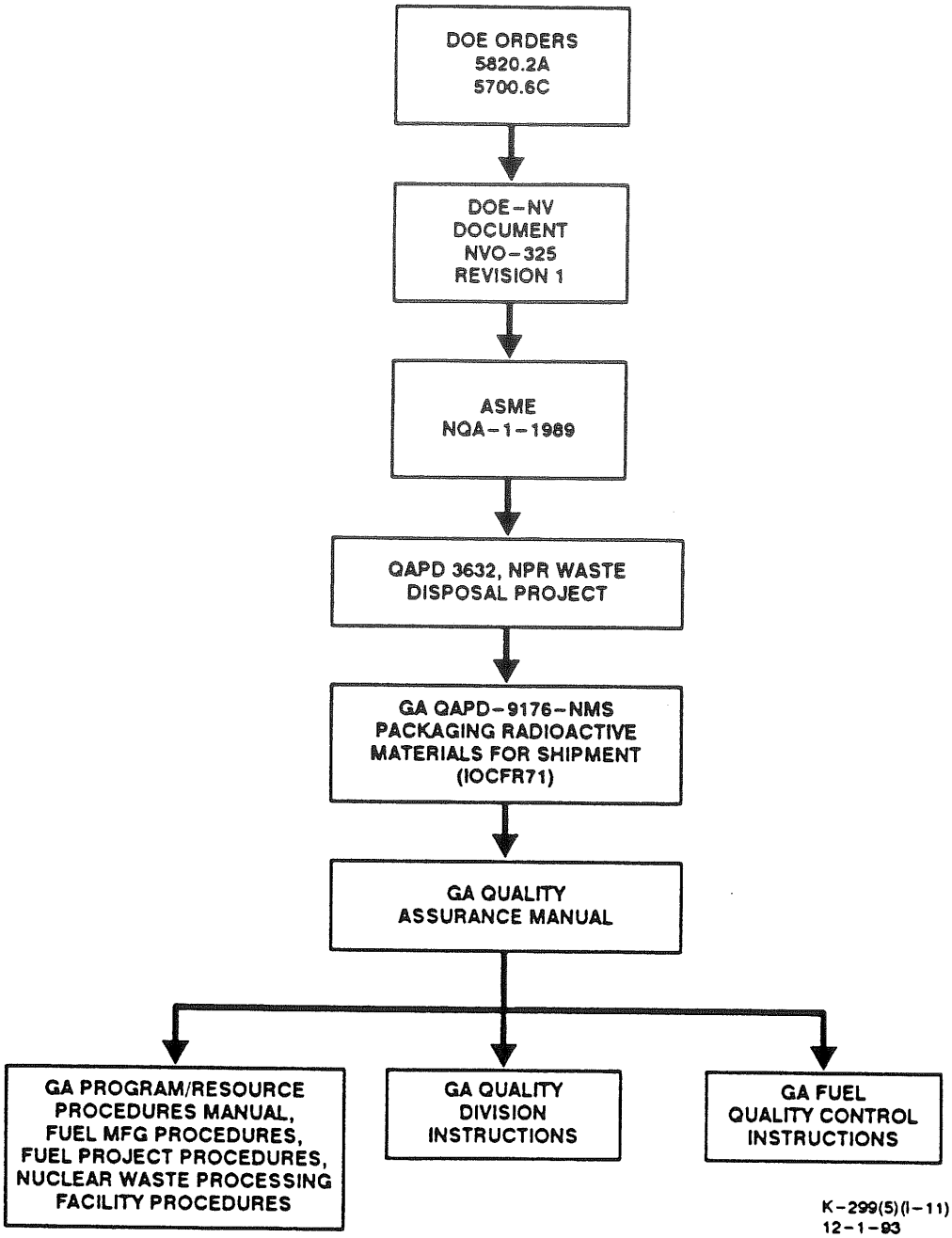

Fig. 3 - Relationship of QA Documents for the NPR Waste Disposal Project

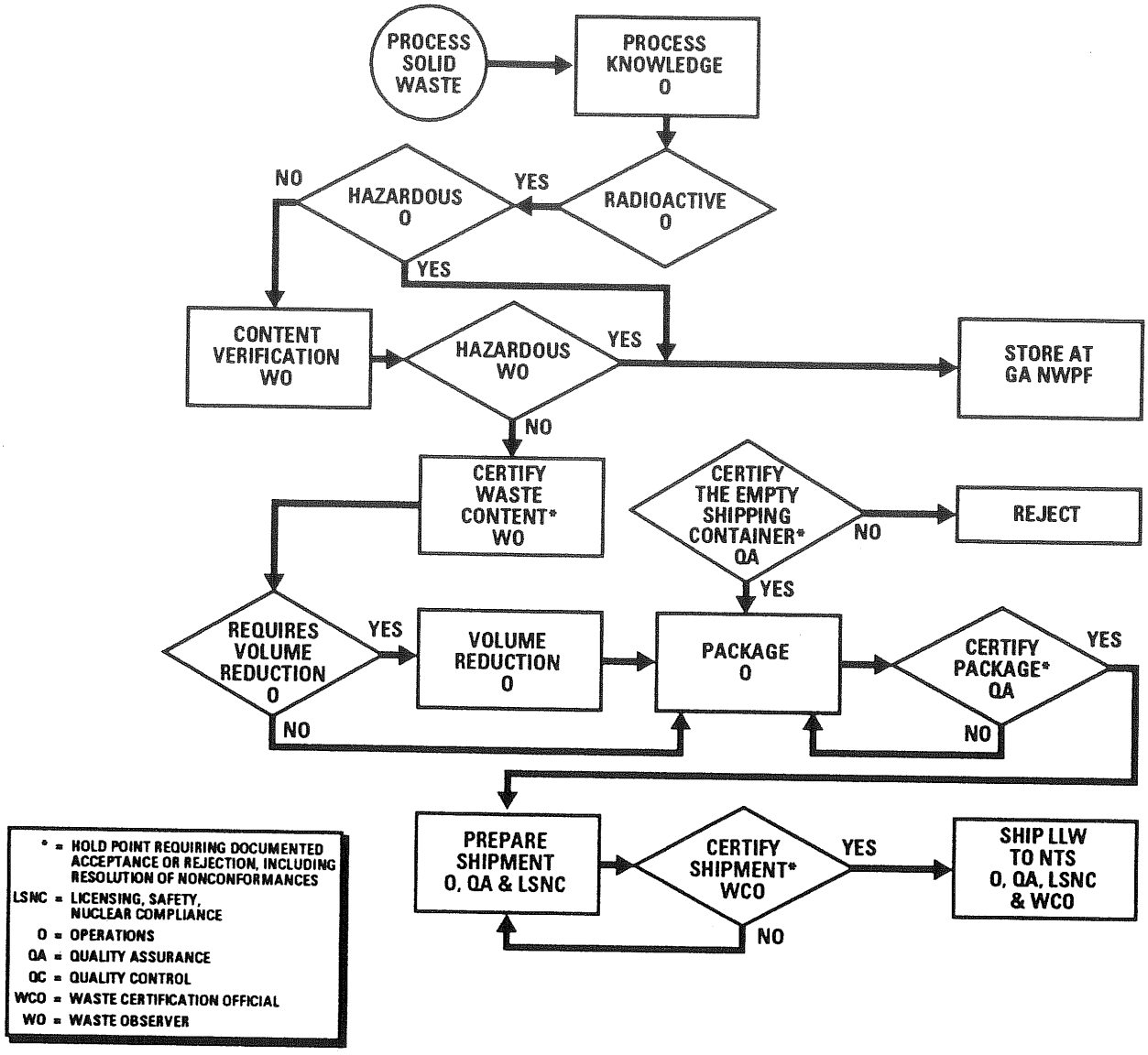

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Fig. 4 - Process Flow Diagram for Solid Waste

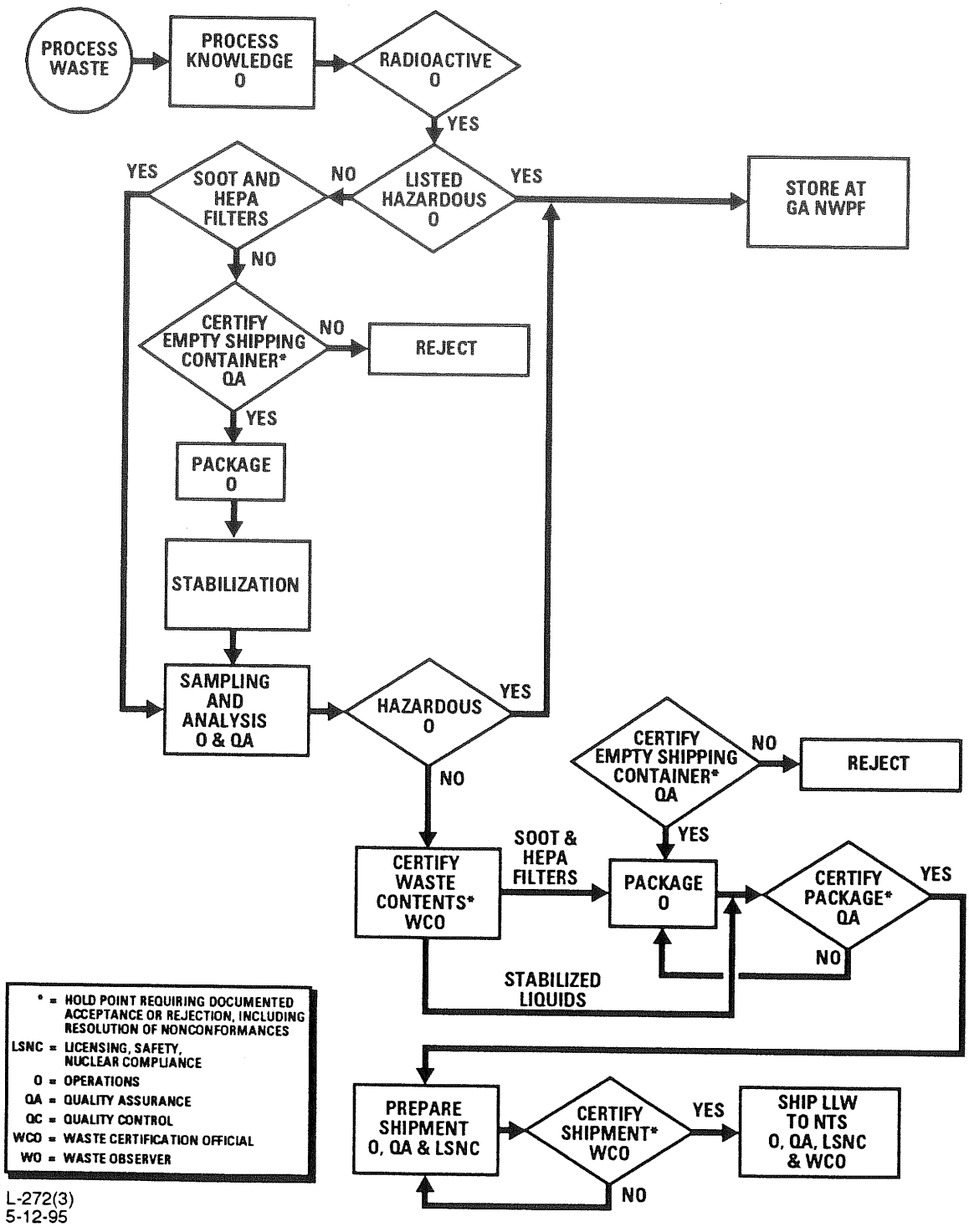

Fig. 5 - Process Flow Diagram for Stabilized Process Liquid Waste

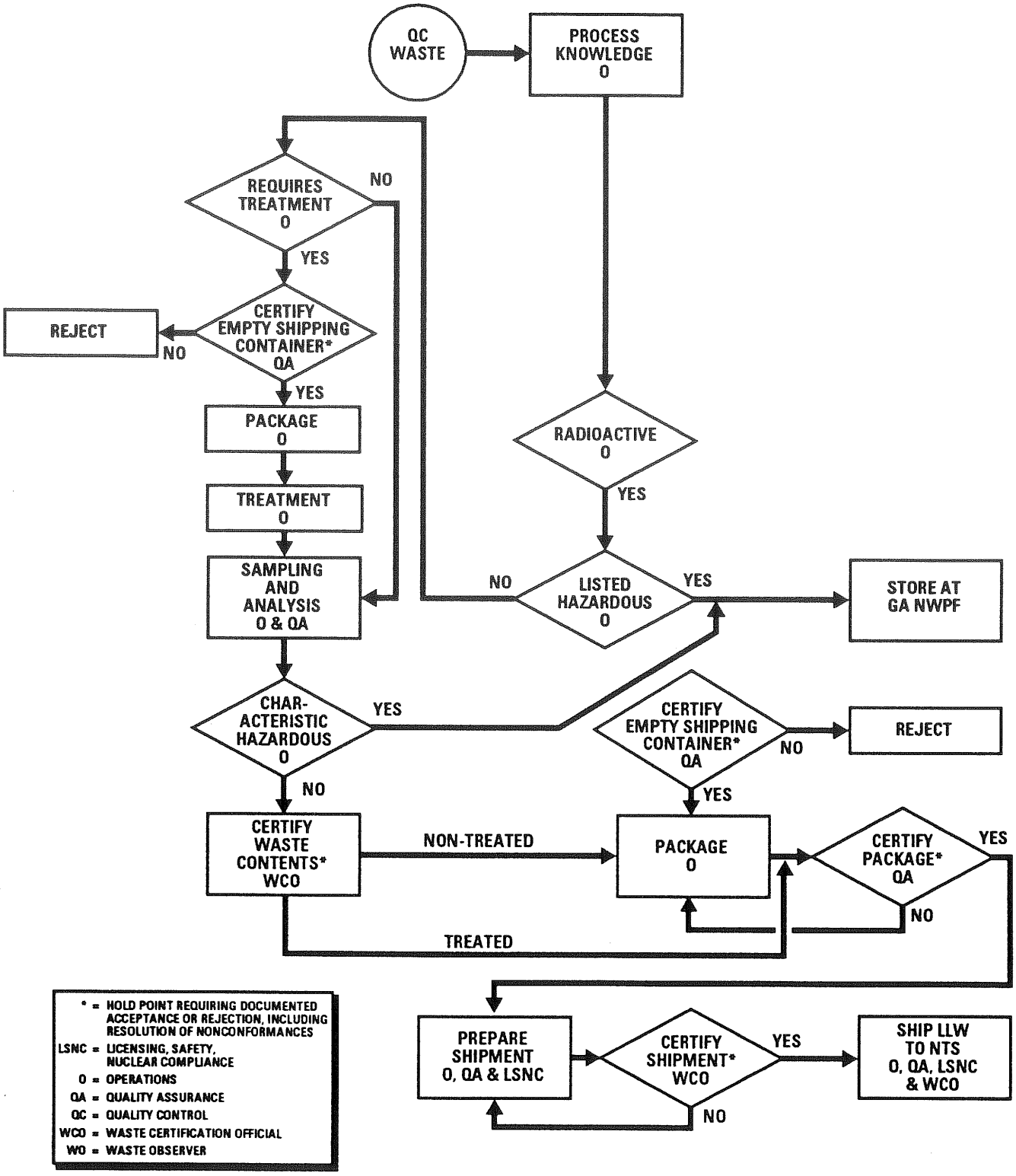

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Fig. 6 - Process Flow Diagram for QC Waste

TABLE 1
QUALITY ASSURANCE PROGRAM INDEX

This Quality Assurance Program Index (QAPI) sets forth the procedures, instructions, and other documents which will be used to implement the Quality Assurance Program for the NPR-Fuel Project.

Definition:

CPM-CP:	Company Policy Manual - Company Policy
QAM-QP:	Quality Assurance Manual - Quality Procedure
QAPD:	Quality Assurance Program Document
PRPM:	Program/Resource Procedures Manual
QDI:	Quality Division Instructions
FPP:	Fuel Project Procedures
FMP:	Fuel Manufacturing Procedures
FQCI:	Fuel Quality Control Instructions
NDE Book:	Nondestructive Examination Operations Book
NWPF-AP:	Nuclear Waste Processing Facility - Administrative Procedure
NWPFP:	Nuclear Waste Processing Facility Procedure

NQA-1 Reqmt. Section	NVO-325 Ap.C Section	Title	QAPD Section	GA Document
1	1	Organization	2	QAM-QP-1
2	2	Quality Assurance Program	3	QAM-QP-2/QDI-2-6, -2-8/PRPM
2	19	Indoctrination and Training	4.1	QAM-QP-2/QDI-2-9,FQCI-105
3	3	Design Control	4.2	QAM-QP-3/PRPM
4	4	Procurement Document Control	4.3	QAM-QP-4/QDI-4-1, -4-2
5	5	Instructions, Procedures, and Drawings	4.4	QAM-QP-5/QDI-5-1
6	6	Document Control	4.6	QAM-QP-6/PRPM/QDI-6-1/FPP-001,004/ FMP-1000/FQCI-101/CPM-CP203/NWPF-AP-1.1
7	7	Control of Purchased Items and Services	4.7	QAM-QP-7/QDI-7-1, -7-2, -7-4, -7-5, -7-7
8	8	Identification and Control of Items	4.8	QAM-QP-8/QDI-8-1, -8-2/FMP/FQCI
9	9	Control of Processes	4.9	QAM-QP-9/QDI/FMP/FQCI/NWPFP
10	10	Inspection	4.10	QAM-QP-10/QDI-10-1, -10-2, -22-41/FQCI/NDE Book
11	11	Test Control	4.12	QAM-QP-11/QDI-11-1/PRPM
12	12	Control of Measuring and Test Equipment	4.13	QAM-QP-12/QDI-12-8/FQCI
13	13	Handling, Storage, and Shipping	4.14	QAM-QP-13/FMP/FQCI/NWPFP

NQA-1 Reqmt. Section	NVO-325 Ap.C Section	Title	QAPD Section	GA Document
14	14	Inspection, Test, and Operating Status	4.15	QAM-QP-14/FMP/FQCI
15	15	Control of Nonconforming Items	4.16	QAM-QP-15/QDI-15-1
16	16	Corrective Action	4.17	QAM-QP-16/QDI-16-5
17	17	Quality Assurance Records	4.18	QAM-QP-17/PRPM/QDI-17-3, -17-5, 17-6, 17-8/FQCI/FMP/NWPFP
18	18	Audits	4.19, 4.20	QAM-QP-18/QDI-18-2, -18-3

TABLE 2
REVIEW AND APPROVAL REQUIREMENTS
FOR DESIGN AND PROJECT CONTROL DOCUMENTS

2.1 Design documents as defined in PRPM, EP-4020. For Information Issue per EP-4030 or Production Release per EP-4040 or R&D Release per EP-4060.

APPROVAL LEVEL	CRITERIA FOR APPROVAL LEVEL ASSIGNMENT	REQUIRED REVIEW AND APPROVAL
1	Not used on this project.	N/A
2	All technical interfaces are intra-division.	Engineer, Task Leader, Project Manager, QA
3	All technical interfaces are intra-company	Engineer, Task Leader, Project Manager, QA
4	Not used on this project.	N/A
5	Has company external technical interfaces or establish criteria for overall performance or major impact on cost, schedule, safety, availability, etc.	Engineer, Task Leader, Project Manager, Project Director, QA

2.2 Project control documents as defined in PRPM PP-2012.

DOCUMENT	CODE	REQUIRED REVIEW AND APPROVAL
Program/Management Plans	PPM	Task Leader, Proj. Manager, Proj. Director, QA
Sampling and Analysis Plans	PTS	Task Leader, Proj. Manager, Proj. Director, QA
General Reports	RGN	Task Leader, Project Manager, QA

TABLE 3
QA RECORD RETENTION RESPONSIBILITIES

Record Type	Record Form (Note 1)	Storage Responsibility	Transmittal to Storage Responsibility
Quality Assurance Program Document	Microfilm	Quality Systems	Quality Systems
Quality Assurance Manual	Microfilm	Quality Systems	Quality Systems
Quality Division Instructions	Microfilm	Quality Systems	Quality Systems
Program/Resource Procedures Manual	Microfilm	Records Management	Program Planning and Scheduling
Design Documents as defined in PRPM, including Review Records	Aperture Cards Microfiche	Records Management	Configuration Management
Project Control Documents as defined in PRPM, including Review Records	Aperture Cards Microfiche	Records Management	Configuration Management
Programmatic Documents including Project/ Organizational Directives and Project-Related Internal and External Correspondence	Microfilm	Records Management	Originator
Progress/Status Reports (as GA Reports)	Microfilm	Records Management	Document Center
Receiving/Source Inspection Plans (Completed) including their associated Data Packages and Procurement Documents (priced or unpriced)	Microfilm	Quality Systems	Cognizant QE
Material Certifications (GA generated)	Microfilm	Quality Systems	Cognizant Quality Engineer
Inspector and Operator Certifications (Note 2)	Original	Quality Systems	Quality Systems
Training and Indoctrination Records (Note 2)	Original	Quality Systems	Training Coordinator
Procurement Documents for Design and/or Testing Services (priced or unpriced)	Microfilm	Quality Systems	Cognizant Quality Engineer
Manufacturing Travelers including Parameter, Run, and Data Sheets and requests for chemical analysis (completed)	Microfilm	Quality Systems	Cognizant Quality Engineer
Fuel Manufacturing Procedures including Review Records	Microfilm	Quality Systems	Cognizant Manufacturing Engineer
Fuel Quality Control instructions including Review Records	Microfilm	Quality Systems	Cognizant QE
NWPF Procedures including Review Records	Microfilm	Quality Systems	Cognizant QE

Record Type	Record Form (Note 1)	Storage Responsibility	Transmittal to Storage Responsibility
Fuel Project Procedures including Review Records	Microfilm	Quality Systems	Cognizant QE
NDE Reports (completed)	Microfilm	Quality Systems	Cognizant QE
Inspection Plans (completed)	Microfilm	Quality Systems	Cognizant QE
Nonconformance Reports and Supplier Disposition Requests including LITCO Supplier Disposition Requests (completed)	Microfilm	Quality Systems	Cognizant QE
Calibration Procedures	Microfilm	Quality Systems	Cognizant QE
Test Data	Microfilm (Note 3)	Quality Systems	Cognizant QE
QA Work Releases	Microfilm	Quality Systems	Cognizant QE
Laboratory Notebooks	Microfilm	Quality Systems	Cognizant Researcher
Surveillance Plans and Reports	Microfilm	Quality Systems	Cognizant QE
QA Audit Reports	Microfilm	Quality Systems	Quality Systems
Corrective Action Requests (completed)	Microfilm	Quality Systems	Quality Systems
Evaluation of Suppliers	Microfilm	Quality Systems	Quality Systems
Waste Shipment Folders (Note 4)	Microfilm	Quality Systems	Manager NWPF

Notes:

1. All microfilm records shall be lifetime. Original hard copy of microfilmed records shall be kept at least 10 years after end of contract unless turned over sooner to LITCO.
2. Except for Health Physics records which shall be stored by Health Physics in accordance with Health Physics procedures.
3. In the case of computer-generated data, the storage media may be discs, tapes, or other suitable media.
4. Records contained in shipment document folders are listed in NWPF-WI-3.41, Para. 7.5.2.

