FINAL

Work Plan
for the Depleted Uranium Slug Search

Santa Susana Field Laboratory
Ventura County, California

Contract Number 114579

Prepared for:

BOEING

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Table of Contents

List of Figures

List of Tables

List of Acronyms, Abbreviations, and Units of Measurement

Boeing	The Boeing Company
CABRERA	Cabrera Services, Inc.
cm	centimeter
DOE	U. S. Department of Energy
DQOs	Data Quality Objectives
DU	depleted uranium
EDA	exploratory data analysis
FSP	field sampling plan
GIS	graphical interface system
GPS	global positioning system
H&S	health and safety
HASP	health and safety plan
m	meter
m/s	meters per second
MDC	minimum detectable concentration
NAD	North America Datum
NaI	sodium iodide
NIST	National Institute of Standards and Technology
pCi/g	picocuries per gram
QA	quality assurance
QC	quality control
RTK	real time kinetic
SOP	Standard Operating Procedure
SNAP	Systems for Nuclear Auxiliary Power
SSFL	Santa Susana Field Laboratory

EXECUTIVE SUMMARY

This work plan describes the comprehensive search that will be performed using both radiological and geophysical surveys to locate the missing depleted uranium (DU) slug at the Santa Susana Field Laboratory (SSFL) in Ventura County, California. The DU slug is suspected to have been lost in the 1960s during a test conducted at Area IV. No documentation has been found to suggest the slug was ever recovered. Cabrera Services, Inc. (CABRERA) has been contracted by The Boeing Company (Boeing) to perform this work.

Boeing operates Area IV of the SSFL for the U.S. Department of Energy (DOE). In the early 1960s, sometime prior to 1966, a test was performed near the west end of Area IV to simulate a rocket failure on the launch pad during the launch of a System for Nuclear Auxiliary Power (SNAP) reactor. The test is believed to have occurred sometime prior to 1966 and most likely in the Spring of 1965. The test was conducted by dropping 20 simulated SNAP fuel elements from a low flying helicopter in order to simulate a launch pad accident, one of which was reported to have not been recovered. Historical documentation (Rockwell, 1991) describes the location of the drop zone as the "field west of building 20 and south of building 9."

The impact area where the slug was dropped is a relatively flat area covered with light brush and grass that is estimated to be approximately two to three acres in size. The object is reported as a DU slug cylindrical in shape approximately 30 centimeters (cm) in length and 3 cm in diameter. No information is available regarding the composition of the DU encapsulation. Since the reported loss occurred in the 1960s, it is thought that the containment would likely be composed of an aluminum, zirconium or steel alloy..

A radiological survey of surface soil will be performed over 100% of the impact area to locate radiation anomalies that indicate potential areas for further investigation. The actual boundaries of the area to be searched will be established at the time of field mobilization. A geophysical survey will then be performed to supplement and corroborate findings from the radiological survey using one or more time-domain electromagnetic systems capable of detecting both ferrous and non-ferrous metals. Hand digging may be performed to investigate subsurface anomalies to a depth of approximately 12 inches below grade surface. Survey instrumentation will use global positioning system (GPS) technology to create radiological and geophysical maps of the impact area to identify possible targets.

The radiological and geophysical data will be presented in a technical report. The report will include a narrative of the DU slug search effort, present and interpret analytical data, include figures showing location of area searched and pertinent field information, describe the methods used to collect and analyze data, present quality assurance/quality control (QA/QC) information, and include field data sheets, project photographs, and maps of the project area. The report will present conclusions and recommendations regarding the possible location of the DU slug. Report appendices will include a complete set of the radiological and geophysical data collected.

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1.0 INTRODUCTION

This work plan describes the comprehensive search that will be performed using both radiological and geophysical surveys to locate the missing depleted uranium (DU) slug at the Santa Susana Field Laboratory (SSFL) in Ventura County, California. The DU slug is suspected to have been lost in the 1960s during a test conducted at Area IV. No documentation has been found to suggest the slug was ever recovered. Cabrera Services, Inc. (CABRERA) has been contracted by The Boeing Company (Boeing) to perform this work.

