Westinghouse Non-Proprietary Class 3

Westinghouse

Hematite Decommissioning Project

SAMPLING PLAN FOR ENGINEERING FINAL DESIGN
WESTINGHOUSE ELECTRIC COMPANY
FESTUS, MISSOURI

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LIST OF ACRONYMS AND ABBREVIATIONS

AEC	U.S. Atomic Energy Commission
AM-241	Americium-241
ASTM	American Society for Testing and Materials
bgs	Below Ground Surface
BP	burial pit
COC	Contaminates of Concern
cpm	counts per minute
DCGL	Derived Concentration Guideline Level(equivalent to release criteria)
DV	Deep Volumetric
EH&S	Environmental Health and Safety
EB	equipment blank
EL	Elevated Level
FSS	Final Status Survey
ft	Feet
GM	Geiger Mueller (radiation detector)
GPS	Global Positioning System
HASP	Health and Safety Plan
HPT	Health Physics Technician
HPD	Health Physics Department
HSA	Historical Site Assessment
ID	Identification
IDW	Investigative Derived Waste
IL	Investigation Level
LLD	Lower Limit of Detection
m	Meter
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDC	Minimum Detectable Concentration
NaI	Sodium Iodide
NCS	Nuclear Criticality Safety
Np-237	Neptunium-237
NPL	National Priorities List
NRC	U.S. Nuclear Regulatory Commission
ORE	Operational Readiness Evaluation
ppm	parts per million
%	Percent
PPE	Personal Protective Equipment
PID	Photo-Ionization Detector
pCi/g	picocuries per gram
Pu-239/240	Plutonium-239/240
K-40	potassium-40
KOH	Potassium Hydroxide

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

PM	Project Manager
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RESRAD	Residual Radioactivity Dose Modeling Software
RI	remedial investigation
RPOM	Radiation Protection Operations Manager
RPP	Radiation Protection Plan
RSO	Radiation Safety Officer
RWP	Radiation Work Permit
SAIC	Science Applications International Corporation
SF	Surface
SO	Soil
SV	Shallow Volumetric
VA	soil vapor
Tc-99	technicium-99
TCE	Tricholorethylene
Th-232	thorium-232
U	Uranium
U-234	uranium-234
U-235	uranium-235
U-238	uranium-238
VOC	Volatile Organic Compound
WEC	Westinghouse Electric Company LLC
WMP	Waste Management Plan
XRF	X-ray Fluorescence

SAMPLING PLAN FOR ENGINEERING FINAL DESIGN

1.0 INTRODUCTION AND SITE DESCRIPTION

The Westinghouse Electric Company LLC (WEC) former fuel cycle facility near Festus, Missouri ceased production in June 2001 after nearly 47 years of operations under several owners and operators. The facility central tract area and the site creek down to Joachim Creek were impacted radiologically and chemically by the fuel fabrication operations from 1956 though 2001. The central tract area is approximately bounded by State Road P to the north, the northeast site creek to the east, the Union-Pacific railroad tracks to the south, and the site creek/pond to the west. The general arrangement of the impacted portion of the Site (approximately 19 acres) including building location and other infrastructure features used during operation is shown on Figure 1-1.

It is the objective of WEC to decommission the facility and site in a manner that is consistent with license requirements, license commitments, current Nuclear Regulatory Commission (NRC) regulations, and to meet the standards of the Environmental Protection Agency and of the Missouri Department of Natural Resources.

Additional sampling is desired within a limited portion of the facility to provide information that will be used as input to the final stage of pre-excavation engineering design. The overall objective is to improve the efficiency of excavation, and decrease the project cost and schedule associated with excavation. Of particular interest is the depth of soil overburden at each burial pit location and, since the sampling equipment and labor will be mobilized, the scope of this effort was expanded to include the area of the natural gas line, the sanitary leach field, and the soil adjacent to the northern, eastern and southern sides of the process buildings.

Sampling is planned at 146 locations and the samples will be analyzed by gamma and alpha spectroscopy when appropriate and liquid scintillation counting for technetium-99. Samples will also be analyzed for non-radiological contaminates of concern (COC) including volatile organic compounds (VOC) and metals. The sampling locations have been selected based on visual identification of surface depressions within the burial pit area, a review of the previous characterization data, anomalies identified from magnetometer surveys, and locations where residual radioactivity concentrations are known to be elevated.

Within the area of the burial pits, the laboratory analytical data will be used by project engineering to refine a more complete 3-dimensional subsurface contour of the depth of the overburden, the depth of the waste, and to identify any contamination immediately beneath an individual pit. Additionally, this information may be used to supplement the Final Status Survey (FSS) within areas where excavation is not required, and may also serve as a portion of the basis for qualifying overburden soil for re-use as backfill.

The sampling associated with the natural gas line (beginning west of the evaporation pond and extending to the eastern edge of the burial pit area) will allow a better understanding of the extent of contamination in the surrounding soil, and identify any migration that may have occurred. This information is important to the engineering design for excavation since the evaporation ponds and one or more of the burial pits may be in close proximity to the natural gas line.

According to the historical information, non-radiological trash may have been buried under some roadways near the process buildings and more knowledge of that material is desired. A portion of this material may be located between the burial pit and the process buildings, and therefore the soil adjacent to the northern, eastern and southern sides of the process buildings has been included for sampling.

Five sampling locations have also been selected from within the sanitary leach field.