Waste Yard Training Matrix

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	QAM	(NWPF) QAPD 9176	QAPD 9445		NVO 325 (1 yr exp)	0063-4 WHC-EP (Fam.)	173-303 WAC-1 (Fam.)	173-303 WAC-1 (Work-shop)	HS-V 0010 2/11/93			
Rev/Issue Date	C	I	N. Rels		Rev. 1	Rev.3	3/7/91	4/18/95	C			
BENNETT, J.	N/R	7/22/93			*	*	7/22/93	4/18/95	N/R			
COWAN, S.	N/R	4/7/95			4/7/95	6/26/95	4/14/95	N/R	N/R			
CZECHOWICZ, D.	N/R	N/R				N/R	N/R	N/R	N/R			
DE VELASCO, R.	N/R	N/R			3/22/95	N/R	6/1/94	N/R	N/R			
DOLPHIN, M.	5/31/94	7/18/93			7/22/94	7/14/95	3/18/93	4/18/95	4/21/93			
FUDEL, A.	1/20/94	7/21/93				6/25/95	7/15/93	4/18/95	6/21/93			
HOCHBRUECKNER, M.	N/R	6/1/94			7/28/94	7/14/95	7/26/93	4/18/95	7/22/93			
KETTERER, J.	N/R	N/R			7/28/94	N/R	N/R	N/R	N/R			
KOZUMA, E	N/R	7/22/93				7/14/95	N/R	N/R	N/R			
MILLER, C.M.	12/14/93	5/11/93			7/28/94		7/21/94	N/R	8/5/94			
NICOLAYEFF, V.	2/1/94	5/11/93				6/22/95	7/16/93	4/18/95	N/R			
NOREN, R.	N/R	N/R			8/8/94	N/R	N/R	N/R	N/R			
RUDGERS, E.	N/R	7/26/94			7/28/94		7/20/94	N/R	N/R			
RUIZ, B.	N/R	7/22/93				7/10/95	7/14/93	4/18/95	N/R			
SAURWEIN, .	1/20/94	N/R			7/21/94	7/6/95	N/R	N/R	N/R			
WELDON, T.	11/3/94	11/23/94			7/22/94	7/6/95	7/20/94	N/R	N/R			

*Training required when utilized

EXHIBIT 1 - Project 3974 Training Matrix

APPENDIX 1

ABBREVIATIONS AND ACRONYMS

ASME	=	American Society of Mechanical Engineers
B&W	=	Babcock & Wilcox (facilities in Lynchburg, VA)
CAR	=	Corrective Action Request
CFR	=	Code of Federal Regulations
CP	=	Company Procedures in GA CPM
CPM	=	GA Company Policy Manual
CRSC	=	Criticality and Radiation Safety Committee
DOE	=	U.S. Department of Energy
DOE-HQ	=	Headquarters of DOE
DOE-ID	=	Idaho Operations Office of DOE
DOE-NV	=	Nevada Field Office of DOE
DOE-OAK	=	Oakland Operations Office of DOE
DOT	=	U.S. Department of Transportation
DV&S	=	Design Verification and Support
EDB	=	GA Engineering Data Base
EP	=	Engineering Procedure in GA PRPM
EPA	=	U.S. Environmental Protection Agency
FMP	=	GA Fuel Manufacturing Procedures
FPP	=	GA Fuel Project Procedures
FQCI	=	GA Fuel Quality Control Instructions
GA	=	General Atomics (facilities in La Jolla, CA)
HP	=	Health Physics
HTGR	=	High Temperature Gas-Cooled Reactor
INEL	=	Idaho National Engineering Laboratory
IR	=	Inquiry Requisition
LLW	=	Low-Level (Radioactive) Waste
LSNC	=	GA Licensing, Safety, and Nuclear Compliance Division
M&TE	=	Measuring and Test Equipment
MRB	=	Material Review Board
MW	=	Mixed Waste
NDE	=	Nondestructive Examination
NMS	=	Nuclear Materials Shipping
NP	=	Nuclear Programs (branch of DOE)
NP-MHTGR	=	New Production-Modular High Temperature Gas-Cooled Reactor
NPR	=	New Production Reactor
NQA	=	Nuclear Quality Assurance
NRC	=	U.S. Nuclear Regulatory Commission
NRT	=	Nuclear Remediation Technologies
NTS	-	Nevada Test Site

APPENDIX 1 (Cont'd)

ABBREVIATIONS AND ACRONYMS

NVO	=	(DOE) Nevada Field Office
NWPF	=	GA Nuclear Waste Processing Facility
NWPFP	=	GA Nuclear Waste Processing Facility Procedures
PCBS	=	Polychlorinated Biphenyls
PQE	=	Project Quality Engineer
PR	=	Procurement Requisition
PRPM	=	GA Program/Resource Procedures Manual
QA	=	Quality Assurance
QAL	=	Quality Assurance Level
QAM	=	GA Quality Assurance Manual
QAPD	=	Quality Assurance Program Document
QAPI	=	Quality Assurance Program Index
QARC	=	GA Quality Assurance Records Center
QC	=	Quality Control
QDI	=	GA Quality Division Instructions
QE	=	Quality Engineer
QP	=	Quality Procedure in QAM
R&D	=	Research and Development
RWP	=	Radiological Work Permit
SNM	=	Special Nuclear Material: Plutonium Isotopes and U-235 and U-238
SR	=	Service Request
UL	=	Underwriters Laboratory
WA	=	Work Authorization
WCO	=	Waste Certification Official

PC-000375/3

NPR PROGRAM DEFENSE WASTE GENERATOR APPLICATION

APPENDIX B

SAMPLING AND ANALYSIS PLAN FOR NPR QC WASTE

Prepared for
Nevada Test Site

July 1995

GENERAL ATOMICS

GENERAL ATOMICS

GA 2175 (REV. 9'89)

PROJECT CONTROL ISSUE SUMMARY

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CONTINUE ON GA FORM 2175-1

*See list of effective pages

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GA 2175—1 (REV. 9/89)

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SAMPLING AND ANALYSIS PLAN FOR NPR QC WASTE

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TABLES

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ACRONYMS AND ABBREVIATIONS

ACD:CA	Analytical Chemistry Department: Chemical Analysis
ACD:RC	Analytical Chemistry Department: Radiochemistry
B&W	Babcock & Wilcox
CA-HWCL	California Hazardous Waste Control Laws
CA-HWMR	California Hazardous Waste Management Regulations
CCR	California Code of Regulations
CFR	Code of Federal Regulations
Cs	Cesium
FMP	Fuel Manufacturing Procedure
FPP	Fuel Project Procedure
FQCI	Fuel Quality Control Instruction
GA	General Atomics
HCl	Hydrochloric Acid
HEU	Highly Enriched Uranium
Hg	Mercury
HNO_3	Nitric Acid
LITCO	Lockheed Idaho Technologies Co.
LLW	Low-Level Waste
LMW	Listed Mixed Waste
MHTGR	Modular High Temperature Gas-Cooled Reactor
MSDS	Material Safety Data Sheet
NP	New Production
NPR	New Production Reactor
NTS	Nevada Test Site

ACRONYMS AND ABBREVIATIONS (Cont'd)

NVO-325	Nevada Test Site Defense Waste Acceptance Criteria, Certification and Transfer Requirements, Rev. 1, June 1992
NWPF	Nuclear Waste Processing Facility
ORNL	Oak Ridge National Laboratory
PCBs	Polychlorinated Biphenyls
PTF	Performance Test Fuel
QA	Quality Assurance
QC	Quality Control
RMTR	Radioactive Material Transfer Request
SAP	Sampling and Analysis Plan
SiC	Silicon Carbide
STLC	Soluble Threshold Limit Concentration
TCLP	Toxicity Characteristic Leaching Procedure
TKF	TRIGA King Furnace
TRISO	Multilayer Fuel Particle Coating Consisting of Pyrolytic Carbon and Silicon Carbide
TTLC	Total Threshold Limit Concentration
U	Uranium
UCO	Uranium Oxycarbide
WET	Waste Extraction Test

DEFINITIONS

Aliquot	Extracted volume of an aqueous solution that has chemical composition representative of the solution.
Characteristic Mixed Waste	Waste that contains radioactivity and exhibits any of the four characteristics defined in the California Code of Regulations, Title 22, section 22-66261.20 to 22-66261.24: ignitability, corrosivity, reactivity, toxicity.
Chelating agent	Chemical molecules possessing a heterocyclic ring containing a metal ion attached to at least two nonmetal ions in the same molecule. When chelating agents bind and attach to heavy metals, fixed heavy metals can become mobile and migrate into the environment. Chelating agents are commonly used to render otherwise water-insoluble compounds soluble in water.
Etiological agent	A substance that has potential to cause disease or medical disorder.
Field blank	An analytical chemistry blank measurement of deionized water that is poured into the field sample container used for sample collection and analyzed.
Listed Mixed Waste	Waste that contains radioactivity and also one or more of the hazardous substances listed in the California Code of Regulations, Title 22, Chapter 11, Article 4 (22-66261.30 to 22-66261.33).
Low-Level Radioactive Waste	Waste that contains radioactivity and is not classified as high-level waste, transuranic waste, or spent nuclear fuel or byproduct material, as defined by Department of Energy (DOE) Order 5820.2A. Test specimens of fissionable material irradiated for research and development only and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic is less than 100 nCi/g.
Matrix spikes	An aliquot of an investigative sample that is fortified (spiked) with the analytes of interest and analyzed with the associated sample batch .
Mixed Waste	Mixed waste is defined as waste containing both radioactive and hazardous components as defined by the Atomic Energy Act and the Resource Conservation and Recovery Act (RCRA) respectively.
Rinsate blank	An analytical chemistry blank measurement of deionized water that is poured over decontaminated sampling equipment and collected in a sampling container.
Stabilization	Solidification of waste to immobilize hazardous substances, eliminate the presence of free liquids, and give the waste structural stability.
Waste substream	A subdivision of a major waste stream. For example, the Davies-Gray waste substream is a subdivision of the QC laboratory waste stream.

Abstract

This Sampling and Analysis Plan provides background information for waste substreams generated by the QC laboratory during the testing of nuclear fuel specimens fabricated for the NPR Program. These waste substreams are likely to be categorized as low-level waste and will be disposed at the Nevada Test Site. Any waste substream that proves to be mixed waste will be stored at GA until it is sent to another DOE facility for treatment and disposal.

This Sampling and Analysis Plan also provides guidance and instructions for the acquisition and analysis of representative samples from solid and stabilized QC lab waste substreams. The objective of this plan is the acquisition of representative analytical data for the QC waste in the practical form that will be shipped to the NTS. This will verify that QC waste meets Federal and State requirements, and requirements of NVO-325, and that it can be shipped to the NTS.

1.0 Project Description

1.1 General Overview

The New Production-Modular High Temperature Gas-Cooled Reactor (NP-MHTGR) Fuel Development Program generated several waste streams during kernel, coating, and compact manufacturing and process development. This sampling and analysis plan (SAP) is specific for waste substreams originating in General Atomics' QC Laboratory. The QC Laboratory is the Fuel Quality Control Laboratory located in Building 39. The QC Laboratory tests as-fabricated quality of representative samples of fuel by various characterization methods. All waste substreams addressed in this SAP were generated solely in the QC Laboratory, with the exception of Hg contaminated particles/kernels. The Hg contaminated particles/kernels were then transferred to the Analytical Chemistry Laboratory, Building 27, where Hg was recovered from the particles/kernels for recycling. The QC waste substreams described in this SAP are:

Uranium oxycarbide kernels and particles
Solid porosimetry-related waste from mercury recycling
Davies-Gray acids
Used radiography developing solutions
Vacuum pump oil
Biodegradable detergent

Other QC laboratory waste substreams that process knowledge indicates are listed mixed waste (LMW) are not covered by this sampling and analysis plan (Ref. 1).

This sampling and analysis plan was developed to provide supporting data to meet the waste characterization requirements of NVO-325 (Ref. 2), Title 22 of the California Code of Regulations (CCR) 66265.13 (Ref. 3), and the waste analysis requirements related to the land disposal restrictions in CCR, Title 22, 66268.7, 66268.9, and 66268.50 as they apply to generators of hazardous waste. This information is required to assure that the waste is properly stored, treated, and disposed in accordance with land disposal restrictions.

Representative samples will be taken from each stabilized waste substream in accordance with this plan. The data generated in this sampling effort will establish the proper storage, disposal, and/or treatment per the Resource Conservation and Recovery Act (RCRA) as amended (Ref. 4), Federal Regulations contained in 40 CFR 260 to 272 (Ref. 1), California Hazardous Waste Control Laws (CA-HWCL), and California Hazardous Waste Management Regulations (CA-HWMR) as contained in CCR, Title 22, 66260-66272 (Ref. 3).

1.2 Description of Site

1.2.1 General Atomics Building 27

The Analytical Chemistry Laboratory housed in Building 27 was used for mercury (Hg) recovery from kernels/particles that were impregnated with Hg during QC testing. After Hg recovery was complete the kernels/particles were transferred to the GA NWPF (Nuclear Waste Processing Facility). Figure 1 is a schematic drawing of Building 27.

1.2.2 General Atomics Building 39

The QC Laboratory is housed in Building 39. Figure 2 is a schematic drawing of this building.

1.2.3 General Atomics Nuclear Waste Processing Facility

All QC waste substreams described in this SAP are currently in the GA NWPF. Figure 3 is a schematic showing the NWPF. These waste substreams will be characterized by process knowledge and analysis, stabilized (where required), then sampled and analyzed as required for hazardous components prior to final packaging for shipment to the disposal site. The following indicates the sampling point, number of containers, and number of samples for the stabilized QC waste substreams housed at the NWPF.

QC Lab Waste Substream	Location/ Sampling Pt.	# Containers	# Samples
Uranium oxycarbide kernels/particles	NWPF	2	1
Solid porosimetry-related waste from Hg recycling	NWPF	5	5
Davies-Gray waste	NWPF	4	2
Used radiography developing solutions	NWPF	1	1
Vacuum pump oil	NWPF	1	1
Biodegradable detergent	NWPF	1	1

1.3 Sampling and Analysis Schedule

Projected milestones for this SAP after completion of the QC waste stabilization is presented below. This schedule applies to each waste substream.

Milestones	Completion Time (working days)
Completion of Stabilization	---
Complete Sample Collection & Shipment	10 days after completing stabilization
Complete Sample Analysis	40 days after completing stabilization
Complete Data Review	55 days after completing stabilization
Submit Waste Characterization Report to LITCO	80 days after completing stabilization

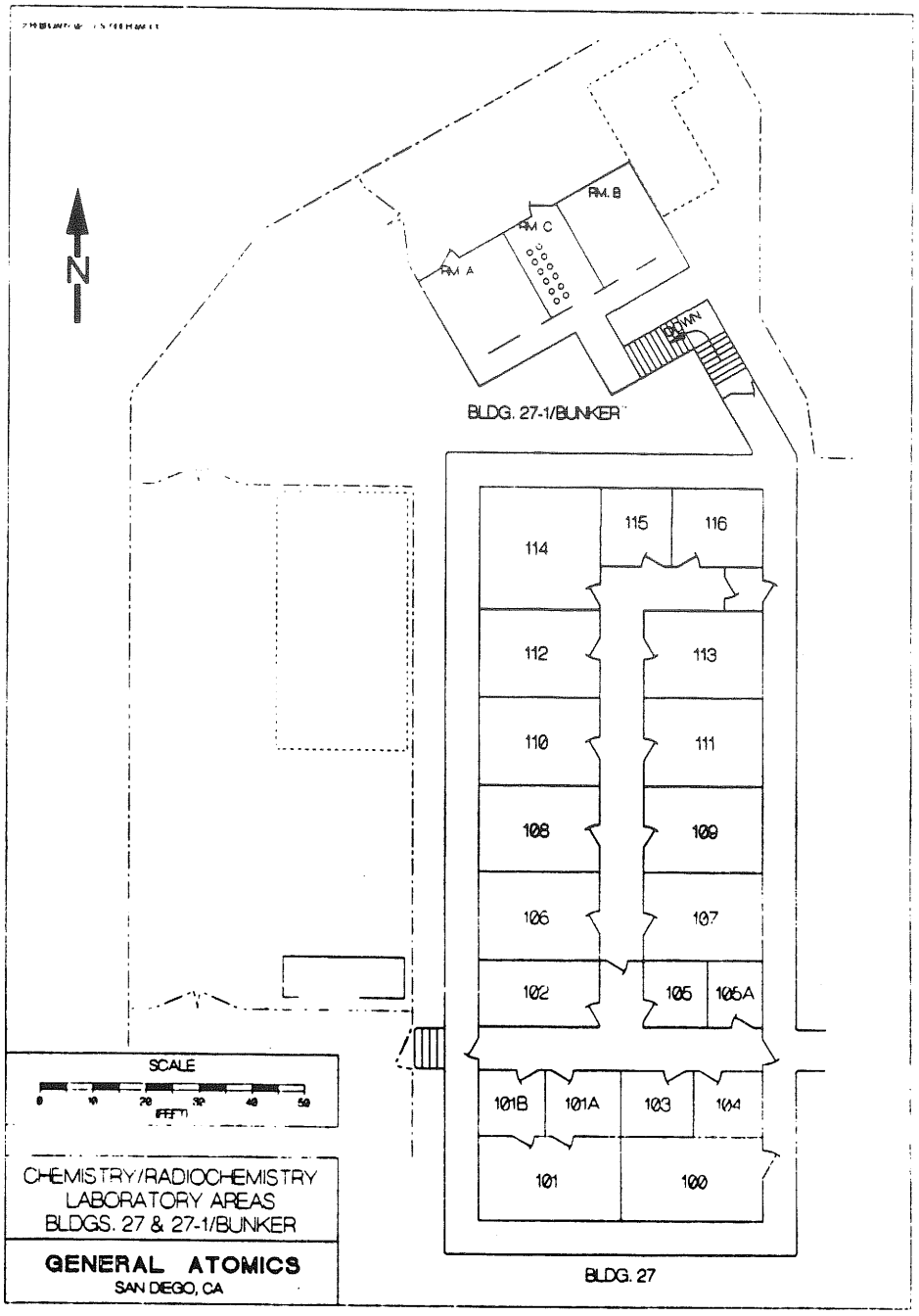

Fig. 1 Schematic of Building 27

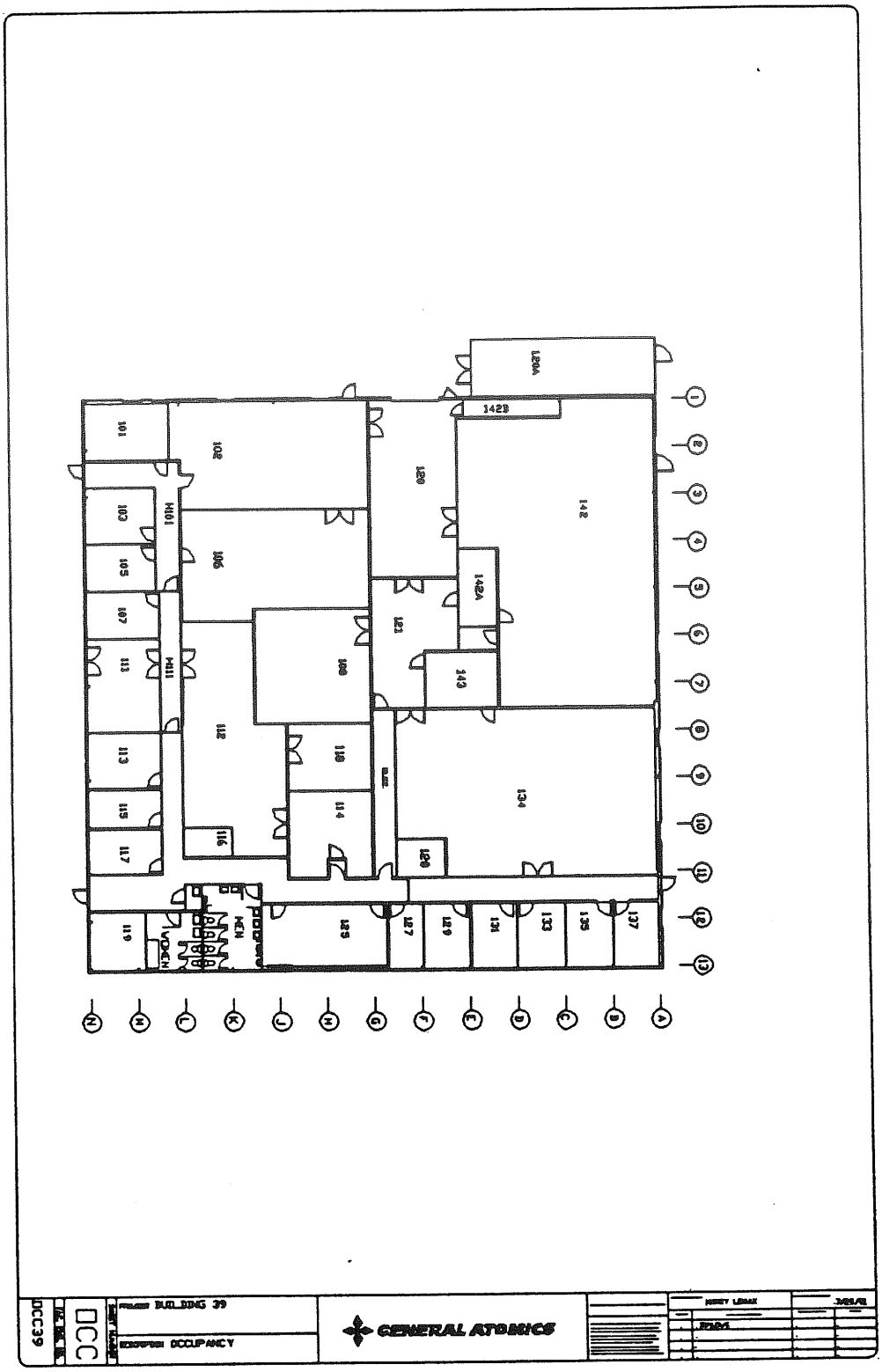

Fig. 2 Schematic of Building 39

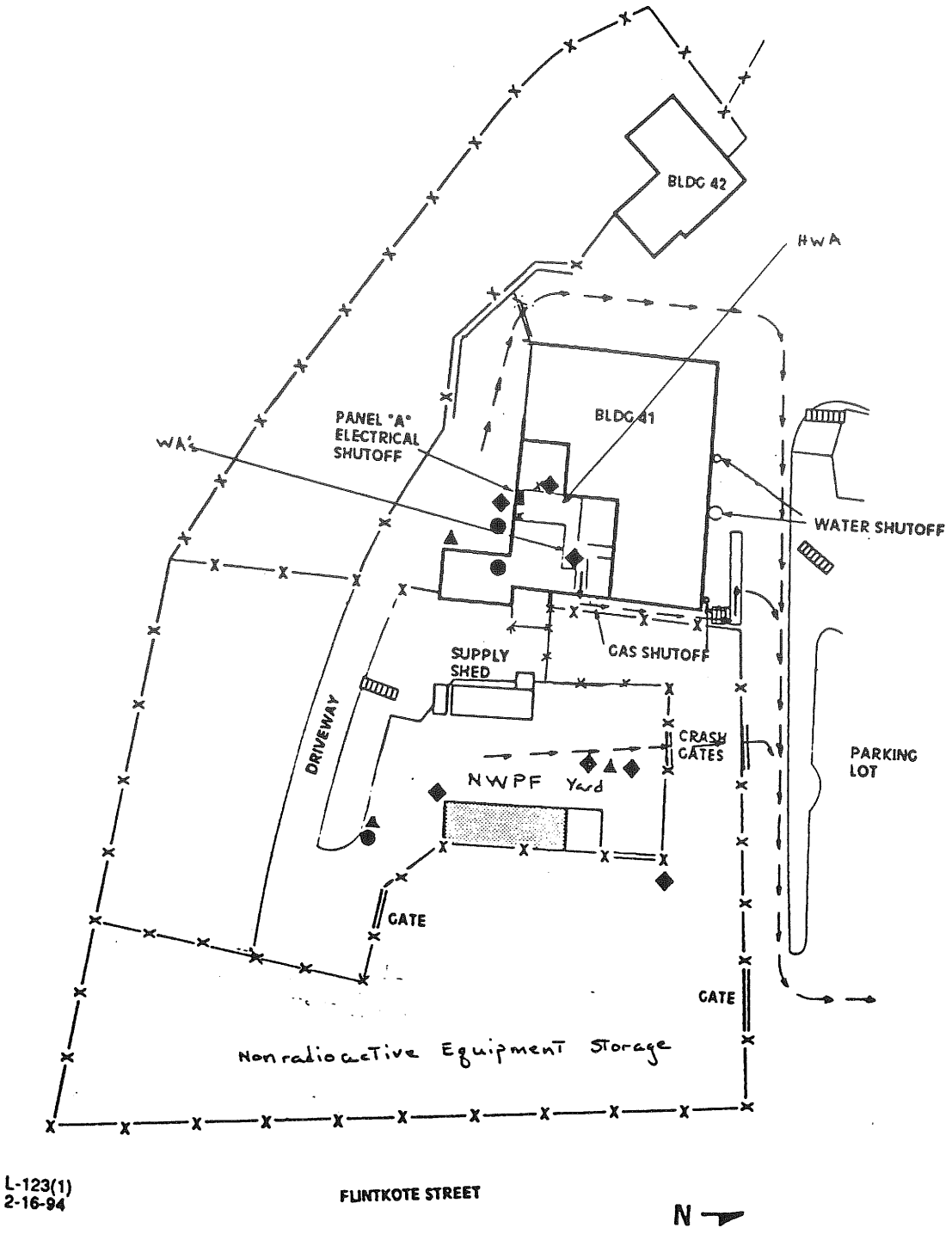

Fig. 3 Schematic of Nuclear Waste Processing Facility

1.4 Identification of Types of Waste to be Evaluated

1.4.1 Uranium Oxycarbide Kernels and Particles

This waste substream consists of two containers of uranium oxycarbide (UCO) kernels and fuel particles generated by the Quality Control (QC) laboratory. These particles are samples of fuel kernels/particles which were analyzed for density and microporosity by mercury porosimetry. Particles after analysis contain a significant amount of mercury. Kernels and particles in this waste stream have been subjected to the mercury recovery process per procedure ACD:CA-114, "Mercury Recovery" (Ref. 5). One container has 100 gm. of 93% enriched U-235 particles. The second container has 150 gm. of depleted uranium particles. Except for possible mercury (Hg) contamination, these particles are well characterized in terms of chemical composition, based on work done during the NPR fuel development program (Refs. 6-9).

The waste consists of solid fuel kernels and TRISO coated particles. TRISO coated particles consist of:

a) Kernels

Kernels are the inner core of the particles. Kernels are uranium oxycarbide (UCO) ceramic spheres with a diameter of approximately 200 μm and a composition mole ratio of approximately $U_{1.0}\ O_{1.6}\ C_{0.4}$. Kernels have a density of ≈ 10.3 g/cc.

Kernels are made from high purity reagent grade raw materials under controlled conditions and following approved procedures. The kernels were produced either at Babcock & Wilcox or at General Atomics (Refs. 10-16). Table 1 lists the procedures used during kernel manufacturing at General Atomics. The original raw materials are UO_3, polyvinyl alcohol, nitric acid, and ammonia. A high temperature calcining/sintering process evaporates/ decomposes the original raw material to yield solid, ceramic, high density UCO kernels. The only significant impurity is iron, which is not a hazardous material.