1.1 Historical Background

Boeing operates Area IV of the SSFL for the U.S. Department of Energy (DOE). In the early 1960s, sometime prior to 1966, a test was performed near the west end of Area IV to simulate a rocket failure on the launch pad during the launch of a System for Nuclear Auxiliary Power (SNAP) reactor. The test is believed to have occurred sometime prior to 1966 and most likely in the Spring of 1965. The test was conducted by dropping 20 simulated hydrid SNAP fuel elements from a low flying helicopter in order to simulate a launch pad accident. Historical documentation describes the test as follows:

> "The helicopter was to fly a straight line path over the south light posts of building 20's parking lot through to and on line with the ESADA tower (building 814) south of the burn pit (area 886). The altitude was about 300 feet above ground. The speed was not recalled, but it appeared to be relatively slow (20 to 30 mph). [An observer] remembers the soil condition as damp and muddy.
>
> "When the fly-over took place a single depleted uranium fuel slug came out first followed by the remainder in a cluster. The cluster started just south of the designated flight path at the intersect of the road to the water tower. The recovery crew with their geiger counters and some military mine detectors, along with the test observers, raced out to the site from our vantage point near a telephone pole.
>
> "The majority of the… slugs were only half buried and were visible, and all but one were recovered, including the single drop, within 45 minutes. Some had landed end first and left a small target of about a 1.5 inch hole…The metal detectors kept finding pieces of pipe, drum lids, cans, angle iron etc. The search continued for 4 hours. Several searchers returned the next day to continue the search.
>
> "The report back from the helicopter was that all of the elements were dropped as they were viewed by the observers. An element was not stuck in the dropping container or anything else." (Rockwell, 1991)

Historical documentation (Rockwell, 1991) describes the location of the drop zone as the "field west of building 20 and south of building 9." An aerial view of the impact area is shown in Figure 1-1.

1.2 Site Description

A terrestrial view of the impact area where the slug was dropped is shown in Figure 1-2. It is a relatively flat area covered with light brush and grass that is estimated to be approximately two to three acres in size.

Figure 1-1 Aerial View of DU Slug Impact Area

1.3 Object Description

The object is reported as a DU slug cylindrical in shape approximately 30 centimeters (cm) in length and 3 cm in diameter. No information is available regarding the composition of the DU encapsulation. Since the reported loss occurred in the 1960s, it is thought that the containment would likely be composed of an aluminum, zirconium or steel alloy..

1.4 Project Overview

A radiological survey of surface soil will be performed over 100% of accessible areas within the impact zone to locate radiation anomalies that indicate potential areas for further investigation. The actual boundaries of the area to be searched will be established at the time of field mobilization. A geophysical survey will then be performed to supplement and corroborate findings from the radiological survey using one or more time-domain electromagnetic systems capable of detecting both ferrous and non-ferrous metals. Hand digging may be performed to investigate subsurface anomalies to a depth of approximately 12 inches below grade surface. Survey instrumentation will use global positioning system (GPS) technology to create radiological and geophysical maps of the impact area to identify possible targets.

Figure 1-2 Terrestrial View of DU Slug Impact Area

(east side looking west)

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2.0 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) were developed to define the purpose of the search, clarify what data should be collected to satisfy the purpose, and specify the performance requirements for the quality of information to be obtained from the data.

2.1 Step 1 – State the Problem

A DU slug is believed to have been lost during a test conducted in the mid-1960s. Boeing would like to recover the slug as part of their ongoing decontamination and decommissioning efforts at the SSFL.

The primary decision maker is the Boeing Project Manager. CABRERA is responsible for developing this work plan and providing the necessary materials, consumables, and qualified personnel, including qualified technicians, to conduct the search. Boeing is responsible for providing information on current and past activities in the form of historical information and data.