Table 1
Kernel Manufacturing Procedures

FMP No.	Title
1020	Kernel Dryer Operation (Ref. 10)
1030	Calciner Furnace Operation (Ref. 11)
1040	Sintering Furnace Operation (Ref. 12)
1050	Broth Manufacture (Ref. 13)
1060	UNH Manufacture (Ref. 14)
1070	Kernel and Particle Tabling System (Ref. 15)
1080	NPR Kernel Forming Column (Ref. 16)

b) Buffer and Inner Pyrocarbon Coatings

Kernels are coated with a low density pyrocarbon (buffer) that is surrounded by a high density inner pyrocarbon layer termed IPyC. These two coatings are applied by thermal decomposition of acetylene and propylene in the absence of oxygen. Gases used in this process are high purity reagent grade. Procedures used to apply these coatings are FMP-1105, "NP-MHTGR 240 mm Development Coater Operating Procedure" (Ref. 17), and FMP-1221, "Particle Buffer Coating" (Ref. 18).

c) SiC Layer

The IPyC layer is coated with SiC deposited by thermal decomposition of methyltrichlorosilane in the presence of hydrogen per FMP-1223, "Particle Silicon Carbide Coating" (Ref. 19) and FMP-1105, "NP-MHTGR 240 mm Development Coater Operating Procedure" (Ref. 17). The raw materials are high purity reagent grade.

d) Outer Pyrocarbon and Protective Coating

After the particles have the SiC layer, they are coated with a high density outer pyrocarbon (OPyC) and a low density pyrocarbon (protective coating, or PPyC) per FMP-1224, "Particle Outer LTI Coating" (Ref. 20), and FMP-1225, "Particle Seal, Protective and Seal Coating" (Ref. 21). Both layers are applied by the thermal pyrolytic decomposition of acetylene and propylene.

All coating and fluidizing gases are high purity reagent grade.

Kernels and particles are characterized as part of the fuel manufacturing sequence.

Because particles forming this waste stream were generated at the QC laboratory while testing process fuel, they may contain from zero to four coating layers.

All particles are radioactive because they are made from either depleted or 93% enriched (U-235) uranium. As-fabricated TRISO coated particles do not contain listed, or hazardous characteristics. Particle components (kernels and coatings) are not pyrophoric.

Density of particles is measured by immersing the particles in liquid mercury under moderate pressures at room temperature per FQCI-211, "Determination of Particle Density" (Ref. 22). The OPyC microporosity is measured using mercury porosimetry at high pressure per FQCI-214, "Evaluation of Outer Isotropic Coating Microporosity" (Ref. 23).

After particles are removed from the measuring apparatus they are filtered to remove as much mercury as possible. Then, particles with a small amount of mercury contamination are heated in a furnace using argon as a sweep gas per ACD-CA-114, "Mercury Recovery" (Ref. 5). This recovers the rest of the mercury. After cooling, mercury is recycled to the measuring apparatus and particles with mercury contamination below RCRA regulations are packaged for shipment to the Nevada Test Site (NTS) for disposal as low-level waste.

Since mercury is the only credible hazardous contamination, this plan will analyze particles for Hg content to determine if this waste substream will be disposed as mixed waste or low-level waste .

1.4.2 Solid Porosimetry Related Waste from Mercury Recycling

This waste substream is associated with the Quality Control laboratory mercury porosimetry analysis of nuclear fuel, used to characterize density and microporosity by procedures FQCI-211, "Determination of Particle Density" (Ref. 22) and FQCI-214, "Evaluation of Outer Isotropic Coating Microporosity" (Ref. 23). This substream is in five containers.

Mercury will be recovered from contaminated paper wipes by heating the paper in a controlled atmosphere furnace at moderate temperatures to vaporize the mercury, according to procedure FQCI-408, "Recovery of Mercury from Mercury-Contaminated Laboratory Items" (Ref. 24). The mercury vapors will be condensed and recycled back to the QC lab. The paper residue/ashes, free of mercury, will be sent as low-level waste to the NTS. Since mercury is the only credible contamination, the residue will be analyzed only for mercury.

Mercury on rubber gloves will be recovered by washing the gloves with nitric acid according to procedure FQCI-408 (Ref. 24). The clean gloves will be analyzed by TCLP for mercury contamination prior to disposal as low-level waste at the NTS.

Laboratory glassware contaminated with mercury will be rinsed and cleaned with nitric acid according to FQCI-408. Cleaned glassware will be returned to the QC laboratory.

Mercury-contaminated nitric acid rinse solutions (from the glove cleanup and glassware cleanup) will be analyzed for mercury and if the regulatory limit is exceeded the solutions will be processed according to FQCI-408. Mercury will be removed from the nitric acid by precipitating the mercury as mercury sulfide and volatilizing the water and nitric acid over sand. Mercury will be recovered from the sand by volatilizing the mercury in an inert atmosphere and trapping it. Sand will be analyzed for mercury contamination to determine if this waste substream will need treatment prior to disposal as low-level waste. The water nitric acid mixture and any of the rinse solutions that meet the mercury limit requirement will be neutralized to a pH of 5-9 by addition of NaOH to form sodium nitrate, and stabilized per procedure NWPF-WI-3.4, "Liquid and Sludge Waste Neutralization and Stabilization Procedure" (Ref. 25). In addition, glass bubblers used in the mercury recovery operations will be crushed and added to the nitric acid mixture before stabilization. The stabilized waste will be analyzed by TCLP for Hg to determine if the waste will be disposed as mixed waste or as low-level waste. In addition the stabilized nitric acid will be measured for free liquids.

Alconox soap contaminated with mercury will be dissolved in water and stabilized per procedure NWPF-WI-3.4, "Liquid and Sludge Waste Neutralization and Stabilization Procedure" (Ref. 25). The stabilized waste will be analyzed by TCLP for leachable mercury before it is sent to NTS as LLW.

1.4.3 Davies-Gray Waste

The Davies-Gray waste substream was generated during uranium analysis of fuel kernels, fuel particles, and liquids containing highly enriched uranium according to GA procedure FQCI-401, "Determination of Uranium by NBL-Modified Davies-Gray Titration" (Ref. 26). The titration produces a liquid waste that is collected in 1 gallon containers. This aqueous waste substream contains uranium, nitric acid, phosphoric acid, sulfuric acid, potassium dichromate, and a vanadium catalyst.

The liquid Davies-Gray waste substream is in 21 containers (20 1-gallon containers and one 55-gallon container). The containers of Davies-Gray waste will be sampled and analyzed for uranium concentration. The waste will be stabilized according to procedure NWPF-WI-3.4, "Liquid and Sludge Waste Neutralization and Stabilization Procedure" (Ref. 25). The stabilized waste (estimated at 4 drums) will be sampled and analyzed by TCLP for Cr and by the waste extraction test (WET) method for V to determine if it will be disposed as mixed waste or low-level waste. In addition the stabilized waste will be measured for free liquids.

1.4.4 Used Radiography Developing Solutions

During the inspection and analysis of fuel particles by radiography, per FQCI-209, "Evaluation of Particle Diameter, Coating Thickness, and Defective Particles," the film is subjected to the development process which uses three solutions (Ref. 27):

1.4.4.1 **HRP Developer:** This photographic developer is an aqueous solution of 10-15 wt % potassium sulfite, 5-10 wt % sodium sulfite, 1-5 wt %

sodium tetraborate, 1-5 wt % potassium hydroxide, 1-5 wt % diethylene glycol, 2 wt % hydroquinone, and < 1 wt % 4-(methylamino) phenol sulfate. The approximate volume of the contaminated HRP Developer is 3 liters.

1.4.4.2 **Kodak Rapid Fixer:** This photographic fixer solution is a combination of two aqueous solutions. The first, part A, is an aqueous solution containing ammonium thiosulfate 45 wt %, sodium acetate 5-10 wt %, boric acid 1-5 wt %, acetic acid 1-5 wt %. The second solution, part B, is an aqueous solution of alum 15-20 wt % and sulfuric acid 11 wt %. The ratio of the volumes of part A and part B is 10:1. The approximate volume of Kodak Rapid Fixer is 2 liters.

1.4.4.3 **Stop:** This photographic solution is a dilute (3 wt %) acetic acid solution. The volume of Stop is approximately 3 liters.

These photographic solutions are uranium contaminated and have a high probability of containing silver from the photographic plates. The waste will be neutralized and solidified according to procedure NWPF-WI-3.4, "Liquid and Sludge Waste Neutralization and Stabilization Procedure" (Ref. 25). The stabilized waste (estimated at one drum)will be analyzed by TCLP for Ag, and for sulfides to determine if it will be disposed as mixed waste or low-level waste. In addition the stabilized waste will be measured for free liquids.

1.4.5 Vacuum Pump Oil

Approximately 4 gallons of waste vacuum oil was generated during mercury pycnometry/porosimetry measurements per FQCI-211, "Determination of Particle Density" and FQCI-214, "Evaluation of Outer Isotropic Coating Microporosity," or during mercury intrusion testing per FQCI-225, "Mercury Intrusion Test for SiC Defects in MHTGR Fuel Particles" (Refs. 22, 23, 28). The pump oil is contaminated with uranium and also has potential mercury contamination. There is also a possibility that metals from the pump housing may have contaminated the vacuum oil. The waste will be solidified before it is shipped to the disposal site according to procedure NWPF-WI-3.4, "Liquid Waste and Sludge Neutralization and Stabilization Procedure" (Ref. 25). The stabilized waste (stimated at one drum) will be sampled and analyzed for TCLP and CA regulated metals to determine if this waste substream should be disposed as mixed waste or low-level waste. In addition the stabilized waste will be measured for free liquids.

1.4.6 Biodegradable Detergent Waste

The biodegradable detergent waste substream was generated during washing of QC laboratory glassware that had come in contact with NPR fuel particles. The detergent waste substream consists of approximately one gallon of U contaminated liquid. The detergent solution was made by dissolving 10 ml of biodegradable detergent (EXTRAN 1000) in a gallon of water. The detergent is specified to contain water, NaOH, marlipal MG, and 1% nitrilotriacetic acid trisodium salt which are biodegradable. The EXTRAN 1000 is also stated to be phosphate and halogen free by the manufacturer.

Process knowledge indicates that this detergent waste substream is not hazardous and contains small amounts of radioactivity. This detergent waste will be solidified according to procedure NWPF-WI-3.4, "Liquid and Sludge Waste Neutralization and Stabilization Procedure" (Ref. 25). The stabilized waste (estimated at one drum) will be sampled and analyzed for RCRA metals and measured for free liquids.

1.5 Common Requirements

Generic requirements common to all sampling and analysis plans are described in Appendix A. These requirements include:

- Calibration procedures and calibration frequency
- Data reduction, validation, and reporting
- Internal quality control checks
- Performance and system audits
- Supplies
- Quality Assurance reports to management
- Quality Assurance objectives

2.0 Sampling and Analysis Organization and Responsibilities

2.1 Technical Personnel

The key personnel and their responsibilities associated with this project are:

Sampling and Analysis Responsibilities	Project Responsibilities	Support Responsibilities
J. Saurwein (Waste Generator)	S. Bresnick (Project Mgr.)	V. Nicolayeff (QA Mgr.)
M. Hochbrueckner (Field Team Leader, Sample Acquisition and Sample Custodian)	R. DeVelasco (Task Mgr.)	M. Miller (QA Engineer)
	D. Czechowicz (Sampling and Analysis Plan)	A. Fudel (Waste Certification Official)
		R. Bott (Industrial Safety Mgr.)
		L. Quintana (Health Physics Mgr.)

Figure 4 presents a flowchart indicating the responsible person or group for performing each step in the sampling plan.

2.2 Required Training

Sampling personnel will be trained in the use of this Sampling and Analysis Plan and referenced documents. All personnel working on the project have been trained to the applicable sections of NVO-325. Sampling personnel will have radiation control training and OSHA hazardous waste operations training as described in 29 CFR Part 1910.120 (Ref. 29).

General Atomics requires personnel performing work in radiation areas to have 16 hours of radiation training. Training is also required on the applicable waste procedures. Indoctrination and training will comply with FPP-003, "Nuclear Fuel Fabrication Division Training Procedure" (Ref. 30).

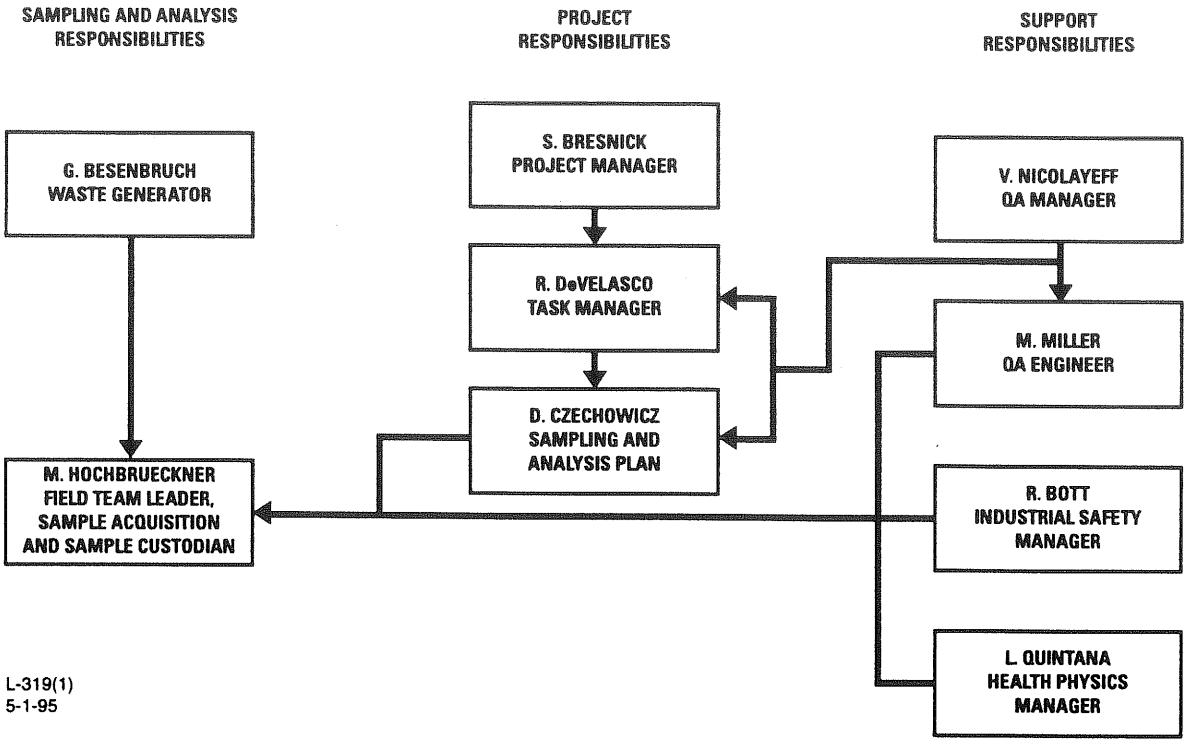

Fig. 4 Flowchart for Sampling and Analysis Organization and Responsibilities

3.0 Objectives

The primary objective of this sampling and analysis plan is to define the method for verifying that, after stabilization (if required), the waste generated in the Quality Control laboratory, is radioactive low-level waste which meets the requirements of NVO-325 (Ref. 2) for shipment to NTS.

The regulatory requirements for hazardous waste applicable to these waste substreams are stated in 40 CFR 261, NVO-325, and in CCR, Title 22, 66261 (Refs. 1-3).

The specific analytical objectives are given in Table 2. The analytes listed are based on process knowledge.

Table 2. Analytical Objectives

Waste	Analyte(s)	Regulation	Regulatory Limit (Max.)
Uranium oxycarbide kernels/particles	mercury	40 CFR	0.2 ppm
Solid porosimetry related waste from Hg Recycling:			
- Rubber gloves	mercury	40 CFR	0.2 ppm
- Paper residues (wipes)	mercury	40 CFR	0.2 ppm
- Sand	mercury	40 CFR	0.2 ppm
- Sodium nitrate salt (stabilized nitric acid)	free liquids mercury	NVO-325 40 CFR	0.5% volume 0.2 ppm
- Alconox detergent (stabilized)	free liquids mercury	NVO-325 40 CFR	0.5% volume 0.2 ppm
Davies-Gray waste (stabilized)	free liquids chromium vanadium	NVO-325 40 CFR 22 CCR	0.5% volume 5 ppm 24 ppm
Used radiography developing solutions (stabilized)	free liquids silver sulfides	NVO-325 40 CFR 40 CFR	0.5% volume 5 ppm 14 ppm
Vacuum pump oil (stabilized)	free liquids RCRA and CA metals	NVO-325 40 CFR 22 CCR	0.5% volume varies varies
Biodegradable detergent (stabilized)	free liquids RCRA and CA metals	NVO-325 40 CFR 22 CCR	0.5% volume varies varies

A representative sample will be obtained and analyzed from at least 10% of the waste containers for each waste substream. Where there are only a few containers housing a particular substream, there will be a minimum of one sample obtained from the substream. That is, for a substream housed in 20 containers, at least 2 containers will be sampled. A substream housed in 2 containers will have one of the containers sampled.

The QC waste substreams are small in size and, after treatment will fit in one or a few containers. The practical result is that the majority of the containers will be sampled.
Uranium oxycarbide kernels/particles is a small (0.5 liter volume) substream from which one representative sample will be obtained. Solid waste from Hg recycling is heterogeneous containing 5 different types of waste each housed in a separate container: (1) paper wipes/ash, (2) rubber gloves, (3) neutralized/stabilized nitric acid waste, (4) sand, and (5) stabilized Alconox detergent. Each type of waste from this substream will be sampled yielding 5 samples. Davies-Gray waste is homogeneous and occupies four 55-gallon drums. To be conservative 2 drums will be sampled to ensure representative sampling of the Davies-Gray waste. The following QC waste substreams are homogeneous and housed in single unique containers: (1) used developing solutions, (2) vacuum pump oil, and (3) biodegradable detergent. Each container will be sampled to generate 1 sample for each of these substreams. The contents of all containers will be traceable based on Radioactive Material Transfer Request (RMTR) numbers.

The substreams will be sampled sequentially one after another. GA will notify NTS as early as possible as to the sampling schedule. At least two weeks notice will be provided to NTS prior to sampling. This information has been inserted to the QC waste SAP.

If none of the resulting analyte concentrations in representative samples equal or exceed the regulatory limit then the waste will be considered non-hazardous and, therefore, radioactive low-level waste suitable for shipment to NTS. If one or more regulatory limits are equaled or exceeded for a waste substream, then the waste substream will be considered mixed waste and will not be shipped to the NTS. A flow chart illustrating this methodology is presented in Fig. 5.

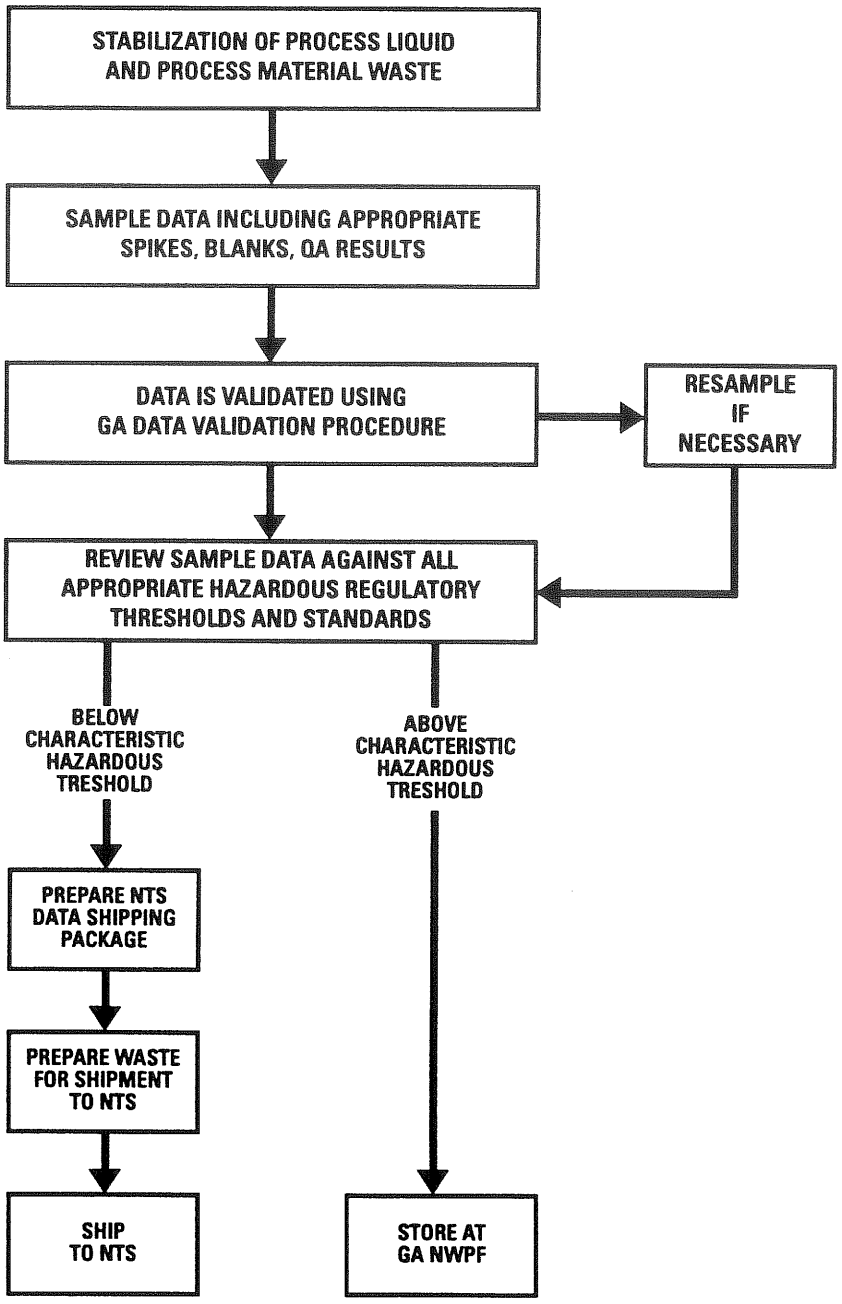

Fig. 5 Use of Sampling Results

4.0 Process Knowledge and Existing Analytical Data

The radionuclide concentration in each waste substream will be calculated based on measured isotopic analyses for the depleted and enriched uranium starting material and measured uranium for each container. The activity of each isotope will be calculated based on Table AIII-1 of Safety Series No. 37, IAEA Safety Guides. Isotopes contributing more the 1% of the total activity will be listed as major radionuclides.

4.1 Uranium Oxycarbide Kernels/Particles

Process knowledge and chemical analysis results of batches of fuel particles indicate that the particles are free of toxicity characteristic metal contaminants other than mercury (Refs. 6-9). For comparison, Table 3 shows a list of toxic substances and their allowable threshold limits according to CCR, Title 22, 66260-66272 (Ref. 3), and Table 4 shows the maximum concentration of contaminants for the Toxicity Characteristic, per 40 CFR, 261.24 (Ref. 1).

The presence of the organic constituents with toxicity characteristic is not credible because kernel and coating operations are made at temperatures ranging from 1100°C to 1650°C. At these temperatures, any organic chemical will evaporate or decompose. Contamination caused by handling in the QC laboratory would have been removed as a by-product of the mercury recovery process which involves subjecting the particles to elevated temperatures (≈ 500°C).

Fuel particles are not exposed to any form of asbestos. Metals, except for mercury, can only be part of the nuclear fuel if they are introduced as impurities in the raw materials. This nuclear fuel was made with high purity, reagent grade chemicals that were bought from pre-approved sources and accepted by B&W-QA or GA-QA as meeting the raw material specifications. Manufacturing processes were executed in controlled access areas by qualified technicians using approved procedures.

Because many metals interfere with the in-reactor performance of the fuel, they are minimized through processing, raw material selection, and metal impurity specifications.

The only credible contaminant is mercury introduced during fuel analysis by mercury porosimetry. Subsequently, the mercury recovery process was used to remove the mercury contamination. Representative samples of this waste substream will be analyzed for mercury to verify that it is low-level waste.

Table 3. Toxic Substances and their Soluble Threshold Limit Concentration (STLC) and Total Threshold Limit Concentration (TTLC) Values - (Ref. 3)

Substance	STLC* mg/l	TTLC* Wet-Wt mg/kg
Antimony and/or antimony compounds	15.0	500
Arsenic and/or arsenic compounds	5.0	500
Asbestos**		1.0 (as %)
Barium and/or barium compounds (excluding barite)***	100.0	10,000
Beryllium and/or beryllium compounds	0.75	75
Cadmium and/or cadmium compounds	1.0	100
Chromium (VI) compounds	5.0	500
Chromium and/or chromium (III) compounds	560.0	2,500
Cobalt and/or cobalt compounds	80.0	8,000
Copper and/or copper compounds	25.0	2,500
Fluoride salts	180.0	18,000
Lead and/or lead compounds	5.0	1,000
Mercury and/or mercury compounds	0.2	20
Molybdenum and/or molybdenum compounds	350.0	3,500
Nickel and/or nickel compounds	20.0	2,000
Selenium and/or selenium compounds	1.0	100
Silver and/or silver compounds	5.0	500
Thallium and/or thallium compounds	7.0	700
Vanadium and/or vanadium compounds	24.0	2,400
Zinc and/or zinc compounds	250.0	5,000

* STLC and TTLC values are calculated on the concentrations of the elements, not the compounds.

** In the case of asbestos and elemental metals, applies only if they are in a friable, powdered, or finely divided state. Asbestos includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite.

***Excluding barium sulfate.

Table 4. Maximum Concentration of Contaminants for Toxicity Characteristic - (Ref. 1)

EPA Hazardous Waste Number	Contaminant	Regulatory Level mg/l
D004	Arsenic	5.0
D005	Barium	100.0
D018	Benzene	0.5
D006	Cadmium	1.0
D019	Carbon tetrachloride	0.5
D020	Chlordane	0.03
D021	Chlorobenzene	100.0
D022	Chloroform	6.0
D007	Chromium	5.0
D023	o-Cresol	200.0
D024	m-Cresol	200.0
D025	p-Cresol	200.0
D026	Cresol	200.0
D016	2,4-D	10.0
D027	1,4-Dichlorobenzene	7.5
D028	1,2-Dichloroethane	0.5
D029	1,1-Dichloroethylene	0.7
D030	2,4-Dinitrotoluene	0.13
D012	Endrin	0.02
D031	Heptachlor (and its epoxide)	0.008
D032	Hexachlorobenzene	0.13
D033	Hexachlorobutadiene	0.5
D034	Hexachloroethane	3.0
D008	Lead	5.0
D013	Lindane	0.4
D009	Mercury	0.2
D014	Methoxychlor	10.0
D035	Methyl ethyl ketone	200.0
D036	Nitrobenzene	2.0
D037	Pentachlorophenol	100.0
D038	Pyridin	5.0
D010	Selenium	1.0
D011	Silver	5.0
D039	Tetrachloroethylene	0.7
D015	Toxaphene	0.5
D040	Trichloroethylene	0.5
D041	2,4,5-Trichlorophenol	400.0
D042	2,4,6-Trichlorophenol	2.0
D017	2,4,5-TP (Silvex)	1.0
D043	Vinyl chloride	0.2

Asbestos
A review of all procedures that generated the kernels and particles, as well as the waste handling procedures, showed that asbestos was not used in the processes that generated this waste substream. Therefore, asbestos could not be present in the kernels/particles waste substream.

Bioaccumulative Toxic Substances
Table 5 contains a list of bioaccumulative toxic substances and their threshold limit according to CCR, Title 22, 66261 (Ref. 3). None of the listed chemicals of Table 5 were introduced into the fuel processing streams.

Free Liquids
As discussed above, the fuel particles and waste were heat treated at 500°C, precluding liquids from being present in the waste.

Particulates
Kernels with approximately 200 μm diameter are the smallest particles. The presence of a large number of particles with less than 10 μm diameter is not credible.

Gases
This waste contains only solid particles.

Stabilization
Solid nuclear fuel is inherently stable in terms of mechanical integrity and chemical flow and does not require stabilization.

Etiological Agents
Etiological agents were never introduced into the fuel manufacturing cycle.

Chelating Agents
No chelating agents were used in the manufacture of TRISO coated particles.

Polychlorinated Biphenyls (PCBs)
PCBs were never used in the manufacture of fuel particles.

Explosives and Pyrophorics
A detailed study of the raw materials and processes used in the manufacture of nuclear fuel particles does not indicate the presence of explosive or pyrophoric materials.

Transuranic
This waste substream contains non-irradiated fuel particles, and therefore, the presence of transuranics is not credible.

4.2 Solid Porosimetry Related Waste from Mercury Recycling

This waste substream consists of the residues from mercury recovery processes carried out on laboratory glassware and other items. The waste will be a stable solid which has been treated according to GA procedure FQCI-408, "Recovery of Mercury from Mercury-Contaminated Laboratory Items" (Ref. 24) (See Section 1.4.2). This waste substream will be analyzed for mercury contamination.

Table 5. List of Organic Persistent and Bioaccumulative Toxic Substances and the Soluble Threshold Limit Concentration (STLC) and Total Threshold Limit Concentration (TTLC) Values - (Ref. 3)

Substance	STLC mg/l	TTLC Wet-Wt mg/kg
Aldrin	0.140	1.40
Chlordane	0.250	2.50
DDT, DDE, DDD	0.100	1.00
2,4-Dichlorophenoxyacetic acid	0.100	100.00
Dieldrin	0.800	8.00
Dioxin (2,3,7,8-TCDD)	0.001	0.01
Endrin	0.020	0.20
Heptachlor	0.470	4.70
Kepone	2.100	21.00
Lead compounds, organic	13.000	
Lindane	0.400	40.00
Methoxychlor	0.100	100.00
Mirex	2.100	21.00
Pentachlorophenol	1.700	17.00
Polychlorinated biphenyls (PCBs)	5.000	50.00
Toxaphene	0.500	5.00
Trichloroethylene	204,000	2,040.00
2,4,5-Trichlorophenoxypropionic acid	1.000	10.00

Asbestos
A review of all procedures that generated the porosimetry-related, as well as the waste handling procedures, showed that asbestos was not used in the processes that generated this waste substream. Therefore, asbestos could not be present in the porosimetry-related waste substream.

Bioaccumulative Toxic Substances
None of the bioaccumulative toxic substances in Table 5 were present in the laboratory where the waste stream was generated.

Free Liquids
As a result of the mercury recovery processes, most wastes are dry solids. The liquid nitric acid portion of this waste substream will be neutralized and solidified and tested for free standing liquid.

Particulates
This waste substream consists of gloves, solidified liquids, ashes, and sand. Gloves and solidified liquids do not contain particulates. Ashes and sand will be double bagged inside a 55-gallon drum, or metal box.

Gases
The waste is composed only of solid material.

Stabilization
The residues from the mercury recovery processes are stable solids.

Etiological Agents
Etiological agents were not present in the components of the mercury experiments or in the original fuel.

Chelating Agents
No chelating agents were used in the mercury experiments.

Polychlorinated Biphenyls (PCBs)
PCBs were not used in the manufacture of the fuel, nor in the mercury experiments.

Explosives and Pyrophorics
The residues from the mercury recovery processes are not explosive or pyrophoric.

Transuranics
Nuclear fuel associated with this waste was non-irradiated, therefore, the presence of transuranics is not credible.

4.3 Davies-Gray Waste

This waste substream was produced during uranium analysis of fuel materials according to GA procedure FQCI-401, "Determination of Uranium by NBL-Modified Davies-Gray Titration" (Ref. 32). Davies-Gray waste will be neutralized and solidified.

Toxic Substances
The Davies-Gray waste substream will contain the toxic substances chromium (as Cr VI) and vanadium (or chromium and vanadium compounds). Chromium can be found as a toxic substance in Table 3 and Table 4. Vanadium can be found as a toxic substance in Table 3. The chromium concentration will be measured by TCLP for the stabilized waste to determine if the CCR, Title 22 (Ref. 3) or 40 CFR (Ref. 1) limit is exceeded. Likewise the vanadium concentration will be measured to determine if the CCR, Title 22 limit is exceeded. If any of the limits are exceeded for the Davies-Gray waste, this waste substream will be classified as mixed waste and sent to another DOE disposal site.

Bioaccumulative Toxic Substances
Davies-Gray waste does not contain any of the bioaccumulative toxic substances listed in Table 5.

Asbestos
A review of all procedures that generated the Davies-Gray waste, as well as the waste handling procedures, showed that asbestos was not used in the processes that generated this waste substream. Therefore, asbestos could not be present in the Davies-Gray waste substream.

Free Liquids
The Davies-Gray waste will be neutralized, and solidified with Portland Cement, then tested to assure the absence of free standing liquids.

Particulates
The Davies-Gray waste will be a stable solid after solidification and will not contain particulates.

Gases
The Davies-Gray waste substream will be in a solid, stable form after solidification.

Stabilization
The Davies-Gray waste will be stabilized by neutralization and solidification. Neutralization will be accomplished by addition of base. Solidification will be accomplished by use of Portland Cement

Etiological Agents
Etiological agents were not present in materials used in the Davies-Gray uranium analysis method or in original fuel materials.

Chelating Agents
No chelating agents were used in Davies-Gray analyses.

Polychlorinated Biphenyls (PCBs)
PCBs were not used in the manufacture of the fuel, nor during Davies-Gray uranium analyses.

Explosives and Pyrophorics
The Davies-Gray waste substream contains no explosives or pyrophorics.

Transuranics
Nuclear fuel associated with this waste was not irradiated, therefore, the presence of transuranics is not credible.

4.4 Used Radiography Developing Solutions

The three radiography developing solutions are well characterized by manufacturers specifications (see Section 1.4.5). These solutions as received or made up following manufacturers instructions contain none of the toxic substances listed in Table 3. With the exception of silver from the radiographic plates, none of these substances were introduced to the solutions in their use in the laboratory. The stabilized solutions will be sampled and analyzed by TCLP for silver, and for sulfides.

Asbestos
A review of all procedures that generated the radiography developing solutions, as well as the waste handling procedures, showed that asbestos was not used in the processes that generated this waste substream. Therefore, asbestos could not be present in the radiography developing solutions waste substream.

Bioaccumulative Toxic Substances
None of the substances in Table 5, "Bioaccumulative Toxic Substances" from CCR, Title 22, 66261 (Ref. 3) were present in the radiography developing solutions as manufactured nor were they introduced during the developing process in the laboratory.

Free Liquids
The solutions will be solidified with Portland cement and tested to assure the absence of free liquids before shipment.

Particulates
The solutions will be a stable solid after solidification, having no free particulates.

Gases
The waste will be in a solid, stable form after solidification.

Stabilization
The radiography developing solutions will be stabilized by solidification with Portland cement.

Etiological Agents
Etiological agents were not present in the developing solutions as manufactured nor were they introduced in the QC laboratory.

Chelating Agents
No chelating agents were present in the developing solutions as manufactured, nor were they introduced in the laboratory.

Polychlorinated Biphenyls (PCBs)
PCBs were not present in the developing solutions and were not present in the QC laboratory where they were used.

Explosives and Pyrophorics
A study of the constituents of the radiographic developing solutions indicates the absence of explosive or pyrophoric substances.

Transuranics
Only non-irradiated fuel was in contact with these developing solutions, therefore, the presence of transuranics is not credible.

4.5 Vacuum Pump Oil

The vacuum pump oil is "DuoSeal" vacuum pump oil. Due to its use in the laboratory, the vacuum pump oil has uranium contamination and is therefore considered low-level waste. Since the pump was used for mercury porosimetry, there is the possibility of mercury contamination. It is also possible that metals from the pump housing may have contaminated the vacuum oil. A study of the Material Safety Data Sheet for "DuoSeal" vacuum pump oil provided by the manufacturer, Welch Vacuum Technology, Inc., states that the oil is stable (non-reactive) and does not possess the ignitability characteristic. The flash point is given as 228°C by the Pensky-Martens technique.

Toxic Substances
The vacuum pump was used in laboratory experiments where the only toxic metal present in the oil could be mercury. The analytical apparatus was made of glass and stainless steel. It is not credible that any toxic metal may have leached into the vacuum oil from the apparatus. However, there is a possibility that hazardous metals from the pump housing may have leached into and contaminated the pump oil. The MSDS for the pump oil lists no organic toxic substances as components. The vacuum pump oil will be tested for leachable RCRA and CA metals.

Bioaccumulative Toxic Substances
None of the substances in Table 5, "Bioaccumulative Toxic Substances" from CCR, Title 22, 66261 (Ref. 3) were present in the vacuum pump oil as it was manufactured, nor were any present in the Quality Control laboratory where the pump oil was used.

Free Liquids
The pump oil waste will be solidified with an appropriate solidification agent such as Petroset from Fluid Tech Inc., then tested to assure the absence of free standing liquids prior to waste shipment.

Asbestos
A review of all procedures that generated the vacuum pump oil, as well as the waste handling procedures, showed that asbestos was not used in the processes that generated this waste substream. Therefore, asbestos could not be present in the vacuum pump oil waste substream.

Particulates
The waste will be a stable solid after stabilization.

Stabilization
The waste will be stabilized with a stabilization agent such as Petroset from Fluid Tech Inc.

Etiological Agents
Etiological agents were not present in the pump oil as manufactured, and were not present in the laboratory.

Chelating Agents
No chelating agents were present in the vacuum pump oil originally, and none were used in the process from which this waste was generated.

Polychlorinated Biphenyls (PCBs)
PCBs were not present in the original pump oil and were not present in the QC laboratory.

Explosives and Pyrophorics
The vacuum pump oil contains no explosives or pyrophorics.

Transuranics
The only nuclear fuel to which this waste oil was in contact was not irradiated, therefore the presence of transuranics is not credible.

4.6 Biodegradable Detergent Waste

The biodegradable detergent waste substream can be characterized based on the manufacturer's content label on the detergent, the MSDS, and process knowledge. The liquid that will be stabilized is contaminated with uranium. The detergent solution contains mostly water; with NaOH, marlipal MG, and nitrilotriacetic acid trisodium salt from the EXTRAN 1000 detergent. Nitrilotriacetic acid is a chelating agent present in EXTRAN 1000. By process knowledge it is known to be present at < 1% concentration. Since the solution is very dilute its pH is close to 7. Based on process knowledge, this waste does not exhibit characteristics of reactivity, ignitability, or corrosivity per 40 CFR (Ref. 1). The solidifed material will be tested for RCRA and CA metals and for free liquids

Asbestos
A review of all procedures that generated the detergent waste, as well as the waste handling procedures, showed that asbestos was not used in the processes that generated this waste substream. Therefore, asbestos could not be present in the detergent waste substream.

Toxic Substances
None of the toxic substances appearing in Tables 3 or 4 can be found in this waste stream based knowledge of the composition of the detergent and process knowledge.

Bioaccumulative Toxic Substances
None of the substances in Table 5, "Bioaccumulative Toxic Substances" from CCR, Title 22 (Ref. 3) are present in the detergent solution or were present in the QC laboratory where the detergent solution was used.

Free Liquids
The biodegradable detergent waste will be solidified with and appropriate solidification agent such as Portland cement , then tested to assure the absence of free-standing liquids prior to shipment.

Particulates
After this waste substream is stabilized there will be no particulates present.

Gases
The stabilized waste will be composed only of solid material.

Stabilization
The waste will be stabilized with a stabilization agent such as Portland cement.

Etiological Agents
Etiological agents were not present in the detergent solution or in the QC laboratory where the detergent solution was used.

Chelating Agents
No chelating agents were present in the detergent solution or in the QC laboratory where the detergent solution was used .

Polychlorinated Biphenyls (PCBs)
PCBs were not present in the detergent solution or in the QC laboratory where the detergent solution was used.

Explosives and Pyrophorics
The biodegradable detergent waste substream contains no explosives or pyrophorics.

Transuranics
Nuclear fuel associated with this waste was not irradiated, therefore, the presence of transuranics is not credible.

5.0 Use of Results

The results of analyses for the substances and properties described in Section 3 and listed in Table 2 for each waste substream will determine if concentrations exceed regulatory limits. This information, combined with process knowledge, then allows a reliable decision to be made regarding the status of the waste substreams, that is, whether or not they are classified as low-level waste. Figure 5 presents a flow chart illustrating this decision making process and how analytical results will be used.

6.0 Sampling Methods and Sampling Procedures

6.1 Sampling Approach

Table 6 presents the sampling method for each of the waste substreams described in this sampling and analysis plan.

Table 6. Sampling Methods

Waste Substream	Sample Volume	Sampling Method	Procedure
Uranium oxycarbide kernels/particles	4 ounces	Riffle splitting	FQCI-103 (Ref. 31)
Solid porosimetry related waste from mercury recycling:			
- Rubber gloves	4 ounces (50 gram minimum)	Modified grab	FQCI-103 (Ref. 31)
- Paper Residue	4 ounces (50 gram minimum)	Coned & quartered	FQCI-103 (Ref. 31)
- Sand	4 ounces (50 gram minimum)	Grab	FQCI-103 (Ref. 31)
- Sodium nitrate (stabilized nitric acid)	4 ounces	Representative Sample	NWPF-WI-3.4 (Ref. 25)
- Alconox detergent (stabilized)	4 ounces	Representative Sample	NWPF-WI-3.4 (Ref. 25)
Davies-Gray waste (stabilized)	4 ounces	Representative Sample	NWPF-WI-3.4 (Ref. 25)
Used radiography developing solutions (stabilized)	4 ounces	Representative Sample	NWPF-WI-3.4 (Ref. 25)
Vacuum pump oil (stabilized)	4 ounces	Representative Sample	NWPF-WI-3.4 (Ref. 25)
Biodegradable detergent waste (stabilized)	4 ounces	Representative Sample	NWPF-WI-3.4 (Ref. 25)

A representative sample will be obtained and analyzed from at least 10% of the waste containers for each waste substream. Where there are only a few containers housing a particular substream, there will be a minimum of one sample obtained from the substream. That is, for a substream housed in 20 containers, at least 2 containers will be sampled. A substream housed in 2 containers will have one of the containers sampled. Containers to be sampled will be selected at random according to procedure QDI-5.5, "Sampling Plan for Product Acceptance" (Ref. 32).

The sampling approach for the various QC waste substreams is as follows. Uranium oxycarbide kernels/particles is a small (0.5 liter volume) substream from which one

representative sample will be obtained. Solid waste from Hg recycling is heterogeneous containing 5 different types of waste each housed in a separate container: (1) paper wipes/ash, (2) rubber gloves, (3) neutralized/stabilized nitric acid waste, (4) sand, and (5) stabilized Alconox detergent. Each type of waste from this substream will be sampled yielding 5 samples. Davies-Gray waste is homogeneous and occupies four 55-gallon drums. To be conservative 2 drums will be sampled to ensure representative sampling of the Davies-Gray waste. The following QC waste substreams are homogeneous and housed in single unique containers: (1) used developing solutions, (2) vacuum pump oil, and (3) biodegradable detergent. Each container will be sampled to generate 1 sample for each of these substreams.

The referenced procedures which correspond to the various sampling methods found in Table 6, contain details of location of samples to be taken from each container.

Analytical results will be evaluated to ensure that analytical characterization meets or exceeds the 90% confidence limit. If necessary additional samples will be obtained to ensure that hazardous analytes for all waste substreams are below regulated limits at the 90% confidence level.

6.2 Sampling Equipment

The sampling and shipping procedures have a detailed explanation of protective equipment required for each operation. The following is a list of health and safety related equipment that is used for characterization operations.

1. Gloves
2. Aprons
3. Face shield
4. Respiratory protective equipment
5. Safety glasses
6. Safety shoes
7. Protective clothing for hazardous material handling (as determined by Cognizant Engineer)

Sample Related Equipment

1. Riffle splitter
2. Spatula for core samples
3. Tumbler for grab samples
4. Laboratory hood
5. Sample containers
   - Core sample containers
   - Polyethylene and glass bottles
   - Plastic bags
   - Metal cans
   - Coolers

6. Forms
   - Chain of Custody Form
   - Radioactive Materials/Removal Record, GA Form 558
   - Radioactive Material Shipping Request
   - Material Transfer Form for SNM
   - Seals, Seal Log
   - Radioactive Material Labels for Core and Standard Samples
     - Enriched
     - Depleted/Natural
   - Hazardous Labels

6.3 Recommended Sample Containers, Preservation, and Holding Times

The recommended sample containers, preservation and holding times are listed in SW-846, Third Edition (Ref. 33). Sample container type, volume, and preservative will be verified with the analytical laboratory before sampling. Samples will be packaged following procedure NWPF-WI-3.10, "Sample Packaging and Shipment" according to the protocol indicated in Table 7 (Ref. 34):

Table 7
Recommended Sample Containers, Preservation, and Holding Times for QC Waste Samples

Waste Substream	Test/ Analyte	Sample Container Type	Preservation	Maximum Holding Time for Field Sample Prior to Extraction of Analysis Sample
Uranium Oxycarbide Kernels/Particles	TCLP[a]/Hg	Polyethylene	Blue Ice, 4°C	28 days[b]
Solid Porosimetry Related Waste from Mercury Recycling	TCLP[a]Hg	Polyethylene	Blue Ice, 4°C	28 days[b]
	Free Liquids[c]	Polyethylene	Not Applicable	Not Applicable
Davies-Gray Waste	TCLP[a]Cr	Polyethylene	Blue Ice, 4°C	180 days[d]
	WET[e]/V	Polyethylene	Blue Ice, 4°C	180 days[d]
	Free Liquids[c]	Polyethylene	Not Applicable	Not Applicable
Used Radiography Developing Solutions	TCLP[a]/Ag	Polyethylene	Blue Ice, 4°C	180 days[d]
	Sulfides	Glass or Polyethylene	Blue Ice, 4°C	7 days[f]
	Free Liquids[c]	Polyethylene	Not Applicable	Not Applicable
Vacuum Pump Oil	TCLP[a]/CA and RCRA metals	Polyethylene	Blue Ice, 4°C	28 or 180 days as applicable[b, d]
	Free Liquids[c]	Polyethylene	Not Applicable	Not Applicable
Biodegradable Detergent Solution	RCRA and CA metals	Polyethylene	Blue Ice, 4°C	28 or 180 days as applicable[b, d]
	Free Liquids[c]	Polyethylene	Not Applicable	Not Applicable

(a) TCLP makes use of Extraction Method 1311, which can be found in SW-846 (Ref. 33).

(b) After field collection there is a maximum time of 28 days allowed to extract analysis sample from field sample. In addition, extracted analysis sample must be analyzed within a similar 28 day period. Therefore there is a maximum allowed time of 56 days from field collection to extracted sample analysis.

(c) The Paint Filter Test will be used to measure free liquids present using Method 9095, which can be found in SW-846 (Ref. 33).

(d) After field collection there is a maximum time of 180 days allowed to extract analysis sample from field sample. In addition, extracted analysis sample must be analyzed within a similar 180 day period. Therefore there is a maximum allowed time of 360 days from field collection to extracted sample analysis.

(e) The WET procedure is described in CCR, Title 22, 66261 (Ref. 3).

(f) Sulfides analysis is a one step process. There is a maximum of 7 days allowed from field sample collection to analysis for sulfides.

7.0 Analysis of QC Waste Samples

Only analytical procedures listed in SW-846, Third or Second Edition, are to be used for the various QC waste analyses (Ref. 33). The GA-QA approved laboratories that will be utilized for waste sample analysis are:

-Thermoanalytical, Inc. (TMA), 160 Taylor St., Monrovia, CA 91016, M. Parish 818-357-3247
- Lockheed Analytical, 975 Kelly Johnson Drive, Las Vegas, NV 89119, L. Lenkauskas 702-361-3955
- Huntingdon Consulting Engineers, 1908 Innerbelt Business Center Drive, St. Louis, MO 63114, P. Smith 314-426-0880
- General Atomics Analytical Chemistry Laboratory, 3550 General Atomics Ct., San Diego, CA 92121, A. Greenwood 619-455-2909.

Target analyte and analytical methods are presented in Table 8:

Table 8
Target Analyte and Analytical Methods

Waste Substream	Test/Analyte	Extraction Method/Analysis Method
Uranium oxycarbide kernels/particles	TCLP/Hg	SW-846 Method 1311/7470
Solid porosimetry related waste from mercury recycling :		
- Rubber gloves	TCLP/Hg	SW-846 Method 1311/7470
- Paper residues (wipes), Sand	TCLP/Hg	SW-846 Method 1311/7470
- Sodium nitrate (stabilized nitric acid)	TCLP/Hg	SW-846 Method 1311/7470
	Free Liquids	SW-846 Analysis Method 9095
- Alconox detergent solution (stabilized)	TCLP/Hg	SW-846 Method 1311/7470
	Free Liquids	SW-846 Analysis Method 9095
Davies-Gray waste (stabilized)	TCLP/Cr	SW-846 Method 1311/6010A or 7190
	WET/V	CCR, Title 22, 66261/SW-846 Analysis Method 6010A or 7910
	Free Liquids	SW-846 Analysis Method 9095
Used radiography developing solutions (stabilized)	TCLP/Ag	SW-846 Method 1311/6010A or 7760
	Sulfides	SW-846 Analysis Method 9030
	Free Liquids	SW-846 Analysis Method 9095
Vacuum pump oil (stabilized)	TCLP/ RCRA metals	SW-846 Method 1311/7470
	WET/CA metals	66261/6010 or 7910
	Free Liquids	SW-846 Analysis Method 9095
Biodegradable detergent solution (stabilized)	RCRA metals	SW-846 Method 1311/7470
	WET/CA metals	66261/6010 or 7910
	Free Liquids	SW-846 Analysis Method 9095

8.0 References

1. Code of Federal Regulations, 40 CFR, 1/1/94.
2. Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements, June 1992, NVO-325 (Rev. 1).
3. California Code of Regulations, Title 22, 3/5/93.
4. Resource Conservation and Recovery Act, Environmental Guidance Program Reference Book, Oak Ridge National Laboratory Report ORNL/M-1277, 12/1/90.
5. ACD:CA-114, Mercury Recovery.
6. NPR-MHTGR Performance Test Fuel QC Data Package for UCO Fuel Kernels Composite Lot Number: B10-K-91381, GA Contract Number P.O.#SC 099765, April 1991.
7. QC Data Package NPR-MHTGR Performance Test Fuel, Test Capsules NPR-1, -1a, and -2, Coated Particles - Composite FM19-00001, EG&G Subcontract # C90-102940, Phase 1a, June 1991.
8. MHTGR DU Fuel Kernel Composite B67B-D-K-92030, Certification Data Package, GA Contract Number P.O.#SC099765, GA Specification Number 910462 N/C Dated February 7, 1992.
9. D. Johnson and C. C. Adams, "Exploratory Process Development - 240 mm Coater Final report," GA 910567, September 30, 1993.
10. FMP-1020, Kernel Dryer Operation.
11. FMP-1030, Calciner Furnace Operation.
12. FMP-1040, Sintering Furnace Operation.
13. FMP-1050, Broth Manufacture.
14. FMP-1060, UNH Manufacture.
15. FMP-1070, Kernel and Particle Tabling System.
16. FMP-1080, NPR Kernel Forming Column.
17. FMP-1105, NP-MHTGR 240 mm Development Coater Operating Procedure.
18. FMP-1221, Particle Buffer Coating.
19. FMP-1223, Particle Silicon Carbide Coating.
20. FMP-1224, Particle Outer LTI Coating.
21. FMP-1225, Particle Seal, Protective and Seal Coating.