2.2 Step 2 – Identify the Decision

The principal study question is: "Do radiological and/or geophysical survey results identify the location of the DU slug?" The following alternative actions will result from resolution of the principle study question:

- If radiological and geophysical survey results do not identify potential locations for the DU slug, then the area(s) will be identified as satisfactorily searched with no further investigation warranted. The survey conclusion shall demonstrate that the DU slug is not present in the survey area.
- If radiological and/or geophysical survey results suggest potential locations for the DU slug, these will be marked and further investigation (e.g., hand digging) will be recommended.

Based on the principal study question and the alternative actions listed above, the decision statement is: Determine areas where radiological and/or geophysical survey results suggest further investigation is warranted.

2.3 Step 3 – Identify Inputs to the Decision

Radiological and geophysical survey measurement data will be used as qualitative inputs to the principal study question.

The action level for the radiological survey is based on the detection of low-energy gamma-emitting surface residual radioactivity by scanning. A z-score greater than 3.0 will be used as it represents a probability greater than 99% that the survey data may not belong to the same population as the rest of the data set (i.e., potentially represents radioactivity other than that due to background). A mean and standard deviation of the collected data set are calculated. The difference between each survey data point and the mean is divided by the standard deviation to convert the measurement to multiples of the standard deviation above or below the population mean (i.e., z-score). These data are used to create a contour map. The contouring process involves creating a regularly spaced grid and assigning values to every spot on the grid using a weighted average based on the inverse square law. The inverse square law is generally used to describe how radiation levels drop off with distance from a source. Once the grid is complete, contours are created from grid node values within the specified ranges of values. The contouring process tends to smooth over single data points with z-score values slightly above 3.0 while accentuating clustered areas or single locations with z-score values significantly above 3.0. This is the desired effect which aids in the data analysis by focusing attention on those areas most likely to have elevated residual radioactivity. Contour areas with a z-score greater than 3.0 may have dissimilar radiological characteristics and should be investigated.

The action level for the geophysical survey is based on the instrument responses to surrogate items of similar size, shape and composition buried in a test strip to be established close to the study area. The use of a "soft prove-out" also allows the geophysicist to determine soil background responses and instrument positioning latencies. The prove-out will provide sufficient data to establish a preliminary threshold for anomaly selection based upon actual data that represents responses from the anticipated targets of interest. The results of the soft prove-out will be presented in the final report as a means of justifying anomaly selection criteria. Once intrusive investigations provide "hard prove-out" data, the thresholds can be adjusted (if necessary) to maximize the efficiency of the investigation.

The analysis of the geophysical data will be completed similarly to that of the radiological data in that color and line contour maps will be created that represent relative responses of the instrumentation to conductive metals in the ground. The geophysicist will also use instrument response profiles to identify anomalies that could represent targets of interest.

2.4 Step 4 – Define the Study Boundaries

For the radiological survey, the target population is the low-energy photons emitting by the DU slug and measured by the FIDLER. For the geophysical survey, the target population is the electromagnetic signature of the encapsulating metal material surrounding the DU slug, and the density of the slug itself. Survey data will be collected from the surface of the search area which will be defined at the beginning of the field mobilization.

Decisions will be made on the individual results of the radiological survey and the geophysical survey. Those results will then be further evaluated collectively to target areas of highest potential for further investigation.

2.5 Step 5 – Develop a Decision Rule

The decision statement results in the decision rules, listed in Table 2-1.

Table 2-1 Decision Rules

<table>
<tr><th>Parameter</th><th>IF</th><th>THEN</th></tr>
<tr><td>Radiological Measurements</td><td>Areas identified with z-scores greater than 3.0,</td><td rowspan="2">Hand survey area; investigate subsurface anomalies by hand digging to a depth of approximately 12 inches below grade surface; consult Boeing Project Manager to determine further action, if any.</td></tr>
<tr><td>Geophysical Measurements</td><td>Areas identified that meet anomaly selection criteria,</td></tr>
</table>

2.6 Step 6 – Specify Limits on Decision Errors

There are no quantitative decision errors rates that will be applied due to the qualitative nature of the survey data and their evaluation.

2.7 Optimize the Design

The data will be reviewed by type (i.e., radiological or geophysical) to qualify results and to rule out anomalous or biased results explainable based on site considerations (soil type, density, structures, improvements, etc.) or otherwise.

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3.0 SEARCH METHODOLOGY

The search methodology involves both radiological survey activities, which will be supervised by a Certified Health Physicist, and geophysical survey activities that will be supervised by a Geophysicist.

3.1 Site Preparation

A walk-down will be performed prior to the start of search to assess the physical state of the search area and to identify actions needed to prepare the search area. Site preparation will be performed by Boeing, including plowing and cutting of standing grass and weeds, and marking of search area boundaries.

A land survey of the search area will be performed using a Leica 1200 Series real time kinetic, differential global positioning system (RTK/GPS). The horizontal accuracy of the survey is anticipated to be within 5 cm on the ground. Uniquely identified wooden survey stakes will be placed at regular intervals to delineate survey grid locations. Survey control points will be established or provided to the survey team, if pre-existing.

If any metal debris exists on the surface, it will be collected and piled outside of the search area boundary.

3.2 Radiological Survey

A radiological survey will be performed over 100% of the reasonably accessible search area to locate radiation anomalies that indicate potential areas where further investigation may be warranted. A large, thin sodium iodide (NaI) gamma scintillation detector operated in a full spectrum mode, such as a Bicron G5 FIDLER mated with a Ludlum 2221 rate meter/scaler, will be used to perform the survey. The detector will be traversed over the search area in rows spaced 0.5 meters (m) apart, at a fixed height of 10 cm above soil, and at a speed of 1 meter per second (m/s) or less. The anticipated minimum detectable concentration (MDC) for this method is 4.9 picocuries per gram (pCi/g) for DU.

Measurement data will be position correlated using a Trimble Pathfinder® Pro XRS GPS receiver mated with a Trimble TSCe™ graphical interface system (GIS) field device (or equivalent). Measurement and position data will be automatically logged at one-second intervals.

3.3 Geophysical Survey

A geophysical survey will be performed to supplement and corroborate findings from the radiological survey using one or more time-domain electromagnetic systems capable of detecting both ferrous and non-ferrous metals, such as the Geonics EM 61-MK2 total metals detector coupled to a Leica 1200 Series RTK/GPS. The EM61-MK2 collects data at up to four separate time gates (channels) which allows for subtler anomaly detection depending upon subsurface soil types and chemistries. Data will be collected along parallel lanes at a spacing of approximately 1 m to ensure 100% coverage of the impact area.

The EM61-MK2 footprint dimensions are 1.0 m by 0.5 m. Based upon the instrument footprint, a 1-m lane overlap ensures 100% coverage. It is anticipated that several data collection sets may be required to completely map the total project area. However, datasets will be merged during processing to provide a single digital geophysical map of the area.

Once the data has been downloaded from the field computer, it will be processed using software such as Geosoft Oasis Montage with the UX-Detect Extension. Anomaly discrimination will be accomplished using linear color contour distribution along with line contours to ensure that subtler anomalies are also selected. Several channels of data may be analyzed to identify and discriminate anomalies of interest. Each selected anomaly will be digitized and compiled into a list containing the unique anomaly designation, location coordinates, and instrument responses (anomaly amplitudes) at the predetermined channels.

Maps displaying the instrument responses will then be prepared displaying the anomaly selections. A dig sheet created to identify anomalies for each area will be formatted for the intrusive team. Additionally, electronic files of anomaly locations will be provided for reacquisition activities, if necessary.

3.4 Instrumentation

Commercially available instrumentation will be used. A project file will be kept on the portable instrumentation (including radioactive calibration and check sources) used for data collection. The file will be maintained on-site for review and inspection.