22. FQCI-211, Determination of Particle Density.

23. FQCI-214, Evaluation of Outer Isotropic Coating Microporosity.

24. FQCI-408, Removal and Recovery of Mercury from Contaminated Laboratory Items.

25. NWPF-WI-3.4, Liquid and Sludge Waste Neutralization and Stabilization.

26. FQCI-401, Determination of Uranium by NBL-Modified Davies-Gray Titration.

27. FQCI-209, Evaluation of Particle Diameter, Coating Thickness, and Defective Particles.

28. FQCI-225, Mercury Intrusion Test for SiC Defects in MHTGR Fuel Particles.

29. Code of Federal Regulations, 29 CFR, latest issue.

30. FPP-003, Nuclear Fuel Fabrication Training Program.

31. FQCI-103, Sampling Methods.

32. QDI-5.5, Sampling Plans for Product Acceptance.

33. Test Method for Evaluating Solid Waste, Physical/Chemical Methods, EPA Publication SW-846, Third edition, Final Update.

34. NWPF-WI-3.10, Sample Packaging and Shipping.

35. NWPF-WI-3.6, Liquid Waste Sampling with the COLIWASA Tube.

36. NWPF-WI-3.34, Chain of Custody.

37. NWPF-WI-3.13, Compositing of Samples.

38. FQCI-407, Measurement of Solution pH.

39. NWPF-WI-3.14, Data Validation Procedure.

40. QAPD-3632, Quality Assurance Program Document - New Production Reactor Waste Disposal.

APPENDIX A

GENERIC REQUIREMENTS OF ALL SAMPLING AND ANALYSIS PLANS

A.1 Data Quality Objectives

A.1.1 Representativeness

For kernels and particles, the technique of riffle splitting as a sampling strategy will result in samples that are unbiased and representative of each waste container. This sampling procedure is documented in General Atomics procedure FQCI-103, "Sampling Methods" (Ref. 31).

Paper residues and sand will be coned and quartered to obtain a representative sample. This sampling method is documented in procedure FQCI, "Sampling Methods" (Ref. 36). A modified grab sampling technique will be used to sample gloves. In this technique contaminated gloves will be entered into a tumbler and grab sampled to yield representative samples for analysis (Ref. 31).

The liquid waste streams will be thoroughly mixed during the solidification process according to NWPF-WI-3.4, "Liquid and Sludge Waste Neutralization and Stabilization " (Ref. 25). A representativesample will be taken from each of the solidified waste containers. The samples will be used for TCLP analyses.

A.1.2 Accuracy

In the analytical laboratory; matrix spikes, and laboratory control samples will be analyzed along with the samples in order to provide a measure of accuracy as prescribed by SW-846 (Ref. 33).

A.1.3 Precision

The samples provided by GA to the analytical laboratory, will be split into duplicate samples. A comparison of the results of the analysis of the duplicate sample will be used to demonstrate the precision of the analysis. If the precision exceeds the acceptance limits then the samples will be re-tested. If the precison is still unacceptable then a Nonconformance Report will be written and dispositioned per QAPD-3632 (Ref. 40).

Analytical results obtained with sampling of at least 10% of the containers will be checked and evaluated to ensure that waste characterization meets or exceeds the 90% confidence limit.

A.1.4 Completeness

Completeness will be measured as a percentage of the data required by the QC waste SAP that was obtained and validated.

A.1.5 Comparability

Comparability will be addressed by using standard EPA SW-846 analytical methods and the same analytical equipment. All samples will be collected and handled according to the same sampling and shipping procedures.

A.1.4 Method Detection Limit

The following are the typical method detection limits and regulatory limits for various analytes.

Method Detection Limits for Various Analytes

Analyte	Typical Detection Limit (mg/l)	Regulatory Limit (mg/l)
Arsenic	0.01	5.0
Barium	0.2	100.0
Cadmium	.005	1.0
Chromium	0.05	5.0
Lead	0.1	5.0
Mercury	0.001	0.2
Selenium	0.005	1.0
Silver	0.01	5.0
Vanadium	0.2	(STLC)[a] 24.0
		(TTLC)[a,b] 2400
Sulfides	0.5	14.0

[a] STLC and TTLC values are calculated on the concentrations of the elements, not the compounds.

[b] Units for TTLC are mg/kg.

A.1.5 Data Reporting

Data reporting will conform to the requirements of NVO-325 (Ref. 2). Forms to be used by the laboratory in reporting the analytical results are included in Appendix C.

A.1.6 Laboratory Quality Assurance/Quality Control

This section contains laboratory practices that ensure analytical QA/QC.

A.1.6.1 General Laboratory Controls

The following analytical controls must be implemented by laboratories performing analyses, in addition to instrument calibration and the analysis of quality control samples. These requirements are standard in a certified laboratory and will be verified during the laboratory inspection and validation process.

- Reagents and solvent will have certified compositions.
- Reagent storage environment and duration will meet the manufacturer's guidelines.
- Laboratory equipment will be calibrated/standardized following the referenced procedures for the methods used and will be documented.
- Volumetric measurements will be made with certified glassware.

- Data reduction computations will be independently checked.
- Qualified personnel will be used for laboratory analyses.
- Quality assurance/quality control requirements and guidelines specified in the selected analytical methods will be followed.

A.1.6.2 Laboratory QA/QC

Laboratories performing analysis of hazardous substances must have quality control procedures to document the accuracy and precision of sampling and specific analytical methods. This documentation requires as a minimum, the laboratories to obtain and analyze quality control samples with every analytical batch, or with at least 1 of every 20 samples, whichever results in the greater number of QC samples. Following are the required quality control samples/analyses.

- Method Blanks
  Method blanks consist of laboratory reagent-grade water treated in the same manner as the sample (e.g., digested, extracted, distilled, etc.) and then analyzed and reported in the same manner as a standard sample. This will detect possible contamination resulting from the preparation or processing of samples.

- Method Blank Spike
  A method blank spike is a sample of laboratory reagent-grade water fortified (spiked) with the analytes of interest, which is prepared and analyzed with the associated sample batch.

- Matrix Spikes
  A matrix spike is an aliquot of an investigative sample that is fortified (spiked) with the analytes of interest and analyzed with the associated sample batch to monitor the effects of the investigative sample matrix (matrix effects) for the analytical method.

- Matrix-Spike Duplicates
  Matrix-spike duplicates are used to determine the precision of organic samples. Matrix-spike duplicates are prepared by spiking with identical concentrations of target analytes.

- Matrix Duplicates
  Matrix duplicates are used to determine the precision of inorganic samples. Matrix duplicates are split samples used to document the precision of a method in a given sample matrix.

- Laboratory Duplicate Samples
  Duplicate samples are obtained by splitting a field sample into two separate aliquots and performing two separate analyses on the aliquots. Duplicates are performed only in association with selected protocols. Laboratory duplicates will be specified by the analytical methods or one per batch of samples, whichever is greater.

- Laboratory QC Standards Sample
  This is a referenced QC sample of known concentration, obtained from the EPA, the National Institute of Standards and Testing, or a Nuclear Regulatory Commission approved commercial source. This QC sample checks the accuracy of the analytical procedure.

A.2 Documentation and Sample Custody

A.2.1 Sample Custody

A.2.1.1 Definition

A sample is considered in custody if it is in one of the following descriptions:
In one's physical possession
In one's view after being in one's physical possession
In one's physical possession and then locked up so that no one can tamper with the sample
Kept in a secured area and restricted to authorized and accountable personnel only.

A.2.1.2 Field Operations

A.2.1.2.1 Sample label is completed according to procedure NWPF-WI-3.6 (Ref. 35).
The following information is recorded on the sample labels:
Sample identification number;
Date and time the sample was collected;
Place of collection or container number from which the sample was taken;
Sampler's initials.

A.2.1.2.2 Chain-of-custody form is completed according to procedure NWPF-WI-3.34 (Ref. 36)
The following information is recorded on the Chain-of-Custody Form:
Site/sample identification number;
Date the sample was collected;
Time the sample was collected;
Analysis to be performed on the sample; and
Signature of person(s) relinquishing custody. (The collector and the person relinquishing the sample are the same person.)

A.2.1.2.3 Field logbook is completed according to procedures NWPF-WI-3.6 (Ref. 34) and NWPF-WI-3.13 (Ref. 37). The following information is recorded in the field logbook:

Project or site name;
Date of the activity;
Names of the samples;
Sample IDs;
Times of sample collection;
Type of analysis to be performed on the samples;
Comments on the sampling activity as needed;
Drawings show the site and sampling locations (optional);
Any personnel who visit during the sampling (optional);

How sample was collected;
Any pertinent calibration data; and
Any deviations as a result of field conditions, from the Standard Operating Procedures or Sampling and Analysis Plan used.

A.2.2 Shipping

Samples will be delivered to a GA QA-approved laboratory as soon as possible after collection. Appropriate sample analysis request forms and chain of custody records will accompany the samples. Samples will be packaged and shipped according to procedure NWPF-WI-3.10, "Sample Packaging and Shipment " (Ref. 34).

A.3 Calibration Procedures and Frequency

A.3.1 Field Instrumentation

Field instruments for pH measurement are to be calibrated prior to use in accordance with FQCI-407, "Measurement of Solution pH" (Ref. 38)

The LEL sniffer will be calibrated annually by the manufacturer and monthly by Emergency Services.

A.3.2 Laboratory Instrumentation

Laboratory Instrumentation is to be calibrated at the required frequencies:

- Per analytical method
- Per manufacturer's recommendations
- In response to any malfunction

A.4 Data Reduction, Validation, and Reporting

A.4.1 Data Reduction

Data reduction is performed by the subcontract laboratory.

A.4.2 Data Validation

Checklists have been developed to validate each sample with respect to integrity and method acceptance criteria in accordance with NWPF-WI-3.14, "Data Validation Procedure" (Ref. 39)

A.4.3 Data Reporting

A final internal report will be issued summarizing the findings and providing recommendations with respect to treatment and/or storage. The report will include:

1. Sampling documentation
2. Analytical methods
3. QA/QC data
4. Treatment standards (the subcontract laboratory will provide the initial input for treatment standards)
5. Supporting documentation

A.4.4 Data Storage

Quality records will be kept for a minimum of ten years. Analytical results, RMTRs and the Land Disposal Restriction and Treatment Standard Notification and Certification will be kept until closure of the facility.

A.5 Internal Quality Control Checks

The quality control checks have been determined during the data quality objective development process based on the assumed risk of false negatives and past experience with the difficulties of analytical methods.

- Waste will be characterized as "mixed" if it has any toxic characteristics or hazardous listed substance, since the waste is defined as uranium contaminated.
- Analyses will be performed to identify and quantify RCRA components.
- Choosing the proper storage, treatment, and disposal options are addressed by this SAP.

A.6 Performance and Systems Audits

Due to the duration of this project a pre-scheduled field audit will not be conducted. However, the QA Department will monitor activities and conduct random surveillances as required.

Materials that come into contact with the samples will be procured in accordance with the instructions provided by QAPD-3632, "Quality Assurance Program Document—New Production Reactor Waste Disposal" (Ref. 40). The sampling bottles will be provided by the contracting laboratory.

A.7 Supplies

To ensure adherence to the project schedule, critical supplies will be kept on hand. An ample supply of sampling bottles, coolers, and associated materials will also be stocked in a controlled area for use in this project.

A.8 Quality Assurance Reports to Management

Due to the finite duration of this project, separate scheduled quality assurance reports to management will not be made. Significant activities will be reported in the QA monthly report for the NPR Waste Disposal Project to the Nuclear Fuel Fabrication Director.

In the case of on-going operations, additional QA surveillance reports will be provided periodically.

Any non-conformances generated during this process will be reported in accordance with contract requirements.

A.9 Quality Assurance Objectives

The field sampling quality control measures defined in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication SW-846, Third Edition, Rev. 1, December 1987 are to be implemented:

1. Field Blanks should be collected and analyzed. For this sampling program, a sampling container will be filled with deionized water. The water is poured directly into the container. The sampling frequency is 1/10, with a minimum of 1.

2. Rinsate Blanks. For this blank, deionized water is poured over decontaminated sampling equipment into the container. The sampling frequency is 1/10, with a minimum of 1.

3. A Field Duplicate will be taken for every 20 samples. If there are less than 20 samples in a batch there will be at least one field duplicate taken per batch. If there are significant discrepancies, additional duplicates will be obtained according to instructions from the field engineer.

APPENDIX B

DATA REPORTING FORMS

PER

NVO-325

SAMPLE NO.

INORGANIC ANALYSIS DATA SHEET

Lab Name: _____ _____

Matrix (soil/water): _____ Lab Sample ID: _____

Level (low/med): _____ Date Received: _____

% Solids: _____

Concentration Units (ug/L or mg/kg dry weight): _____

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7449-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

5A
SPIKE SAMPLE RECOVERY

SAMPLE NO.

Lab Name: _____

Matrix: _____ Level (low/med): _____

% Solids for Sample: _____

Concentration Units (ug/L or mg/kg dry weight): _____

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

Comments:

6
DUPLICATES

SAMPLE NO.

Lab Name: _____

Matrix (soil/water): _____ Level (low/med): _____

% Solids for Sample: _____ % Solids for Duplicate: _____

Concentration Units: (ug/L or mg/kg dry weight): _____

Analyte	Control Limit		Sample (S)	C		Duplicates (D)	C		RPD		Q	M
Aluminum												
Antimony												
Arsenic												
Barium												
Beryllium												
Cadmium												
Calcium												
Chromium												
Cobalt												
Copper												
Iron												
Lead												
Magnesium												
Manganese												
Mercury												
Nickel												
Potassium												
Selenium												
Silver												
Sodium												
Thallium												
Vanadium												
Zinc												
Cyanide												

FORM VI - IN 7/88

LABORATORY CONTROL SAMPLE

Lab Name: _____

Solid LCS Source: _____

Aqueous LCS Source: _____

Analyte	Aqueous (ug/L) True	Found	%R	Solid (mg/kg) True	Found	C	Limits		%R
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

FORM VII - IN

7/88

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

Lab Name: _____ SDG No. _____

Matrix (soil/water): _____ _____ Lab Sample ID: _____

Sample wt/vol.: _____(g/mL) Lab File ID: _____

Level (low/med): _____ Date Received: _____

% Moisture: not dec. _____ dec. _____ Date Analyzed: _____

Column (pack/cap): _____ Dilution Factor: _____

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg)	Q
74-87-3	Chloromethane		
74-83-9	Bromomethane		
75-01-4	Vinyl Chloride		
75-00-3	Chloroethane		
75-09-2	Methylene Chloride		
67-64-1	Acetone		
75-15-0	Carbon Disulfide		
75-35-4	1,1-Dichloroethene		
75-34-3	1,1-Dichloroethane		
540-59-0	1,2-Dichloroethene (total)		
67-66-3	Chloroform		
107-06-2	1,2-Dichloroethane		
78-93-3	2-Butanone		
71-55-6	1,1,1-Trichloroethane		
56-23-5	Carbon Tetrachloride		
108-05-4	Vinyl Acetate		
75-27-4	Bromodichloromethane		
78-87-5	1,2-Dichloropropane		
10061-01-5	cis-1,3-Dichloropropene		
79-01-6	Trichloroethene		
124-48-1	Dibromochloromethane		
79-00-5	1,1,2-Trichloroethane		
71-43-2	Benzene		
10061-02-6	trans-1,3-Dichloropropene		
75-25-2	Bromoform		
108-10-1	4-Methyl-2-Pentanone		
591-78-6	2-Hexanone		
127-18-4	Tetrachloroethene		
79-34-5	1,1,2,2-Tetrachloroethane		
108-88-3	Toluene		
108-90-7	Chlorobenzene		
100-41-4	Ethylbenzene		
100-42-5	Styrene		
1330-20-7	Xylene (total)		

FORM I VOA 1/87 Rev.

3A

WATER VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: _____ SDG No. _____

Matrix Spike Sample No.: _____

Compound	Spike Added (ug/L)	Sample Concentration (ug/L)	MS Concentration (ug/L)	MS % REC #	QC Limits Rec.
1,1-Dichloroethene					61-145
Trichloroethene					71-120
Benzene					76-127
Toluene					76-125
Chlorobenzene					75-130

Compound	Spike Added (ug/L)	MSD Concentration (ug/L)	MSD % REC #	% RPD	QC Limits RPD	QC Limits Rec.
1,1-Dichloroethene					14	61-145
Trichloroethene					14	71-120
Benzene					11	76-127
Toluene					13	76-125
Chlorobenzene					13	75-130

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: _____ out of _____ outside limits

Spike Recovery: _____ out of _____ outside limits

Comments:

FORM III VOA-1 1/87 Rev.

5A

VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: _____ SDG No. _____

Lab File ID: _____ BFB Injection Date: _____

Instrument ID (1): _____ BFB Injection Time: _____

Matrix (soil/water): _____ Level (low/med): _____ Column (pack/cap): _____

m/e	Ion Abundance Criteria	% Relative Abundance
50	15.0 - 40.0% of mass 95	
75	30.0 - 60.0% of mass 95	
95	Base peak, 100% relative abundance	
96	5.0 - 9.0% of mass 95	
173	Less than 2.0% of mass 174	( ) 1
174	Greater than 50.0% of mass 95	
175	5.0 - 9.0% of mass 174	( ) 1
176	Greater than 95.0%, but less than 101.0% of mass 174	( ) 1
177	5.0 - 9.0% of mass 176	( ) 2

1 - Value is % mass 174 2 - Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01					
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

6A

VOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: _____ SDG No. _____

Instrument ID: _____ Calibration Dates: _____ _____

Matrix (soil/water): _____ Level (low/med): _____ Column (pack/cap): _____

Min RRF for SPCC(#) = 0.300 (0.250 for Bromoform) Max %RSD for CCC(°) = 30.0%

Lab File ID: RRF20 = _____ RRF50 = _____
RRF100 = RRF150 = RRF200 =

Compound	RRF20	RRF50	RRF100	RRF150	RRF200	RRF	% RSD
Chloromethane #							#
Bromomethane							
Vinyl Chloride °							°
Chloroethane							
Methylene Chloride							
Acetone							
Carbon Disulfide							
1,1-Dichloroethene °							°
1,1-Dichloroethane #							#
1,2-Dichloroethene (total)							
Chloroform °							°
1,2-Dichloroethane							
2-Butanone							
1,1,1-Trichloroethane							
Carbon Tetrachloride							
Vinyl Acetate							
Bromodichloromethane							
1,2-Dichloropropane °							°
cis-1,3-Dichloropropene							
Trichloroethene							
Dibromochloromethane							
1,1,2-Trichloroethane							
Benzene							
trans-1,3-Dichloropropene							
Bromoform #							#
4-Methyl-2-Pentanone							
2-Hexanone							
Tetrachloroethene							
1,1,2,2-Tetrachloroethane #							#
Toluene °							°
Chlorobenzene #							#
Ethylbenzene °							°
Styrene							
Xylene (total)							
Toluene-d8							
Bromofluorobenzene							
1,2-Dichloroethane-d4							

FORM VI VOA 1/87 Rev.

PC-000393/2

NPR PROGRAM DEFENSE WASTE GENERATOR APPLICATION

APPENDIX C

SAMPLING AND ANALYSIS PLAN FOR NPR PROGRAM STABILIZED PROCESS LIQUID AND PROCESS MATERIAL WASTE

Prepared for
Nevada Test Site

July 1995

GENERAL ATOMICS

GENERAL ATOMICS

GA 2175 (REV. 9'89)

PROJECT CONTROL ISSUE SUMMARY

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Sampling and Analysis Plan for NPR Program Stabilized Process Liquid and Process Material Waste

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CONTINUE ON GA FORM 2175-1

* See list of effective pages

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ACRONYMS AND ABBREVIATIONS

CA-HWCL	California Hazardous Waste Control Laws
CA-HWMR	California Hazardous Waste Management Regulations
CCR	California Code of Regulations
CFR	Code of Federal Regulations
DL	Detection Limit
DOE	Department of Energy
FMP	Fuel Manufacturing Procedure
FPP	Fuel Project Procedure
FQCI	Fuel Quality Control Instruction
GA	General Atomics
HEPA	High Efficiency Particulate Air
HCl	Hydrochloric Acid
LEL	Lower Explosive Limit
LITCO	Lockheed Idaho Technologies Company
LLW	Low-Level Waste
MHTGR	Modular High Temperature Gas-Cooled Reactor
NFPD	Nuclear Fuel Process Development
NP	New Production
NPR	New Production Reactor
NTP	Notice to Proceed
NTS	Nevada Test Site
NVO	Nevada Operations Office
NVO-325	Nevada Test Site Defense Waste Acceptance Criteria, Certification and Transfer Requirements, June 1992 (Rev. 1)

ACRONYMS AND ABBREVIATIONS (Cont'd)

NWPF	Nuclear Waste Processing Facility
OSHA	Occupational Safety and Health Administration
PCBs	Polychlorinated Biphenyls
PVA	Polyvinyl Alcohol
PTF	Performance Test Fuel
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RMTR	Radioactive Material Transfer Request
SAP	Sampling and Analysis Plan
TTLC	Total Threshold Limit Concentration
TCLP	Toxicity Characteristic Leaching Procedure
THFA	Tetrahydrofurfuryl Alcohol
TTLC	Total Threshold Limit Concentration
U	Uranium

DEFINITIONS

Aliquot	Extracted volume of an aqueous solution that has chemical composition representative of the solution.
Characteristic	Waste that contains radioactivity and exhibits any of the four characteristics
Mixed Waste	defined in the California Code of Regulations, Title 22, section 22-66261.20 to 22-66261.24: ignitability, corrosivity, reactivity, toxicity.
Chelating agent	Chemical molecules possessing a heterocyclic ring containing a metal ion attached to at least two nonmetal ions in the same molecule. When chelating agents bind and attach to heavy metals, fixed heavy metals can become mobile and migrate into the environment. Chelating agents are commonly used to render otherwise water-insoluble compounds soluble in water.
Etiological agent	A substance that has potential to cause disease or medical disorder.
Field blank	An analytical chemistry blank measurement of deionized water that is poured into the field sample container used for sample collection.
Listed Mixed Waste	Waste that contains radioactivity and also one or more of the hazardous substances listed in the California Code of Regulations, Title 22, Chapter 11, Article 4 (22-66261.30 to 22-66261.33).
Low-Level	Waste that contains radioactivity and is not classified as high-level waste,
Radioactive Waste	transuranic waste, or spent nuclear fuel or by-product material, as defined by Department of Energy (DOE) Order 5820.2A. Test specimens of fissionable material irradiated for research and development only and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranics is less than 100 nCi/g.
Matrix spikes	An aliquot of an investigative sample that is fortified (spiked) with the analytes of interest and analyzed with the associated sample batch.
Mixed Waste	Mixed waste is defined as waste containing both radioactive and hazardous components as defined by the Atomic Energy Act and the Resource Conservation and Recovery Act (RCRA) respectively.
Rinsate blank	An analytical chemistry blank measurement of deionized water that is poured over decontaminated sampling equipment and collected in a sampling container.
Stabilization	Solidification of waste to immobilize hazardous substances, eliminate the presence of free liquids, and give the waste structural stability.
Waste substream	A subdivision of a major waste stream. For example, the Davies-Gray substream is a subdivision of the QC laboratory waste stream.

ABSTRACT

This Sampling and Analysis plan provides background information for stabilized process liquid process and process material waste substreams generated during the NP-MHTGR Fuel Development Program. These waste substreams are likely to be categorized as low-level waste and will be disposed at the Nevada Test Site. Any waste substream that proves to be mixed waste will be stored at GA until it is sent to another DOE facility for treatment or disposal.

This Sampling and Analysis Plan provides guidance and instructions for the acquisition and analysis of representative samples from the waste substreams. The objective of this plan is the acquisition of representative analytical data for stabilized process liquid and process material waste in the practical form that will be shipped to the NTS. This will verify that stabilized process liquid and process material waste substreams meet Federal and State requirements, and requirements of NVO-325, and that the waste can be shipped for disposal to the NTS.

1. PROJECT DESCRIPTION

1.1 GENERAL OVERVIEW

The New Production-Modular High Temperature Gas-Cooled Reactor (NP-MHTGR) Fuel Development Program generated a number of waste streams during kernel, coating, and compact manufacturing, and process development. This sampling and analysis plan (SAP) is specific for the following stabilized process waste substreams originating in General Atomics Nuclear Fuel Process Development (NFPD) Facilities:

Stabilized Mop Water Waste
Stabilized Scrubber Waste
Stabilized Waste Column Waste
Stabilized Soot Waste
Stabilized HEPA Filter Waste

This sampling and analysis plan was developed to provide supporting data to meet the waste characterization requirements of NVO-325 (Ref. 1), Title 22 of the California Code of Regulations (CCR) 66265.13 (Ref. 2), and the waste analysis requirements related to the land disposal restrictions in CCR, Title 22, 66268.7, 66268.9, and 66268.50 as they apply to generators of hazardous waste. This information is required to assure that the waste is properly stored, and disposed in accordance with land disposal restrictions.

Based on this objective, representative sampling will be conducted for each waste substream in accordance with this plan. The data generated in this sampling effort will establish the proper storage and disposal per the Resource Conservation and Recovery Act (RCRA) as amended (Ref. 3), Federal Regulations contained in 40 CFR 260 to 272 (Ref. 4), California Hazardous Waste Control Laws (CA-HWCL), and California Hazardous Waste Management Regulations (CA-HWMR) as contained in CCR, Title 22, 66260-66272 (Ref. 2).