3.4.1 Instrument Selection

Commercially available detection and measurement instrumentation will be selected based on reliable operation, detection sensitivity, operating characteristics, and expected performance in the field. Table 4-1 lists the types of portable survey instrumentation used.

Table 4-1 Field Survey Instrumentation

Measurement Type	***Instrument and Model Description***
Low-energy gamma radiation	Bicron G5 FIDLER NaI scintillation detector mated with a Ludlum 2221 ratemeter/scaler (or equivalent)
Time-domain electromagnetics	Geonics EM61 MK2 metal detector (or equivalent)
Geospatial positioning	Leica 1200 Series real time kinetic, differential GPS Trimble Pathfinder® Pro XRS GPS receiver mated with a Trimble TSCe™ GIS field device (or equivalent)

3.4.2 Calibration and Maintenance

Instrumentation will be maintained to manufacturer's specifications and calibrated for the radiation types and energies of interest using National Institute of Standard Technology (NIST) traceable sources. Instrumentation will be inspected prior to use to ensure its proper working condition, and properly protected against inclement weather conditions in the field.

Calibration/maintenance records will include the following information:

- Type of instrument
- Instrument name and identification number (e.g., model and serial number)
- Manufacturer
- Date of calibration

- Calibration due date
- Name of person performing the calibration

3.4.3 Response Checks

Instrument response checks will be conducted to assure constancy in instrument response and to verify the detector is operating properly. Instrument response will be checked before and after instrument use each day. A check source will be used that emits the same type of radiation (i.e., gamma) as the radiation being measured and that gives a similar instrument response. The check source will not necessarily use the same radionuclide as the radionuclide being measured. The response check will be performed at a set location using a specified source-detector alignment that can be easily repeated. Corrective action will be taken for instruments exhibiting response outside the acceptance criteria and the instrument will not be used until corrected.

Instrument response acceptance criteria will be established for each instrument prior to initial use. Ten one-minute counts will be collected using a source representative of the radiation types and energies of interest, and the mean of the source counts calculated. The source response acceptance criterion is ± 20% of the mean of the source counts. Ten one-minute counts will also be collected with the source removed to determine expected instrument response to ambient background. The background response acceptance criterion is ± 20% of the mean of the background counts.

Daily response checks will be monitored using a control chart. Background will be monitored qualitatively to assess daily variations that may impact the instrument's MDC. Records of daily response checks will be maintained, along with any control charts or logs associated with each instrument.

By design, the GPS unit is self-calibrating, using data received from the satellite constellation to determine the precision and accuracy of its readings. To provide additional QC for this system, the GPS system will be checked daily against a calibration point. The calibration point will be selected upon commencement of fieldwork and will consist of a benchmark or monument of known location. Prior to initial GPS use, ten static positional readings will be obtained at the calibration point. From these positional readings, a mean position will be determined. This position will be expressed in units of northing/easting, latitude/longitude, or other equivalent unit. The position will also be referenced to a horizontal North American Datum (NAD) 1983. Thereafter, the GPS unit will be checked against the calibration point at least daily. The acceptance criterion for GPS daily checks will be within one meter of the calibration point, as calculated using the Pythagorean Theorem.

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4.0 DATA MANAGEMENT

Project data will be recorded in project data logbooks, on approved survey forms (e.g., field records, maps, photographs,), or in electronic data files. Project documentation will be maintained for at least five years.

4.1 Project Data Logbooks

Project data logbooks will be maintained during search activities. For survey activities, sample data listed below will be collected at each measurement location and recorded by survey team personnel in project data logbooks:

- Time and date of sample acquisition
- Sample type
- Instrumentation used
- Location descriptor
- Sample collection personnel

Project data logbooks will be permanently bound and the pages will be numbered. Pages will not be removed from logbooks under any circumstances. Logbook entries will be in permanent ink, legible, factual, detailed, and complete and will be signed and dated by the individual(s) making the entries. Completed forms will be legible, detailed, factual, and signed and dated by the individual completing the form. If a mistake is made in a log or on a form, the error will be denoted by placing a single line through the erroneous entry and initialing the correction. Under no circumstances will any previously entered information be completely obliterated. Use of whiteout in data logbooks or on forms will not be permitted for any reason.

4.2 Search Documentation

Forms, such as sample collection forms, direct measurement forms, and photographic log sheets, will be provided as needed to search teams. Actions taken to review, approve, transfer, copy, duplicate, backup, store or secure project data will be noted in a project data logbook. Other search documentation will include, as needed, logbooks, maps, equipment use/calibration logs. Each completed form (a copy or original, depending on the type of form) will be maintained on-site until the completion of search activities.

4.2.1 Maps/Sketches

Copies of maps or sketches will be used by the search teams to record key site conditions and to show approximate locations of site features and other appropriate site location information.

4.2.2 Corrections to Documentation

Measurements will be recorded. Search personnel will initial each page as it is completed. Corrections will be made by drawing a single line through the incorrect entry and writing in the correct entry. The person making the correction will date and initial the correction. There will be no erasures or deletions from the search logs. Additionally, no correction fluid will be used.

4.2.3 Photographic Records

Photographs of search activities will be documented in a project logbook or using approved forms. Descriptions of photographs will include orientation information relevant to the photograph to correlate location.

4.3 Electronic Data Backup and Security

Project electronic data will be downloaded from its collection device on a daily basis. Electronic files will be labeled with unique file identification numbers. At the conclusion of each day's survey activities, electronic data collected that day will be backed up to appropriate removable media (e.g., compact disk, zip disk, or equivalent) and the backup will be removed from the site. The backup will not be stored in the same building in which the original project electronic data are stored.

5.0 DATA EVALUATION AND REPORTING

The data inputs collected according to project DQOs and survey data collection requirements will be quantitative and qualitative in nature. The data will be reviewed, verified, and validated during and after collection. Data will be qualitatively reviewed to determine further investigation during the project.

5.1 Data Validation and Verification

Survey data will be reviewed to verify they are authentic, appropriately documented, and technically defensible. The review criteria for data acceptability are:

- The instruments used to collect the data are capable of detecting the radiological or geophysical characteristics of interest.
- The calibration of the instruments used is current. Radioactive sources used for calibration of radiological survey instrumentation were NIST traceable.
- Instrument response is checked before and after instrument use each day.
- The search methods and techniques used to collect the data were appropriate for the media and types of radiological and geophysical parameters being measured.

Where one or more criteria are not met, the discrepancy will be reviewed and the reasons for acceptability of the data or the corrective actions taken to restore data acceptability will be documented.

5.2 Exploratory Data Analysis

Exploratory data analysis (EDA) will be performed on the data to identify distribution trends and potential outliers. EDA will include visual inspection of measurement results using time-series plots, posting plots, cumulative frequency distributions, probability plots, and histograms, as required, and calculation of statistical quantities including mean, median, standard deviation, and range. EDA of survey results will be performed in the field, as necessary, for the data sets to evaluate whether an investigation or additional survey data collection are warranted. EDA will include investigation of spatial or temporal distribution, outliers, and data population distributions.

5.3 Documentation

The radiological and geophysical data evaluation will be presented in a technical report. The report will include a narrative of the DU slug search effort, present and interpret analytical data, include figures showing location of area searched and pertinent field information, describe the methods used to collect and analyze data, present QA/QC information, and include field data sheets, project photographs, and maps of the project area. The report will present conclusions and recommendations regarding the possible location of the DU slug. Possible locations will also be staked. If possible locations of the DU slug have not been definitively identified, the report will conclude that the DU slug does not exist in the survey area. Report appendices will include a complete set of the radiological and geophysical data collected.

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6.0 PROJECT MANAGEMENT

6.1 Project Organization and Responsibilities

The responsibilities of key project personnel are described below.

6.1.1 Program Manager

The Program Manager will be responsible for overall project objectives, scope, budget, and quality of submittals. Duties will include:

- Planning, coordinating, integrating, monitoring, and managing project activities.
- Ensuring adequate corporate resources are made available to the project
- Providing senior technical review and project support.
- Ensuring compliance with all contractual requirements.