1.2 DESCRIPTION OF SITE

1.2.1 General Atomics Nuclear Waste Processing Facility

Mop water, scrubber liquid, waste column, soot waste, and HEPA filter waste are currently at the GA Nuclear Waste Processing Facility (NWPF). Mop water, scrubber liquid, and waste column waste will be neutralized and stabilized. All five waste substreams will be sampled prior to final packaging for shipment to the disposal site. Figure 1 is a schematic showing the NWPF yard.

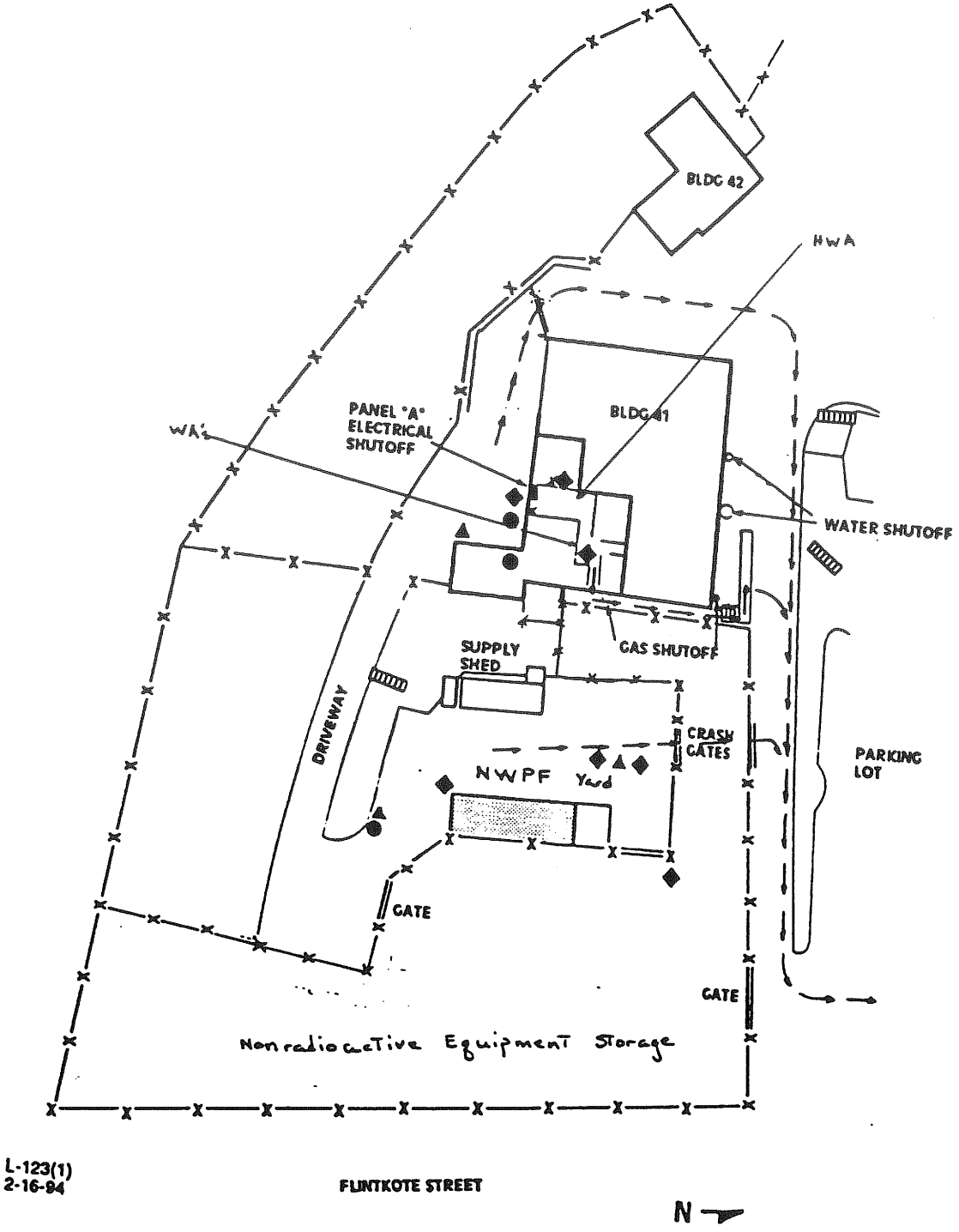

Fig. 1 Schematic of Nuclear Waste Processing Facility

1.3 SAMPLING AND ANALYSIS SCHEDULE

Projected milestones for this SAP after completion of the process liquid and process material waste stabilization is presented below. This schedule applies to each waste substream.

Milestones	Completion Time (working days)
Completion of Stabilization	---
Complete Sample Collection & Shipment	10 days after completing stabilization/or continuously during stabilization if required
Complete Sample Analysis	40 days after completing stabilization/ or sample collection if no stabilization is required
Complete Data Review	55 days after completing stabilization or sample collection if no stabilization is required
Submit Waste Characterization Report to LITCO	80 days after completing stabilization or sample collection if no stabilization is required

1.4 IDENTIFICATION OF TYPES OF WASTE TO BE EVALUATED

1.4.1 Stabilized Mop Water Waste

This waste substream was generated during regularly scheduled floor cleaning of areas of the Fuel Pilot Plant Manufacturing Facility that were considered potentially contaminated with uranium. When the Fuel Pilot Plant Manufacturing Facility was handling depleted uranium, the contents of the mop bucket were transferred directly to 55-gallon drums.

Analytical results using SW-846 methodology indicates that this waste is not corrosive, ignitable, or toxic (Ref. 5). A review of procedures used in the controlled fuel processing area indicates that this waste is not reactive.

The mop water waste substream currently is contained in two 55-gallon drums located at the General Atomics NWPF. Mop water waste will be stabilized according to procedure NWPF-WI-3.4, "Liquid and Sludge Waste Stabilization"

(Ref. 6). Representative samples of the stabilized waste will be measured for free liquids.

1.4.2 Stabilized Scrubber Waste

The scrubber waste was produced by SiC coating during the NP-MHTGR Fuel Development Program. During SiC coating HCl and H_2 were generated as by-product gases along with SiC soot. The HCl, H_2, and SiC soot generated was passed through a 304 stainless steel pipe to a scrubber containing a NaOH solution to neutralize the HCl. Scrubber liquid which is initially a concentrated NaOH aqueous solution eventually becomes neutralized or spent from absorption of HCl. From process knowledge and the Preliminary Waste Characterization Report (Ref. 5), the scrubber waste substream is known to contain on the average approximately $3x10^{-3}$ g U/liter. Approximately 5 to 10 % by weight of the scrubber waste consists of NaCl crystals and SiC soot.

Silicon carbide coating off-gases that were passed through 304 stainless steel piping can corrode the stainless steel piping and form chromium chloride that ends up in the scrubber waste. Measurements have shown the scrubber waste liquids to contain as much as 17 ppm Cr (Ref. 5). All other RCRA and CA toxic metals are below regulatory levels. This waste is not ignitable, however pH measurements show that scrubber waste in its present form is corrosive. A review of coating procedures indicates that this waste is not reactive.

The scrubber waste currently is contained in approximately forty 55-gallon drums located at the General Atomics NWPF. Scrubber waste will be neutralized and solidified according to procedure NWPF-WI-3.4, "Liquid and Sludge Waste Neutralization and Stabilization" (Ref. 6). Stabilized scrubber waste will be sampled and analyzed by TCLP for RCRA metals to determine if it will be disposed as characteristic mixed waste or low-level waste. The stabilized waste will also be measured for free liquids.

1.4.3 Stabilized Waste Column Waste

This waste substream was generated by the kernel fabrication process during the NP-MHTGR Fuel Development Program. The waste columns were the central liquid waste collecting point for the Fuel Pilot Plant Manufacturing Facility. The kernel forming columns, the dryer, and the contaminated sinks were hard piped to the waste columns where liquid waste was collected in two nuclear safe geometry

columns. After process effluents filled the waste columns, samples were taken to determine U concentration for accountability and nuclear safety. The waste column liquid waste then was transferred to 55-gallon drums. Typically, two or three drums were filled each time the columns were emptied.

The waste column liquid waste contains water, isopropyl alcohol, ammonium nitrate, and either free nitric acid or free NH_4OH. It also contains small amounts of UO_3, polyvinyl alcohol (PVA), tetrahydrofurfuryl alcohol (THFA), and dilute nitric acid solutions used for cleaning equipment. The contaminated sinks contributed liquids from washing glassware. Analytical data found in the Preliminary Waste Characterization Report indicates that amounts of Hg and Pb are present in this waste substream above regulatory limits (Ref. 5). In addition, the majority of the liquid waste column waste samples have been observed to be ignitable (flash point <140°F) and corrosive based on results documented in the Preliminary Waste Characterization Report (Ref. 5). The concentration of chemicals in this waste substream varies depending on the day-to-day activities, therefore chemical concentrations could vary in each drum containing waste column waste. However, analytical results reported above are based on 100% sampling of containers. A review of kernel manufacturing procedures indicates that this waste is not reactive.

The waste column waste substream is contained in approximately sixty-five 55-gallon drums located at the General Atomics NWPF. Waste column waste will be stabilized according to procedure NWPF-WI-3.4, "Liquid and Sludge Neutralization and Waste Stabilization" (Ref. 6). Representative samples of the stabilized waste will be measured by TCLP for RCRA metals, tested for ignitability, and also tested for free liquids.

1.4.4 Stabilized Soot Waste

This waste substream was generated during kernel coating operations. The soot is composed of fine pyrocarbon that exits the coater with effluent gases during coating operations. Soot waste from the coater is recovered in the coater baghouse. The soot has the same chemical composition as graphite and is therefore not ignitable. A review of coating procedures indicates that this waste is not corrosive or reactive. Soot waste will be measured by TCLP for RCRA metals, volatiles, and semi-volatiles.

The soot waste substream is contained in approximately twenty four 55-gallon drums located at the General Atomics NWPF.

1.4.5 HEPA Filter Waste

This waste substream was generated during operations in Building 39. The filters were removed after the NPR fuel program was terminated in 1993. In addition to the HEPA filters from Building 39, some filter waste may be generated in Building 41. This will occur only if the HEPA filters need replacement while the NPR waste is being processed. The filters are approximately 2' by 2' by 1'. The filters are made of: corrugated paper media with fine silicon-boron fibers, plywood, galvanized metal, and a neoprene rubber seal. The fresh filters have no hazardous or radioactive components as defined by the CCRs and CFRs. All ventilation exhausts from Building 39 passed through these filters before being discharged to the atmosphere. During service, the filters may have picked up minor amounts of uranium and possibly some hazardous materials which were used during operations. A review of the chemicals that were used in Buildings 39 and 41 indicates that the filters are potentially toxic, but are not corrosive, reactive, or ignitable. Samples of the filters will be analyzed for hazardous constituents which were used during operation of the facility during the time that the filters were in place.

The HEPA filter waste substream consists of approximately fifteen filters located in the General Atomics NWPF.

1.5 COMMON REQUIREMENTS

There are a number of generic requirements common to all sampling and analysis plans that are grouped in Appendix A to avoid repetition. These requirements includes:

- Calibration procedures and calibration frequency
- Data reduction, validation, and reporting
- Internal quality control checks
- Performance and system audits
- Supplies
- Quality Assurance reports to management
- Quality Assurance objectives

2. SAMPLING AND ANALYSIS ORGANIZATION AND RESPONSIBILITIES

2.1 TECHNICAL PERSONNEL

A flowchart indicating the interrelationships between individuals responsible for carrying out the sampling plan is provided in Fig. 2.

2.2 REQUIRED TRAINING

Sampling personnel will be trained in the use of this Sampling and Analysis Plan and referenced documents. All personnel working on the project have been trained to the applicable sections of NVO-325. Sampling personnel must have radiation control training and OSHA hazardous waste operations training as described in 29 CFR Part 1910.120 (Ref. 7).

General Atomics requires personnel performing work in radiation areas to have 16 hours of radiation training. Training is also required on the applicable waste procedures. Indoctrination and training will comply with FPP-003, "Nuclear Fuel Fabrication Division Training Program" (Ref. 8).

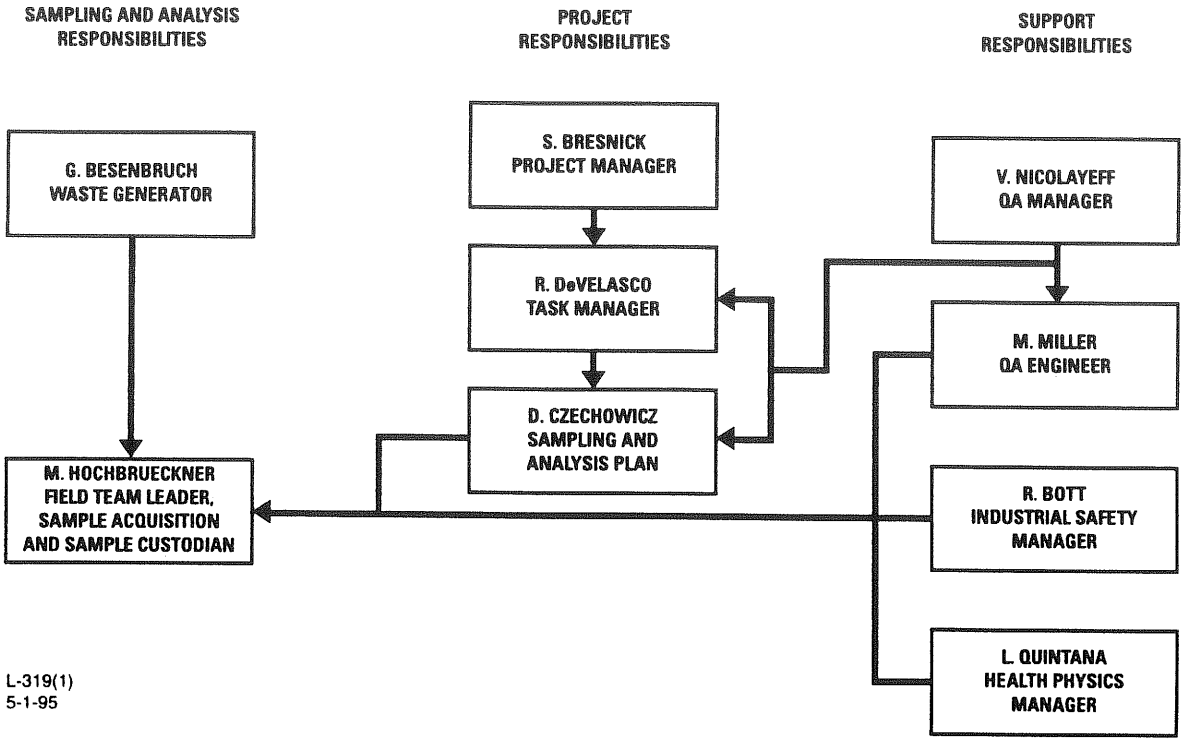

Fig. 2. Flowchart Indicating Interrelationships between Individuals Responsible for Carrying Out the Sampling Plan

3. OBJECTIVES

The primary objective of this sampling and analysis plan is to define the method for verifying that, after stabilization, the NPR Program process liquid and process material waste is radioactive low-level waste which meets the requirements of NVO-325 (Ref. 1) for shipment to NTS.

The regulatory requirements for hazardous waste applicable to these waste substreams are stated in NVO-325, CCR Title 22, 66261, and in 40 CFR 261, (Refs. 1, 2, 4).

The specific analytical objectives are given in Table 1.

TABLE 1. ANALYTICAL OBJECTIVES

Waste Substream	Analyte(s)	Regulation	Regulatory Limit (Max.)
Stabilized Mop Water	Free Liquids	NVO-325	0.5 % Vol.
Stabilized Scrubber	RCRA Metals	40 CFR	varies
	Free Liquids	NVO-325	0.5 % Vol.
Stabilized Waste Column	RCRA Metals	40 CFR	varies
	Free Liquids	NVO-325	0.5 % Vol.
	Ignitable	40 CFR	200mm burn in ≤ 2 minutes
Stabilized Soot	RCRA Metals	40 CFR	varies
	Volatiles	40 CFR	varies
	Semi-Volatiles	40 CFR	varies
HEPA Filters	RCRA Metals	40 CFR	varies
	California Metals	22 CCR	varies
	Fluoride Salts	40 CFR	180 mg/l
	Benzene	40 CFR	0.5 mg/l
	Tetrachloroethylene	40 CFR	0.7 mg/l

A review of the existing process liquid waste, and soot waste, liquid waste analyses, and process knowledge has resulted in this sampling plan for the waste in question. If none of the resulting hazardous analyte concentrations in representative samples equal or exceed the regulatory limit then the waste will be considered non-hazardous and, therefore, radioactive low-level waste suitable for shipment to NTS. If one or more regulatory limits are equaled or exceeded for a waste substream, then the waste substream will be considered mixed waste and will not be shipped to the NTS. A flow chart illustrating this methodology is presented in Fig. 3.

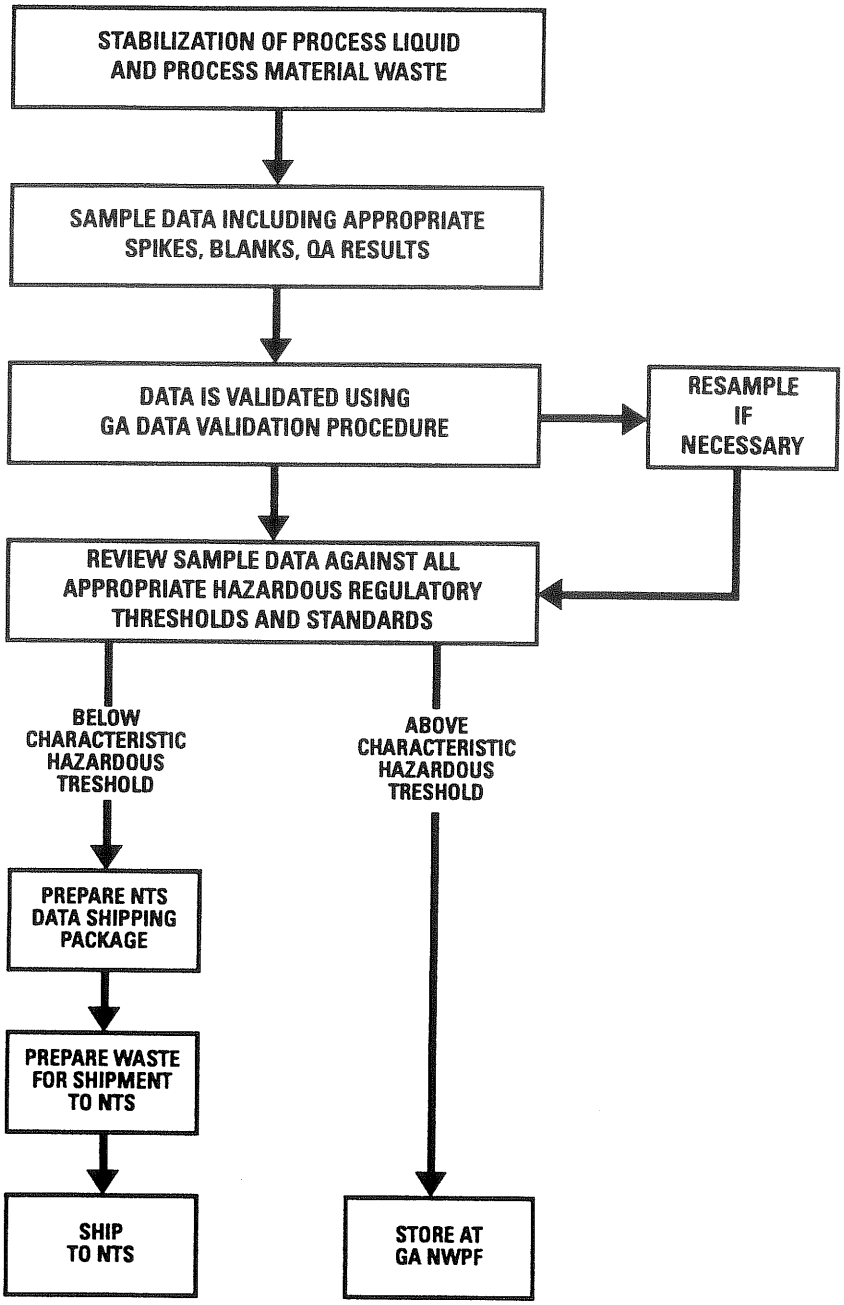

Fig. 3. Use of Sampling Results

4. PROCESS KNOWLEDGE AND EXISTING ANALYTICAL DATA

The radionuclide concentration in each waste substream will be calculated based on measured isotopic analyses for the depleted and enriched uranium starting material and measured uranium by gamma spectroscopy or Davies-Gray titration. The activity of each isotope will be calculated based on Table AIII-1 of Safety Series No. 37, IAEA Safety Guides. Isotopes contributing more the 1% of the total activity will be listed as major radionuclides.

4.1 STABILIZED MOP WATER WASTE

Process knowledge and chemical analysis results of the mop water waste substream indicates that the mop water waste is free of toxicity characteristic metal contaminants and is not reactive, corrosive, or ignitable (Ref. 5). Analytical results for liquid mop water waste are given in Table 2 (Ref. 5).

For comparison, Table 3 shows a list of toxic substances and their allowable threshold limits according to CCR, Title 22, 66260-66272 (Ref. 3), and Table 4 shows the maximum concentration of contaminants for the Toxicity Characteristic, per 40 CFR, 261.24 (Ref. 4).

The presence of organic constituents with toxicity characteristics is not likely in the mop water waste substream since these types of substances were not present in areas of the fuel fabrication facility where the mop water was collected.

TABLE 2. ANALYTICAL RESULTS FOR LIQUID MOP WATER WASTE

	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb
Regulatory limit									
TTLC (mg/kg)	500	500	10000	75	100	2500	8000	2500	1000
STLC (mg/l)	15	5	100	0.75	1	5	80	25	5
Result-RMTR # (TTLC)									
41071 (mg/kg)	<0.03		0.93	<0.005	0.21	0.13	0.04	7.2	2.0
42530 (mg/kg)	<0.03	<0.03	1.60	<0.005	0.20	0.10	0.12	5.1	1.0

	Hg	Mo	Ni	Se	Ag	Tl	V	Zn	pH	Flash Pt.
Regulatory limit										
TTLC (mg/kg)	20	3500	2000	100	500	700	2400	5000	$\leq$ 2.0	<140°F
STLC (mg/l)	0.2	350	20	1	5	7	24	250	$\geq$ 12.5	
Result-RMTR # (TTLC)										
41071 (mg/kg)	0.076	0.02	0.54	<0.045	0.012	<0.15	0.02	100	9.64	>212°F
42530 (mg/kg)	0.061	4.10	4.50	<0.045	0.020	<0.15	0.03	42	9.63	>212°F

TABLE 3. TOXIC SUBSTANCES AND THEIR SOLUBLE THRESHOLD LIMIT CONCENTRATION (STLC) AND TOTAL THRESHOLD LIMIT CONCENTRATION (TTLC) VALUES - (REF. 2)

Substance	STLC* mg/l	TTLC* Wet-Wt mg/kg
Antimony and/or antimony compounds	15.0	500
Arsenic and/or arsenic compounds	5.0	500
Asbestos**		1.0 (as %)
Barium and/or barium compounds (excluding barite)***	100.0	10,000
Beryllium and/or beryllium compounds	0.75	75
Cadmium and/or cadmium compounds	1.0	100
Chromium (VI) compounds	0.5	500
Chromium and/or chromium (III) compounds	560.0	2,500
Cobalt and/or cobalt compounds	80.0	8,000
Copper and/or copper compounds	25.0	2,500
Fluoride salts	180.0	18,000
Lead and/or lead compounds	5.0	1,000
Mercury and/or mercury compounds	0.2	20
Molybdenum and/or molybdenum compounds	350.0	3,500
Nickel and/or nickel compounds	20.0	2,000
Selenium and/or selenium compounds	1.0	100
Silver and/or silver compounds	5.0	500
Thallium and/or thallium compounds	7.0	700
Vanadium and/or vanadium compounds	24.0	2,400
Zinc and/or zinc compounds	250.0	5,000

* STLC and TTLC values are calculated on the concentrations of the elements, not the compounds.

** In the case of asbestos and elemental metals, applies only if they are in a friable, powdered, or finely divided state. Asbestos includes chrysotile, amosite, crocidolite,tremolite, anthophyllite, and actinolite.

*** Excluding barium sulfate.

TABLE 4. MAXIMUM CONCENTRATION OF CONTAMINANTS FOR TOXICITY CHARACTERISTIC - (REF. 4)

EPA Hazardous Waste Number	Contaminant	Regulatory Level mg/l
D004	Arsenic	5.0
D005	Barium	100.0
D018	Benzene	0.5
D006	Cadmium	1.0
D019	Carbon tetrachloride	0.5
D020	Chlordane	0.03
D021	Chlorobenzene	100.0
D022	Chloroform	6.0
D007	Chromium	5.0
D023	o-Cresol	200.0
D024	m-Cresol	200.0
D025	p-Cresol	200.0
D026	Cresol	200.0
D016	2,4-D	10.0
D027	1,4-Dichlorobenzene	7.5
D028	1,2-Dichloroethane	0.5
D029	1,1-Dichloroethylene	0.7
D030	2,4-Dinitrotoluene	0.13
D012	Endrin	0.02
D031	Heptachlor (and its epoxide)	0.008
D032	Hexachlorobenzene	0.13
D033	Hexachlorobutadiene	0.5
D034	Hexachloroethane	3.0
D008	Lead	5.0
D013	Lindane	0.4
D009	Mercury	0.2
D014	Methoxychlor	10.0
D035	Methyl ethyl ketone	200.0
D036	Nitrobenzene	2.0
D037	Pentachlorophenol	100.0
D038	Pyridin	5.0
D010	Selenium	1.0
D011	Silver	5.0
D039	Tetrachloroethylene	0.7
D015	Toxaphene	0.5
D040	Trichloroethylene	0.5
D041	2,4,5-Trichlorophenol	400.0
D042	2,4,6-Trichlorophenol	2.0
D017	2,4,5-TP (Silvex)	1.0
D043	Vinyl chloride	0.2

Asbestos

A review of all procedures used in the controlled fuel processing area indicates that asbestos was not used in any unit operations or waste handling. Therefore, asbestos could not be present in the mop water waste substream.

Bioaccumulative Toxic Substances

Table 5 contains a list of bioaccumulative toxic substances and their threshold limit according to CCR, Title 22, 66261 (Ref. 3). A review of all procedures used in the controlled fuel processing area indicates that none of the listed chemicals of Table 5 were introduced into the mop water waste substream.

Free Liquids

After stabilization there should not be any free liquids present in the stabilized mop water waste. The stabilized mop water waste substream will be tested for free standing liquid using the EPA paint filter test (Ref. 10).

Particulates

Particulates will not be present in the stabilized mop water waste since the mop water waste will be stabilized by solidification.

Gases

The stabilized waste will be in solid form, no gases will be present.

Stabilization

Stabilization of the mop water will be accomplished by neutralizing the mop water if necessary, then solidifying the mop water waste substream.

Etiological Agents

A review of all procedures used in the controlled fuel processing area indicates that etiological agents were never introduced into areas of the fuel fabrication facility where the mop water was collected.

TABLE 5. LIST OF ORGANIC PERSISTENT AND BIOACCUMULATIVE TOXIC SUBSTANCES AND THE SOLUBLE THRESHOLD LIMIT CONCENTRATION (STLC) AND TOTAL THRESHOLD LIMIT CONCENTRATION (TTLC) VALUES - (REF. 2)

Substance	STLC* mg/l	TTLC* Wet-Wt mg/kg
Aldrin	0.140	1.40
Chlordane	0.250	2.50
DDT, DDE, DDD	0.100	1.00
2,4-Dichlorophenoxyacetic acid	0.100	100.00
Dieldrin	0.800	8.00
Dioxin (2,3,7,8-TCDD)	0.001	0.01
Endrin	0.020	0.20
Heptachlor	0.470	4.70
Kepone	2.100	21.00
Lead compounds, organic	13.000	
Lindane	0.400	40.00
Methoxychlor	0.100	100.00
Mirex	2.100	21.00
Pentachlorophenol	1.700	17.00
Polychlorinated biphenyls (PCBs)	5.000	50.00
Toxaphene	0.500	5.00
Trichloroethylene	204,000	2,040.00
2,4,5-Trichlorophenoxypropionic acid	1.000	10.00

* STLC and TTLC values are calculated on the concentrations of the elements, not the compounds.

Chelating Agents

A review of all procedures used in the controlled fuel processing area indicates that chelating agents were not introduced into areas of the fuel fabrication facility where the mop water was collected.

Polychlorinated Biphenyls (PCBs)

A review of all procedures used in the controlled fuel processing area indicates that PCBs were never introduced into areas of the fuel fabrication facility where the mop water was collected.

Explosives and Pyrophorics

A review of all procedures used in the controlled fuel processing area indicates that the stabilized mop water waste does not contain substances that are explosive or pyrophoric.

Transuranics

A review of all procedures used in the controlled fuel processing area indicates that this waste substream does not contain transuranics.

4.2 STABILIZED SCRUBBER WASTE

The scrubber waste was produced by SiC coating during the NP-MHTGR Fuel Development Program. During SiC coating HCl and H_2 were generated as by-product gases along with SiC soot. The HCl, H_2, and SiC soot generated was passed through a 304 stainless steel pipe to a scrubber containing NaOH solution to neutralize the HCl. Scrubber liquid which is initially a concentrated NaOH aqueous solution eventually becomes neutralized or spent from absorption of HCl.

Silicon carbide coating off-gases that were passed through 304 stainless steel piping can corrode the stainless steel piping and form chromium chloride that ends up in the scrubber waste. Measurements have shown the scrubber waste to contain as much as 17 ppm Cr, but no other RCRA or CA toxic metals above regulatory limits (Ref. 5). The original liquid waste is not ignitable or reactive, however the liquid scrubber waste is corrosive. After neutralization and stabilization the corrosive characteristic for this waste substream will be removed. For completeness Tables 6 and 7 have been provided. The data found in these tables was obtained using EPA SW-846 methodology.

Asbestos

A review of the coating procedures that generated the scrubber waste, as well as the waste handling procedures showed that asbestos was not used in the processes that generated this waste substream. Therefore, asbestos could not be present in the scrubber waste substream.

Bioaccumulative Toxic Substances

A review of all procedures used in the controlled fuel processing area indicates that none of the bioaccumulative toxic substances in Table 5 were present in the pilot plant laboratory where the waste stream was generated.

Free Liquids

The liquid scrubber waste substream will be neutralized and solidified and tested for free standing liquid.

Particulates

There will be no particulates present in the stabilized scrubber waste.

Gases

The stabilized waste will be composed only of solid material, gases will not be present.

Stabilization

After stabilization of the scrubber waste the product waste will be a stable solid.

Etiological Agents

A review of all procedures used in the controlled fuel processing area indicates that etiological agents were not present in the materials producing the scrubber waste substream.

Chelating Agents

A review of all procedures used in the controlled fuel processing area indicates that no chelating agents were present in operations producing the scrubber waste.

Polychlorinated Biphenyls (PCBs)

A review of all procedures used in the controlled fuel processing area indicates that PCBs were not used in processes that produced scrubber waste.

Explosives and Pyrophorics

A review of all procedures used in the controlled fuel processing area indicates that the stabilized scrubber waste will not contain any explosive or pyrophoric substances.

Transuranics

A review of all procedures used in the controlled fuel processing area indicates that there are no transuranics present in the scrubber waste substream.

Table 6. Analytical Results for Liquid Scrubber Waste TTLC Metals

RMTR	Sb	Ba	Be	Cd	Cr	Co	Cu	Pb	Mo	Ni	Ag	Tl	V	Zn	As	Se	Hg
Regulatory limit TTLC (mg/kg)	500	10,000	75	100	2,500	8,000	2,500	1,000	3,500	2,000	500	700	2,400	5,000	500	100	20
42133	<0.03	2.0	<0.005	<0.005	10.00	0.40	0.52	0.26	0.08	4.2	0.007	<0.150	0.03	1.20	0.036	<0.045	0.0020
42134	<0.03	2.8	<0.005	<0.005	7.70	0.32	0.23	0.03	2.20	3.3	0.003	<0.150	0.03	1.60	0.033	<0.045	0.0042
42135	<0.03	2.1	<0.005	<0.005	6.65	0.33	0.36	0.10	0.09	3.1	0.004	<0.150	0.04	1.10	<0.030	0.045	<0.0008
42136	<0.03	2.4	<0.005	0.013	17.40	0.52	3.20	0.17	0.30	9.1	0.014	<0.150	0.07	2.80	<0.030	0.045	0.0012
42137	<0.03	1.6	<0.005	<0.005	13.00	0.22	0.27	0.12	<0.010	8.7	<0.002	<0.150	<0.010	0.62	<0.030	<0.045	<0.0008
42138	<0.03	1.4	<0.005	<0.005	0.42	0.01	0.16	0.08	0.03	0.3	<0.002	<0.150	0.04	1.40	<0.030	<0.045	0.0012
42732	<0.03	1.5	<0.005	<0.005	1.80	0.04	0.25	0.10	0.04	0.9	0.005	<0.150	0.04	0.88	<0.030	<0.045	0.0020
42733	<0.03	1.5	<0.005	<0.005	3.70	0.07	0.66	0.26	0.03	1.9	0.005	<0.150	0.03	1.50	<0.030	<0.045	0.0025
42734	<0.03	1.5	<0.005	<0.005	1.80	0.05	0.16	0.10	0.03	1.1	0.004	<0.150	0.04	0.76	<0.030	<0.045	<0.0008
42735	<0.03	1.6	<0.005	<0.005	3.70	0.11	0.37	0.11	0.07	2.0	0.002	<0.150	0.03	1.30	0.084	<0.045	0.0339
42736	<0.03	1.8	<0.005	<0.005	4.50	0.12	2.30	0.15	0.04	2.3	0.004	<0.150	0.04	3.40	<0.030	<0.045	0.0350
42737	<0.03	1.6	<0.005	<0.005	4.20	0.12	1.20	0.07	0.27	2.1	0.003	<0.150	0.05	1.20	<0.030	<0.045	0.0390
42738	<0.03	1.5	<0.005	<0.005	4.50	0.14	0.23	0.18	0.03	2.9	0.003	<0.150	0.01	0.85	<0.030	<0.045	0.0070
42739	<0.03	1.7	<0.005	0.012	3.30	0.12	0.83	0.23	0.25	2.6	0.006	<0.150	0.01	8.80	<0.030	<0.045	0.0130
42740	<0.03	1.5	<0.005	<0.005	0.03	0.01	0.11	0.32	0.39	0.1	<0.002	<0.150	0.05	0.59	<0.030	<0.045	<0.0008
42741	<0.03	1.7	<0.005	0.014	2.50	0.08	1.40	0.06	0.10	2.1	<0.002	<0.150	0.02	2.00	<0.030	<0.045	0.0009
42742	<0.03	0.7	<0.005	<0.005	0.32	0.03	1.10	0.36	0.11	0.2	0.003	<0.150	0.03	1.80	<0.030	<0.045	<0.0008
42743	<0.03	1.8	<0.005	0.027	3.60	0.15	1.60	0.05	0.31	2.4	0.019	<0.150	0.10	3.00	<0.030	<0.045	<0.0008
42744	<0.03	1.7	<0.005	<0.005	2.70	0.07	0.52	0.02	0.07	2.6	0.002	<0.150	<0.010	1.00	<0.030	<0.045	<0.0008
Mean*	0.03	1.7	0.005	0.008	4.83	0.15	0.81	0.15	0.13	2.7	0.005	0.150	0.04	1.88	0.033	0.045	0.0078
Std. Dev.	0.00	0.4	0.000	0.006	4.48	0.14	0.83	0.10	0.12	2.4	0.004	0.000	0.02	1.86	0.012	0.000	0.0129
Regulatory limit STLC (mg/l)	15	100	1	1	5	80	25	5	350	20	5	7	24	250	5	1	0

* DL value was used when the analyte concentration was below the DL

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Table 7. Analytical Results for Liquid Scrubber Waste Uranium Concentration and pH

RMTR	U (g/l)	pH
42133	9.98E-03	12.65
42134	1.34E-02	12.55
42135	9.98E-03	12.50
42136	8.23E-03	12.64
42137	9.98E-03	12.52
42138	9.41E-03	10.53
42732	1.02E-04	13.00
42733	9.31E-05	13.00
42734	5.46E-05	13.02
42735	5.11E-05	0.13
42736	4.80E-05	0.11
42737	4.80E-05	0.01
42738	9.60E-05	12.08
42739	4.95E-05	12.10
42740	1.44E-04	9.90
42741	4.80E-05	12.97
42742	4.80E-05	12.80
42743	9.60E-05	12.93
42744	4.98E-04	12.20
Mean	3.28E-03	10.40
Std. Dev.	4.89E-03	4.66

4.3 STABILIZED WASTE COLUMN WASTE

This waste substream was generated by the kernel fabrication process during the NP-MHTGR Fuel Development Program. The waste columns were the central liquid waste collecting point for the Fuel Pilot Plant Manufacturing Facility. The kernel forming columns, the dryer, and the contaminated sinks were hard piped to the waste columns where liquid waste was collected in the nuclear safe geometry columns. After process effluents filled the waste columns, samples were taken to determine U concentration for accountability and nuclear safety. The waste column liquid waste then was transferred to 55-gallon drums. Typically, two or three drums were filled each time the columns were emptied.

Process chemicals and effluents collected in the waste columns can be found in the following procedures:

- FMP-1020 Kernel Dryer Operation, Issue B, February 1991.
- FMP-1050 Broth Manufacture, Issue B, March 1991.
- FMP-1060 UNH Manufacture, Issue B, March 1991.
- FMP-1080 NPR Kernel Forming Column, Issue A, Nov. 1990.

Since these procedures were used to produce waste column waste only the following chemicals comprised the waste column liquid waste; deionized water, isopropyl alcohol, ammonium nitrate, nitric acid, NH_4OH, uranium oxide, polyvinyl alcohol (PVA), and tetrahydrofurfuryl alcohol (THFA). Liquids discarded through the contaminated sinks were generated by cleaning of process glassware with dilute nitric acid and water. Controls and procedures preclude the possibility of cross contamination of the waste column waste during transfer from the waste columns to the waste storage facility. Analytical data found in the Preliminary Waste Characterization Report indicates that amounts of Hg, and Pb may be present in this waste substream above regulatory limits (Ref. 5). The concentration of chemicals in this waste substream may vary depending on the day-to-day activities, therefore chemical concentrations may vary in each drum containing waste column waste. In addition, since the majority of liquid samples were observed to be ignitable (flash point <140°F) based on results documented in the Preliminary Waste Characterization Report, the stabilized Waste Column Waste samples will be tested for ignitability (flash point). This waste substream was corrosive initially, however after neutralization and stabilization this corrosive characteristic will be removed.

For completeness Tables 8 and 9 are included showing mean radiological, ignitability, pH and toxicity data from 100% sampling of the Waste Column Waste drums. The analyses were performed using approved EPA SW-846 methodology.

Asbestos

A review of all procedures used in the controlled fuel processing area indicates that asbestos was not used in the processes that generated this waste substream. Therefore, asbestos could not be present in the waste column waste substream.

Toxic Substances

The waste column waste substream does not contain any toxic substances except for possible RCRA metals.

Bioaccumulative Toxic Substances

A review of all procedures used in the controlled fuel processing area indicates that none of the substances in Table 5, "Bioaccumulative Toxic Substances" from CCR, Title 22, 66261 (Ref. 2) are present in the waste column waste.

Free Liquids

There will be no free liquids present in the stabilized waste column waste substream. After stabilization the waste column waste will be tested for free standing liquids.

Particulates

The stabilized waste column waste will not contain particulates.

Gases

The stabilized waste column waste will be composed only of solid material, no gases will be present.

Stabilization

The waste column waste will be neutralized to a pH of between 5 and 9 if necessary, and then solidified.

TABLE 8. ANALYTICAL RESULTS FOR LIQUID WASTE COLUMN WASTE MEAN VALUES FOR TCLP METALS, PH, IGNITABILITY, AND URANIUM CONCENTRATION

	As	Ba	Cd	Cr	Pb	Hg	Se	Ag	pH	Flash Point	LEL	U
Regulatory Limit -TCLP (mg/l)	5.0	100	1	5	5	0.20	1	5	pH ≤ 2 or pH ≥12.5	<140°F	(%)	(g/l)
Mean* (mg/l)	1.0	10	0.11	0.52	1.2	0.07	0.15	0.5	9.83	NA‡	60	0.453
Std. Dev.	0.0	0	0.04	0.06	1.2	0.20	0.01	0.0	3.07	NA‡	41	1.204

* DL value was used when the analyte concentration was below the DL

‡ Approximately 80% of the drums contain materials with a flash point below 140°F.

TABLE 9. ANALYTICAL RESULTS FOR LIQUID WASTE COLUMN WASTE MEAN VALUES FOR TTLC METALS

RMTR	Sb	Ba	Be	Cd	Cr	Co	Cu	Pb	Mo	Ni	Ag	Tl	V	Zn	As	Se	Hg
Regulatory Limit TTLC (mg/kg)	500	10000	75	100	2500	8000	2500	1000	3500	2000	500	700	2400	5000	500	100	20
Mean* (mg/kg)	0.8	1.7	0.11	0.09	0.9	0.8	3.4	4.5	0.8	0.9	0.8	0.8	0.9	13.2	0.8	0.7	0.0117
Std. Dev.	0.7	1.5	0.10	0.09	0.7	0.7	4.5	20.9	0.7	0.8	0.8	0.7	0.8	58.5	0.7	0.7	0.0315
Regulatory Limit STLC (mg/l)	15	100	0.75	1	5	80	25	5	350	20	5	7	24	250	5	1	0

* DL value was used when the analyte concentration was below the DL

Etiological Agents

A review of all procedures used in the controlled fuel processing area indicates that etiological agents were not present in the materials making up the waste column waste substream.

Chelating Agents

A review of all procedures used in the controlled fuel processing area indicates that no chelating agents are present in the waste column waste substream.

Polychlorinated Biphenyls (PCBs)

A review of all procedures used in the controlled fuel processing area indicates that PCBs are not present in the waste column waste substream.

Explosives and Pyrophorics

A review of all procedures used in the controlled fuel processing area indicates that the stabilized waste column waste does not contain any explosive or pyrophoric substances.

Transuranics

A review of all procedures used in the controlled fuel processing area indicates that transuranics are not present in the waste column waste.

4.4 STABILIZED SOOT WASTE

The soot waste substream was generated during kernel coating following procedures FMP-1221 "Particle Buffer Coating," FMP-1224 "Particle Outer LTI Coating," and FMP-1225 "Particle Seal, Protective and Seal Coating." The soot waste was generated during the deposition of PyC coatings on particles. Soot waste is similar to fine graphite and not ignitable or corrosive. A review of procedures used in coating indicates that this waste is not reactive. The soot powder was periodically collected in the coater baghouse. The soot waste will be sampled and analyzed for RCRA metals, volatiles, and semi-volatiles.

Asbestos

A review of all coating that generated the soot, as well as the waste handling procedures showed that asbestos was not used in the processes that generated this waste substream. Therefore, asbestos could not be present in the soot waste substream.

Toxic Substances

The soot waste substream has the potential to contain RCRA metals and volatile organics.

Bioaccumulative Toxic Substances

A review of all procedures used in the controlled fuel processing area indicates that none of the substances in Table 5, "Bioaccumulative Toxic Substances" from CCR, Title 22, 66261 (Ref. 2) are present in the soot waste.

Free Liquids

The soot waste is solid waste. There are no free liquids present in the soot waste.

Particulates

The soot waste does contain particulates that will be double bagged for containment.

Gases

Soot waste is composed only of solid material, no gases are present in the waste.

Stabilization

Stabilization of soot waste will require double bagging of the soot.

Etiological Agents

A review of all procedures used in the controlled fuel processing area indicates that etiological agents were not present in the materials used to produce the soot waste.

Chelating Agents

A review of all procedures used in the controlled fuel processing area indicates that no chelating agents are present in the soot waste substream.

Polychlorinated Biphenyls (PCBs)

A review of all procedures used in the controlled fuel processing area indicates that PCBs are not present in the soot waste substream.

Explosives and Pyrophorics

A review of all procedures used in the controlled fuel processing area indicates that the soot waste does not contain any explosive or pyrophoric substances.

Transuranics

A review of all procedures used in the controlled fuel processing area indicates that transuranics are not present in the soot waste.

4.5 STABILIZED HEPA FILTER WASTE

The HEPA filters are used in the ventilation systems for Buildings 39 and 41. After the NPR fuel development was terminated, the HEPA filters in Building 39 were replaced and the old filters were added to the NPR fuel waste inventory. Some additional HEPA filter waste may be generated as a result of the waste processing in Building 41. A review of the materials used in filters showed that the fresh filters are not toxic, corrosive, ignitable, or reactive. A review of the materials used in buildings 39 and 41 showed that the filters may have been exposed to small quantities of toxic materials which could have been carried in the ventilation air. The filters will be sampled and analyzed for RCRA and CA hazardous metals, fluoride salts, and volatiles, and semi-volatiles which may have been used in the building while the filters were in use.

Asbestos

A review of all procedures used in the controlled fuel processing area indicates that asbestos was not used in any of the manufacturing processes or quality control analyses. Therefore, the exhaust gases from the controlled area could not have contaminated the HEPA filters with asbestos. In addition, asbestos is not present as a material in the HEPA filters. Therefore, asbestos is not present in this waste substream.

Toxic Substances

The HEPA filter substream has the potential to contain hazardous RCRA and CA metals, fluoride salts, and volatile organics. Representative samples will be obtained and analyzed. Depending on the results of these analyses, the filters will be characterized as LLW or mixed waste.

Bioaccumulative Toxic Substances

A review of all procedures used in the controlled fuel processing area and of the chemical inventory for that area indicates that none of the substances in Table 5, "Bioaccumulative Toxic Substances" from CCR, Title 22, 66261 (Ref. 2) are present in the HEPA filters.

Free Liquids

The HEPA filters are solid waste. There are no free liquids in the HEPA filters.

Particulates

The HEPA filters do contain particulate matter. Since immobilization is not practical, the filters will be packaged to meet the following criteria of NVO-325: packaging by sealing in plastic at least 6-mil thick and then placing the sealed bag in a steel box or steel drum.

Gases

HEPA filters are composed only of solid material, no gases are present.

Stabilization

Stabilization is not required; the filters are stable solid material. The filters will be compacted and placed inside plastic bags.

Etiological Agents

A review of all procedures used in the controlled fuel processing area and of the chemical inventory for that area indicates that etiological agents were not present in Building 39 and therefore could not be present in the HEPA filters.

Chelating Agents

A review of all procedures and processes used in the controlled fuel processing area indicates that no chelating agents are present in the HEPA filters.

Polychlorinated Biphenyls (PCBs)

A review of all procedures used in the controlled fuel processing area and of the chemical inventory for that area indicates that PCBs are not present in the HEPA filters.

Explosives and Pyrophorics

A review of the materials used in the filters and a review of all procedures used in the controlled fuel processing area indicates that the HEPA filters do not contain any explosive or pyrophoric substances.

Transuranics

A review of all procedures, materials, and product used in the controlled fuel processing area indicates that transuranics are not present in the HEPA filters.

5. USE OF RESULTS

The results of analyses for the substances and properties described in Section 3 and listed in Tables 1 and 12 for each waste substream will determine if concentrations exceed regulatory limits. This information, combined with process knowledge, then allows a reliable decision to be made regarding the status of the waste substreams, that is, whether or not they are classified as low-level waste. Figure 3 presents a flow chart illustrating this decision making process and how analytical results will be used.

6. SAMPLING METHODS AND SAMPLING PROCEDURES

6.1 SAMPLING APPROACH

Table 10 presents the sampling method for each of the waste substreams described in this sampling and analysis plan.

TABLE 10. SAMPLING METHODS

Waste Substream	Sample Volume	Sampling Method	Procedure
Stabilized Mop Water	4 ounces	Representative Sample	NWPF-WI-3.4 (Ref. 6)
Stabilized Scrubber	4 ounces	Representative Sample	NWPF-WI-3.4 (Ref. 6)
Stabilized Waste Column	4 ounces	Representative Sample	NWPF-WI-3.4 (Ref. 6)
Stabilized Soot	16 ounces-metals & semi-volatiles (min. weight of 100 grams) 4 ounces-volatiles(min. weight of 25 grams)	Grab sample Grab sample	FQCI-103 (Ref. 12) FQCI-103 (Ref. 12)
HEPA Filters	16 ounces-metals & semi-volatiles(min. weight of 100 grams) 4 ounces-volatiles (min. weight of 25 grams)	Core Sample-Each Filter Core Sample-Each Filter	NWPF-WI-3.20 (Ref . 17) NWPF-WI-3.20 (Ref . 17)

Each HEPA filter will be core sampled per the referenced procedure. In addition, one fresh filter will be core sampled and analyzed for the same constituents as the waste filters.

For each of the other waste substreams, a representative sample will be obtained and analyzed from at least 10% of the waste containers. Where there are only a few containers housing a particular substream, there will be a minimum of one sample obtained from the substream. That is, for a substream housed in 20 containers, at least 2 containers will be sampled. A substream housed in 2 containers will have at least one of the containers sampled. Containers to be sampled will be selected at random according to procedure QDI-5.5, "Sampling Plan for Product Acceptance" (Ref. 9).

The sampling approach for the various stabilized process liquid/material substreams is as follows. Liquid Mop Water Waste is housed in two drums, liquid Scrubber Waste is housed in approximately 40 drums, liquid Waste Column Waste is housed in approximately 65 drums, and Soot Waste occupies approximately 24 containers. After stabilization the amount of drums occupied by stabilized process liquid waste will increase by a factor of 2 to 2.6. Soot waste which is solid will continue to occupy approximately 24 containers. In all cases at least 10% of the containers housing stabilized process liquid and process material waste will be sampled with a minimum of one per waste substream.

Representative samples will be obtained from neutralized and solidified liquid waste according to procedure NWPF-WI-3.4, "Liquid and Sludge Waste Neutralization and Stabilization" (Ref. 6). That procedure describes the process that homogenizes the liquid waste during neutralization by thorough mixing. Thorough mixing is continued while solidification agents are added to the waste. At the end of the solidification process a sample is taken prior to setting of the mixture. This process ensures that drum contents are homogeneous and that samples obtained are representative of the waste. Representative samples will be obtained from soot waste according to procedure FQCI-103, "Sampling Methods" (Ref. 12). This procedure ensures that representative samples will be obtained from the soot waste for analysis.

The referenced procedures which correspond to the various sampling methods found in Table 10 contain details of location of samples to be taken from each container.