The Program Manager communicates directly with Boeing and project stakeholder personnel, as necessary.

6.1.2 Project Manager

The Project Manager will report to the Program Manager and will serve as the primary client interface. The Project Manager will be responsible for:

- Planning, coordinating, integrating, monitoring, and managing project activities.
- Ensuring proper implementation of this plan.
- Performing day-to-day management and monitoring of the project budget, schedule, and scope.

6.1.3 Health and Safety Coordinator

The Health and Safety (H&S) Coordinator will report to the Project Manager and will serve as the project safety officer. The H&S Coordinator or an on-site designee will be responsible for:

- Implementing project health and safety plan (HASP) in accordance with site-specific safety protocols, including any project-specific health and safety programs.
- Performing ongoing hazards assessment, including reviewing survey conditions and authorizing appropriate changes to the HASP.
- Conducting daily safety meetings to review the day’s work plan, associated activities, and any anticipated hazards.
- Imposing proper health and safety procedures and halting unsafe work activities.
- Addressing project health and safety concerns.

6.1.4 Quality Assurance/Quality Control Coordinator

The QA/QC Coordinator will report to the Project Manager. The QA/QC Coordinator will be responsible for:

- Performing ongoing oversight of QA/QC activities, including ensuring procedure compliance and conducting audits, as necessary.
- Imposing proper QA/QC procedures and halting activities detrimental to data quality.

- Addressing project QA/QC concerns.

6.1.5 Survey Team Leader

The Survey Team Leader will report to the Project Manager and will serve as the project radiation safety officer. The Survey Team Leader will be responsible for:

- Organizing, scheduling, and supervising survey data collection activities.
- Implementing the field sampling plan (FSP) with regards to survey data collection activities (i.e., ensuring proper collection and documentation of survey data by the survey team).
- Working closely with the QA/QC Coordinator and H&S Coordinator to ensure proper implementation of QA/QC and HASP requirements with regards to survey team activities.
- Serving as the primary on-site point of contact for project activities.

6.1.6 Survey Team

The Survey Team will report to the Survey Team Leader. The Survey Team will be responsible for properly collecting survey data and documenting its collection using appropriate logbooks, forms, and electronic data capture.

6.1.7 Project Subcontractors

Project subcontractors report to the Project Manager. Project subcontractors provide analytical laboratory capability and survey support, such as excavation work.

6.2 Training

On-site project personnel, including contractors, subcontractors, and visitors, will be required to be familiar with this plan and applicable site standard operating procedures (SOPs). Project personnel who may be exposed to hazardous conditions will have received the following training:

- 40-Hour OSHA HAZWOPER
- HAZWOPER supervisor training (supervisory personnel only)
- Radiation Worker

Copies of training certificates will be maintained on-site and provided to Boeing management prior to start of field work.

6.3 Procedures

Standardized survey methods and techniques established in written procedures or protocols will be used.

6.4 Quality Assurance/Quality Control

The objective of QA/QC is to ensure survey results are of the type and quality such that decisions can be made with sufficient confidence. Search activities will be performed in a controlled, deliberate manner by trained individuals using calibrated instruments and following written procedures and/or protocols. Survey data will be recorded and reviewed, and documentation will be auditable (see Section 5.0).

Where identified, problems or questions about QA/QC will be documented and appropriate corrective actions taken to address them. The Project Manager and QA/QC Coordinator will be notified immediately of QA/QC situations requiring immediate corrective action.

6.5 Project Schedule

The project schedule calls for search activities to be completed within a two-week period, and the report to be issued three weeks following demobilization.

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7.0 REFERENCES

The following works were consulted in preparing this plan.

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Rockwell, 1991. Rockwell International Internal Memorandum from F. H. Badger to P. D. Rutherford, dated June 5, 1991, entitled "Field Survey for Depleted Uranium Slug."

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