Analytical results will be evaluated to ensure that analytical characterization meets or exceeds the 90% confidence limit. If necessary additional samples will be obtained to ensure that hazardous analytes for all waste substreams are below regulated limits at the 90% confidence level.

6.2 SAMPLING EQUIPMENT

The sampling and shipping procedures have a detailed explanation of protective equipment required for each operation. The following is a list of health and safety related equipment that is used for characterization operations.

1. Gloves
2. Aprons
3. Face shield
4. Respiratory protective equipment
5. Safety glasses

6. Safety shoes
7. Protective clothing for hazardous material handling
   (as determined by Cognizant Engineer)

Sample Related Equipment

1. Riffle splitter
2. Spatula for core samples
3. Tumbler for grab samples
4. Laboratory hood
5. Sample containers
   - Core sample containers
   - Polyethylene and glass bottles
   - Plastic bags
   - Metal cans
   - Coolers
6. Forms
   - Chain-of-Custody Form
   - Radioactive Materials/Removal Record, GA Form 558
   - Radioactive Material Shipping Request
   - Material Transfer Form for SNM
   - Seals, Seal Log, Radioactive Material Labels for Core and Standard Samples
     - Enriched
     - Depleted/Natural

6.3 RECOMMENDED SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

The recommended sample containers, preservation and holding times are listed in SW-846, Third Edition (Ref. 10). Sample container type, volume, and preservative will be verified with the analytical laboratory before sampling. Samples will be packaged following procedure NWPF-WI-3.10, "Sample Packaging and Shipping" (Ref. 11) according to the protocol indicated in Table 11.

TABLE 11.
RECOMMENDED SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES FOR STABILIZED PROCESS LIQUID WASTE AND PROCESS MATERIAL WASTE SAMPLES

Waste Substream	Test/ Analyte	Sample Container Type	Preservation	Maximum Holding Time for Field Sample Prior to Extraction of Analysis Sample
Stabilized Mop Water	Free Liquids[a]	Polyethylene	Not Applicable	Not Applicable
Stabilized Scrubber	TCLP[b]/RCRA Metals	Polyethylene	Blue Ice, 4°C	28 or 180 days[c]
	Free Liquids[a]	Polyethylene	Not Applicable	Not Applicable
Stabilized Waste Column	TCLP[b]/RCRA Metals	Polyethylene	Blue Ice, 4°C	28 or 180 days[c]
	Free Liquids[a]	Polyethylene	Not Applicable	Not Applicable
Stabilized Soot	TCLP[b]/RCRA Metals	Polyethylene	Blue Ice, 4°C	28 or 180 days[c]
	TCLP[b]/Volatiles[d]	Glass Bottle	Blue Ice, 4°C	14 days[e]
	TCLP[b]/Semi-Volatiles[f]	Glass Bottle	Blue Ice, 4°C	14 days[g]
HEPA Filters	TCLP [b]/RCRA Metals	Polyethylene	Blue Ice, 4°C	28 or 180 days[c]
	WET CA Hazardous Metals	Polyethylene	Blue Ice, 4°C	28 or 180 days[c]
	Fluoride Salt	Polyethylene	Unpreserved	28 days
	TCLP [b] Benzene Tetrachloroethylene	Glass Bottle	Blue Ice, 4°C	[g]

(a) The Paint Filter Test will be used to measure free liquids present using Method 9095, which can be found in SW-846 (Ref. 10), or if practical the presence free liquids will be determined by visual inspection.

(b) TCLP makes use of Extraction Method 1311, which can be found in SW-846 (Ref. 10).

(c) After field collection there is a maximum time of 180 days allowed to extract analysis sample from field sample. In addition, extracted analysis sample must be analyzed within a similar 180 day period. Therefore there is a maximum allowed time of 360 days from field collection to extracted sample analysis. There is one exception for Hg that has a 28 day limit to extraction and a 28 day limit from extraction to analytical measurement.

(d) EPA SW-846 Method 8240 or 8260.

(e) 14 days to TCLP extraction (Method 1311), and 14 days from extraction to analysis.

(f) EPA SW-846 Method 8250 or 8270.

(g) 14 days to TCLP extraction (Method 3510 and 3640), and 40 days from extraction to analysis.

7. ANALYSIS OF WASTE SAMPLES

Only analytical procedures listed in SW-846, Third or Second Edition, are to be used for the various waste sample analyses (Ref. 10). The GA-QA approved laboratories that will be utilized for waste sample analysis are:

- Thermoanalytical, Inc. (TMA), 160 Taylor St., Monrovia, CA 91016, M. Parish 818-357-3247

- Lockheed Analytical, 975 Kelly Johnson Drive, Las Vegas, NV 89119, L. Lenkauskas 702-361-3955

- Huntingdon Consulting Engineers, 1908 Innerbelt Business Center Drive, St. Louis, MO 63114, P. Smith 314-426-0880

- General Atomics Analytical Chemistry Laboratory, 3550 General Atomics Ct., San Diego, CA 92121, A. Greenwood 619-455-2909.

Target analyte and analytical methods are presented in Table 12.

TABLE 12.
TARGET ANALYTE AND ANALYTICAL METHODS

Waste Substream	Test/Analyte	Extraction Method/Analysis Method
Stabilized Mop Water	Free Liquids	SW-846 Analysis Method 9095
Stabilized Scrubber	TCLP/RCRA Metals	SW-846 Method 1311/6000 or 7000 series
	Free Liquids	SW-846 Analysis Method 9095
Stabilized Waste Column	TCLP/RCRA Metals	SW-846 Method 1311/6000 or 7000 series
	Ignitability	Preliminary screening test per 49 CFR Appendix E to part 173
	Free Liquids	SW-846 Analysis Method 9095
Stabilized Soot	TCLP/RCRA Metals	SW-846 Method 1311/6000 or 7000 series
	Volatiles	SW-846 Method 1311/8240 or 8260
	Semi-Volatiles	SW-846 Method 3510 and 3640/ 8250 or 8270
HEPA Filters	TCLP/RCRA Metals	SW-846 Method 1311/6000 or 7000 series
	Volatiles	SW-846 Method 1311/8240 or 8260
	Semi-Volatiles	SW-846 Method 3510 and 3640/ 8250 or 8270
	WET/CA Metals	WET extraction, 3010 or 3020 method, and 6000 or 7000 series.

8. REFERENCES

1. Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements, June 1992, NVO-325 (Rev. 1).

2. California Code of Regulations, Title 22, 3/5/93.

3. Resource Conservation and Recovery Act, Environmental Guidance Program Reference Book, Oak Ridge National Laboratory Report ORNL/M-1277, latest issue.

4. Code of Federal Regulations, 40 CFR, 1/1/94.

5. Preliminary Waste Characterization Report, GA Document, 910748, Rev. A, March 1995.

6. NWPF-WI-3.4, Liquid and Sludge Waste Neutralization and Stabilization.

7. Code of Federal Regulations, 29 CFR, 1/1/94

8. FPP-003, Nuclear Fuel Fabrication Division Training Program.

9. QDI-5.5, Sampling Plan for Product Acceptance.

10. Test Method for Evaluating Solid Waste, Physical/Chemical Methods, EPA Publication SW-846, Third edition, Final Update.

11. NWPF-WI-3.10, Sample Packaging and Shipping.

12. FQCI-103, Sampling Methods

13. NWPF-WI-3.34, Chain of Custody.

14. FQCI-407, Measurement of Solution pH.

15. NWPF-WI-3.14, Data Validation Procedure.

16. QAPD-3632, Quality Assurance Program Document - New Production Reactor Waste Disposal.

17. NWPF-WI-3.20, Core Sampling of HEPA Filters.

APPENDIX A

GENERIC REQUIREMENTS OF ALL SAMPLING AND ANALYSIS PLANS

A.1 DATA QUALITY OBJECTIVES

A.1.1 REPRESENTATIVENESS

For solid waste, the technique of riffle splitting as a sampling strategy will result in samples that are unbiased and representative of each waste container. This sampling procedure is documented in General Atomics procedure FQCI-103, "Sampling Methods" (Ref. 12).

For liquid waste that has been solidified, a representative sample will be taken according to NWPF-WI-3.4, "Liquid and Sludge Waste Neutralization and Stabilization" (Ref. 6). Analytical samples will then be extracted from the samples by TCLP to measure analytes of interest.

A.1.2 ACCURACY

In the analytical laboratory; matrix, spikes, and laboratory control samples will be analyzed along with the samples in order to provide a measure of accuracy as prescribed by SW-846 (Ref. 10).

A.1.3 PRECISION

The samples provided by GA to the analytical laboratory will be split into duplicate samples. A comparison of the results of the analysis of the duplicate samples will be used to demonstrate the precision of the analysis. If the precision exceeds the acceptance limits then the samples will be re-tested. If the precision is still unacceptable then a Nonconformance Report will be written and dispositioned per QAPD-3632 (Ref.16).

Analytical results obtained with sampling of at least 10% of the containers will be checked and evaluated to ensure that waste characterization meets or exceeds the 90% confidence limit.

A.1.4 COMPLETENESS

Completeness will be measured as a percentage of the data required by the SAP for stabilized process liquids and process material waste that was obtained and validated.

A.1.5 COMPARABILITY

Comparability will be addressed by using standard EPA SW-846 analytical methods and the same analytical equipment. All samples will be collected and handled according to the same sampling and shipping procedures.

A.1.6 METHOD DETECTION LIMIT

The following are the typical method detection limits and regulatory limits for various analytes.

Method Detection Limits for Various Analytes

Analyte	Typical Detection Limit (mg/l)	TCLP Regulatory Limit (mg/l)
Arsenic	0.01	5.0
Barium	0.2	100.0
Cadmium	.005	1.0
Chromium	0.05	5.0
Lead	0.1	5.0
Mercury	0.001	0.2
Selenium	0.005	1.0
Silver	0.01	5.0
Vanadium	0.2	(STLC)[a] 24.0
		(TTLC)[a,b] 2400
Sulfides	0.5	14.0

a STLC and TTLC values are calculated on the concentrations of the elements, not the compounds.

b Units for TTLC are mg/kg.

A.1.7 DATA REPORTING

Data reporting will conform to the requirements of NVO-325 (Ref. 1). Forms to be used by the laboratory in reporting the analytical results are included in Appendix B.

A.1.8 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

This section contains laboratory practices that ensure analytical QA/QC.

A.1.8.1 General Laboratory Controls

The following analytical controls must be implemented by laboratories performing analyses, in addition to instrument calibration and the analysis of quality control samples. These requirements are standard in a certified laboratory and will be verified during the laboratory inspection and validation process.

- Reagents and solvent will have certified compositions.
- Reagent storage environment and duration will meet the manufacturer's guidelines.
- Laboratory equipment will be calibrated/standardized following the referenced procedures for the methods used and will be documented.
- Volumetric measurements will be made with certified glassware.
- Data reduction computations will be independently checked.
- Qualified personnel will be used for laboratory analyses.
- Quality assurance/quality control requirements and guidelines specified in the selected analytical methods will be followed.

A.1.6.2 Laboratory QA/QC

Laboratories performing analysis of hazardous substances must have quality control procedures to document the accuracy and precision of sampling and specific analytical methods. This documentation requires as a minimum, the laboratories to obtain and analyze quality control samples with every analytical batch, or with at least 1 of every 20 samples, whichever results in the greater number of QC samples. Following are the required quality control samples/analyses.

- Method Blanks

Method blanks consist of laboratory reagent-grade water treated in the same manner as the sample (e.g., digested, extracted, distilled, etc.) and then analyzed and reported in the same manner as a standard sample. This will detect possible contamination resulting from the preparation or processing of samples.

- Method Blank Spike

A method blank spike is a sample of laboratory reagent-grade water fortified (spiked) with the analytes of interest, which is prepared and analyzed with the associated sample batch.

- Matrix Spikes

A matrix spike is an aliquot of an investigative sample that is fortified (spiked) with the analytes of interest and analyzed with the associated sample batch to monitor the effects of the investigative sample matrix (matrix effects) for the analytical method.

- Matrix-Spike Duplicates

Matrix-spike duplicates are used to determine the precision of organic samples. Matrix-spike duplicates are prepared by spiking with identical concentrations of target analytes.

- Matrix Duplicates

Matrix duplicates are used to determine the precision of inorganic samples. Matrix duplicates are split samples used to document the precision of a method in a given sample matrix.

- Laboratory Duplicate Samples

Duplicate samples are obtained by splitting a field sample into two separate aliquots and performing two separate analyses on the aliquots. Duplicates are performed only in association with selected protocols. Laboratory duplicates will be specified by the analytical methods or one per batch of samples, whichever is greater.

- Laboratory QC Standards Sample

This is a referenced QC sample of known concentration, obtained from the EPA, the National Institute of Standards and Testing, or a Nuclear Regulatory Commission approved commercial source. This QC sample checks the accuracy of the analytical procedure.

A.2 DOCUMENTATION AND SAMPLE CUSTODY

A.2.1 SAMPLE CUSTODY

A.2.1.1 Definition

A sample is considered in custody if it is in one of the following descriptions:

In one's physical possession

In one's view after being in one's physical possession

In one's physical possession and then locked up so that no one can tamper with the sample

Kept in a secured area and restricted to authorized and accountable personnel only.

A.2.1.2 Field Operations

A.2.1.2.1 Sample label is completed according to procedure NWPF-WI-3.10 (Ref. 11)

The following information is recorded on the sample labels:
Site/sample identification number;
Date the sample was collected;
Time the sample was collected;
Analysis to be performed on the sample; and
Sampler's initials.

A.2.1.2.2 Chain-of-custody form is completed according to procedure NWPF-WI-3.34 (Ref. 13)

The following information is recorded on the Chain-of-Custody
Site/sample identification number;
Date the sample was collected;
Time the sample was collected;
Analysis to be performed on the sample; and
Signature of person(s) relinquishing custody. (The collector and the person relinquishing the sample are the same person.)

A.2.1.2.3 Field logbook is completed according to procedures NWPF-WI-3.4 (Ref. 6)

The following information is recorded in the field logbook:
Project or site name;
Date of the activity;
Names of the samples;
Sample IDs;
Times of sample collection;
Type of analysis to be performed on the samples;
Comments on the sampling activity as needed;
Drawings show the site and sampling locations (optional);
Any personnel who visit during the sampling (optional);
How sample was collected;
Any pertinent calibration data; and
Any deviations as a result of field conditions, from the Standard Operating Procedures or Sampling and Analysis Plan used.

A.2.2 SHIPPING

Samples will be delivered to a GA QA-approved laboratory as soon as possible after collection. Appropriate sample analysis request forms and chain-of-custody records will accompany the samples. Samples will be packaged and shipped according to procedure NWPF-WI-3.10, "Sample Packaging and Shipping " (Ref. 11).

A.3 CALIBRATION PROCEDURES AND FREQUENCY

A.3.1 FIELD INSTRUMENTATION

Field instruments for pH measurement are to be calibrated prior to use in accordance with FQCI-407, "Measurement of Solution pH" (Ref. 14)

The LEL sniffer will be calibrated annually by the manufacturer and monthly by Emergency Services.

A.3.2 LABORATORY INSTRUMENTATION

Laboratory Instrumentation is to be calibrated at the required frequencies:

- Per analytical method
- Per manufacturer's recommendations
- In response to any malfunction

A.4 DATA REDUCTION, VALIDATION, AND REPORTING

A.4.1 DATA REDUCTION

Data reduction is performed by the subcontract laboratory.

A.4.2 DATA VALIDATION

Checklists have been developed to validate each sample with respect to integrity and method acceptance criteria in accordance with NWPF-WI-3.14, "Data Validation Procedure" (Ref. 15)

A.4.3 DATA REPORTING

A final internal report will be issued summarizing the findings and providing recommendations with respect to treatment and/or storage. The report will include:

1. Sampling documentation
2. Analytical methods
3. QA/QC data
4. Treatment standards (the subcontract laboratory will provide the initial input for treatment standards)
5. Supporting documentation

A.4.4 DATA STORAGE

Quality records will be kept for a minimum of ten years. Analytical results, RMTRs and the Land Disposal Restriction and Treatment Standard Notification and Certification will be kept until closure of the facility.

A.5 INTERNAL QUALITY CONTROL CHECKS

The quality control checks have been determined during the data quality objective development process based on the assumed risk of false negatives and past experience with the difficulties of analytical methods.

- Waste will be characterized as "mixed" if it has any toxic characteristics or hazardous listed substance, since the waste is defined as uranium contaminated.
- Analyses will be performed to identify and quantify RCRA components.
- Choosing the proper storage, treatment, and disposal options are addressed by this SAP.

A.6 PERFORMANCE AND SYSTEMS AUDITS

Due to the duration of this project a pre-scheduled field audit will not be conducted. However, the QA Department will monitor activities and conduct random surveillances as required.

Materials that come into contact with the samples will be procured in accordance with the instructions provided by QAPD-3632, "Quality Assurance Program Document—New Production Reactor Waste Disposal" (Ref. 16). The sampling bottles will be provided by the contracting laboratory.

A.7 SUPPLIES

To ensure adherence to the project schedule, critical supplies will be kept on hand. An ample supply of sampling bottles and associated materials will also be stocked in a controlled area for use in this project.

A.8 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Due to the finite duration of this project, separate scheduled quality assurance reports to management will not be made. Significant activities will be reported in the QA monthly report for the NPR Waste Disposal Project to the Nuclear Fuel Fabrication Director.

In the case of on-going operations, additional QA surveillance reports will be provided periodically.

Any non-conformances generated during this process will be reported in accordance with contract requirements.

A.9 QUALITY ASSURANCE OBJECTIVES

The field sampling quality control measures defined in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication SW-846, Third Edition, Rev. 1, December 1987 (Ref. 10) are to be implemented:

1. Field Blanks should be collected and analyzed. For this sampling program, a sampling container will be filled with deionized water. The water is poured directly into the container. The sampling frequency is 1/10, with a minimum of 1.

2. Rinsate Blanks. For this blank, deionized water is poured over decontaminated sampling equipment into the container. The sampling frequency is 1/10, with a minimum of 1.

3. A Field Duplicate will be taken for every 20 samples. If there are less than 20 samples in a batch there will be at least one field duplicate taken per batch. If there are significant discrepancies, additional duplicates will be obtained according to instructions from the field engineer.

APPENDIX B

DATA REPORTING FORMS PER NVO-325

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

Lab Name: _____ _____

Matrix (soil/water): _____

Level (low/med): _____

% Solids: _____

Lab Sample ID: _____

Date Received: _____

Concentration Units (ug/L or mg/kg dry weight): _____

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7449-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron				
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese				
7439-97-6	Mercury				
7440-02-0	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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5A
SPIKE SAMPLE RECOVERY

SAMPLE NO.

Lab Name: _____

Matrix: _____ Level (low/med): _____

% Solids for Sample: _____

Concentration Units (ug/L or mg/kg dry weight): _____

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

Comments:

6
DUPLICATES

SAMPLE NO.

Lab Name: _____

Matrix (soil/water): _____ Level (low/med): _____

% Solids for Sample: _____ % Solids for Duplicate: _____

Concentration Units: (ug/L or mg/kg dry weight): _____

Analyte	Control Limit		Sample (S)	C		Duplicates (D)	C		RPD		Q	M
Aluminum												
Antimony												
Arsenic												
Barium												
Beryllium												
Cadmium												
Calcium												
Chromium												
Cobalt												
Copper												
Iron												
Lead												
Magnesium												
Manganese												
Mercury												
Nickel												
Potassium												
Selenium												
Silver												
Sodium												
Thallium												
Vanadium												
Zinc												
Cyanide												

LABORATORY CONTROL SAMPLE -

Lab Name: _____

Solid LCS Source: _____

Aqueous LCS Source: _____

Analyte	Aqueous (ug/L) True	Found	%R	Solid (mg/kg) True	Found	C	Limits		%R
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron									
Lead									
Magnesium									
Manganese									
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

Lab Name: _____ SDG No. _____

Matrix (soil/water): _____ _____ Lab Sample ID: _____

Sample wt/vol.: _____(g/mL) Lab File ID: _____

Level (low/med): _____ Date Received: _____

% Moisture: not dec. _____ dec. _____ Date Analyzed: _____

Column (pack/cap): _____ Dilution Factor: _____

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg)	Q
74-87-3	Chloromethane		
74-83-9	Bromomethane		
75-01-4	Vinyl Chloride		
75-00-3	Chloroethane		
75-09-2	Methylene Chloride		
67-64-1	Acetone		
75-15-0	Carbon Disulfide		
75-35-4	1,1-Dichloroethene		
75-34-3	1,1-Dichloroethane		
540-59-0	1,2-Dichloroethene (total)		
67-66-3	Chloroform		
107-06-2	1,2-Dichloroethane		
78-93-3	2-Butanone		
71-55-6	1,1,1-Trichloroethane		
56-23-5	Carbon Tetrachloride		
108-05-4	Vinyl Acetate		
75-27-4	Bromodichloromethane		
78-87-5	1,2-Dichloropropane		
10061-01-5	cis-1,3-Dichloropropene		
79-01-6	Trichloroethene		
124-48-1	Dibromochloromethane		
79-00-5	1,1,2-Trichloroethane		
71-43-2	Benzene		
10061-02-6	trans-1,3-Dichloropropene		
75-25-2	Bromoform		
108-10-1	4-Methyl-2-Pentanone		
591-78-6	2-Hexanone		
127-18-4	Tetrachloroethene		
79-34-5	1,1,2,2-Tetrachloroethane		
108-88-3	Toluene		
108-90-7	Chlorobenzene		
100-41-4	Ethylbenzene		
100-42-5	Styrene		
1330-20-7	Xylene (total)		

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3A

WATER VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: _____ SDG No. _____

Matrix Spike Sample No.: _____

Compound	Spike Added (ug/L)	Sample Concentration (ug/L)	MS Concentration (ug/L)	MS % REC #	QC Limits Rec.
1,1-Dichloroethene					61-145
Trichloroethene					71-120
Benzene					76-127
Toluene					76-125
Chlorobenzene					75-130

Compound	Spike Added (ug/L)	MSD Concentration (ug/L)	MSD % REC #	% RPD	QC Limits RPD	QC Limits Rec.
1,1-Dichloroethene					14	61-145
Trichloroethene					14	71-120
Benzene					11	76-127
Toluene					13	76-125
Chlorobenzene					13	75-130

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: _____ out of _____ outside limits

Spike Recovery: _____ out of _____ outside limits

Comments:

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5A

VOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - BROMOFLUOROBENZENE (BFB)

Lab Name: _____ SDG No. _____

Lab File ID: _____ BFB Injection Date: _____

Instrument ID (1): _____ BFB Injection Time: _____

Matrix (soil/water): _____ Level (low/med): _____ Column (pack/cap): _____

m/e	Ion Abundance Criteria	% Relative Abundance
50	15.0 - 40.0% of mass 95	
75	30.0 - 60.0% of mass 95	
95	Base peak, 100% relative abundance	
96	5.0 - 9.0% of mass 95	
173	Less than 2.0% of mass 174	( ) 1
174	Greater than 50.0% of mass 95	
175	5.0 - 9.0% of mass 174	( ) 1
176	Greater than 95.0%, but less than 101.0% of mass 174	( ) 1
177	5.0 - 9.0% of mass 176	( ) 2

1 - Value is % mass 174 2 - Value is % mass 176

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01					
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

6A

VOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: _____ SDG No. _____

Instrument ID: _____ Calibration Dates: _____ _____

Matrix (soil/water): _____ Level (low/med): _____ Column (pack/cap): _____

Min RRF for SPCC(#) = 0.300 (0.250 for Bromoform) Max %RSD for CCC(°) = 30.0%

Lab File ID: RRF20 = _____ RRF50 = _____
RRF100 = RRF150 = RRF200 =

Compound	RRF20	RRF50	RRF100	RRF150	RRF200	RRF	% RSD
Chloromethane #							#
Bromomethane							
Vinyl Chloride °							°
Chloroethane							
Methylene Chloride							
Acetone							
Carbon Disulfide							
1,1-Dichloroethene °							
1,1-Dichloroethane #							°
1,2-Dichloroethene (total)							#
Chloroform °							
1,2-Dichloroethane							°
2-Butanone							
1,1,1-Trichloroethane							
Carbon Tetrachloride							
Vinyl Acetate							
Bromodichloromethane							
1,2-Dichloropropane °							
cis-1,3-Dichloropropene							°
Trichloroethene							
Dibromochloromethane							
1,1,2-Trichloroethane							
Benzene							
trans-1,3-Dichloropropene							
Bromoform #							
4-Methyl-2-Pentanone							#
2-Hexanone							
Tetrachloroethene							
1,1,2,2-Tetrachloroethane #							
Toluene °							#
Chlorobenzene #							°
Ethylbenzene °							#
Styrene							°
Xylene (total)							
Toluene-d8							
Bromofluorobenzene							
1,2-Dichloroethane-d4							

FORM VI VOA 1/87 Rev.

INTRODUCTION

This volume includes all documents which comprise the General Atomics Waste Generator Application for NPR program defense waste for the Nevada Test Site. The waste was generated during the NPR fuel and target development work from about 1990-1993. The application was prepared in response to requirements in DOE document NVO-325 (6/92), "Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements."

The following documents are included in this volume:

PC-000390: "NPR Program Defense Waste Generator Application"

Appendix A: PC-000391, "Low-Level Waste Certification Program Plan"

Attachment A: QAPD-3632, "Quality Assurance Program Document - New Production Reactor Waste Disposal"

Appendix B: PC-000375, "Sampling & Analysis Plan for NPR QC Waste"

Appendix C: PC-000393, "Sampling & Analysis Plan for NPR Program Stablized Process Liquid and Process Material Waste"