1.1 BURIAL PIT AREA DESCRIPTION

Based on historic documentation (e.g., burial pit logbooks, aerial photographs), 40 unlined pits were excavated northeast of the plant buildings and southwest of "Northeast Site Creek" between July 1965 and November 1970. The burial pit logbooks contain approximately 15,000 entries listing the date of burial, pit number, physical description of the disposed item, the enrichment of the item, the uranium mass content, and miscellaneous logging codes. The primary waste types were trash, empty bottles, floor tile, rags, drums, bottles, glass wool, lab glassware, acid residues and filters. The amounts of uranium disposed in each pit ranged from approximately 178 grams to 802 grams per pit with a maximum amount in one item of 44 grams. Buried chemical wastes may also have included residual amounts of hydrochloric acid, hydrofluoric acid, potassium hydroxide (KOH), trichloroethene (TCE), alcohols, oils, and waste water.

The applicable regulations required that buried waste be covered with approximately 4 feet of soil when filling was completed, but the soil cover thickness may have been modified over time as the area where the burial pits are located was re-graded on several occasions.

Previous characterization has been performed in the area of the burial pits, and are summarized in Energy*Solutions* LLC, "Entire Site Characterization Report" (draft). The three major efforts are described below:

- Between April 26, 2004 and January 7, 2005, SAIC conducted remedial investigation and characterization for the facility including the burial pits. Twelve (12) surface soil samples and twenty-eight (28) subsurface soil samples were collected from seven (7) locations situated along the northeast and southeast perimeter of the area identified to contain the Burial Pits.

- In November 2006, Cabrera Services, Inc. (CABRERA) conducted subsurface investigation activities in areas of the facility to provide information on the characteristics of buried waste and surrounding soil. These activities consisted of over 80 surface and 50 subsurface soil samples.
- In November and December of 2007, Energy Solutions LLC conducted additional sampling and analyses of the impacted area. The results of these additional characterization activities are presented in the Hematite Supplemental Characterization Report. That survey provided additional surface and subsurface soil samples taken from over 40 systematic and 14 biased locations; part of which were in the burial pit area.

1.2 NATURAL GAS LINE DESCRIPTION

The natural gas pipeline is located along the northern side of the active railroad line that lies southeast of the facility. The natural gas line was installed in the late 1940's and is an 8" steel, gas welded line. The line is buried at a nominal depth of 42 to 48 inches below ground surface (bgs).

- The natural gas service line to the process buildings was capped and abandoned. The cap for the line is about 4 feet from the main. This line runs from near Building 252 perpendicular to the main and the pipe itself is in the ground except for a 3' section on each end.
- A pressurized natural gas line is currently used for heating Building 230, and runs underground from the southwest corner of Building 230 to a connection to the main south of Building 231.

1.3 SANITARY LEACH FIELD DESCRIPTION

Original on-site sewage treatment incorporated a design where all building locker room drains and plumbing were directed first to a buried hold-up tank and then to a connected leach field. Liquids containing radioactivity could have contaminated the piping, storage tank, and leach field. Five sampling locations are planned for the leach field which is no longer in service circa 1978.

1.4 SOIL AREA ADJACENT TO THE PROCESS BUILDING DESCRIPTION

Information gathered during the Historical Site Assessment (HSA) indicates that other undocumented burial pits used for the burial of non-radiological waste may exist within the area of investigation. Since the content of these additional pits is less known, the controls used during this investigation will be the same as those used for the documented burial pits. It is estimated that there may be an additional 20 to 25 undocumented pits, and interviews with former plant employees indicate that these pits may be located in close proximity to the former process buildings adjacent to the northern, eastern and southern sides of the process buildings.

1.5 CONTAMINANTS OF CONCERN (COC)

1.5.1 CHEMICAL CONTAMINANTS

The burial pit material consists of various solids such as trash, empty bottles, floor tile, rags, drums, bottles, glass wool, lab glassware, acid residues and filters. The chemical residues may include hydrochloric acid, hydrofluoric acid, KOH, TCE, alcohols, oils, and wastewater.

1.5.2 RADIONUCLIDES OF CONCERN

Based on site historical operational information and the analytical data obtained during the previous sampling, the primary radionuclides of concern within the facility are uranium 234 (U-234) uranium 235 (U-235), uranium 238 (U-238) and technetium 99 (Tc-99). Other radionuclides may be present in trace quantities, such as: americium 241 (Am-241), neptunium 237 (Np-237), plutonium 239/240 (Pu-239/240), and thorium 232 (Th-232). These trace radionuclides were not identified in significant quantities during previous characterization and there is no expectation to find these radionuclides in soil samples during these characterization surveys. However, U-235, U-238, Th-232 will be evaluated as part of a library of radionuclides identified by gamma emission. Alpha spectroscopy is planned for U-234, U-235, and U-238; and also for Th-232 for an elevated area in the burial pit.

1.6 CRITICALITY SAFETY AND MC&A

Criticality safety and MC&A measurements will be addressed in Appendix B to the Work Instruction for this plan. Measurements are designed to detect 1060 pCi/g of U-235 as 98% enriched uranium and also any objects containing 350 g of U-235 as 98% enriched uranium.

1.7 REFERENCES FOR CHAPTER 1

1-1 Code of Federal Regulations, Title 10, Part 20, "Standards for Protection Against Radiation" May 8, 2008.

1-2 Westinghouse Electric Company LLC, DO-02-001, "Historical Site Assessment", Draft, March 1, 2008

1-3 LVI Services, Inc. HE-R-01 "MARSSIM Survey Methodology for Final Status Surveys of Building 230", Rev. 1, February 2004

1-4 SAIC and GEO Consultants, LLC, "Remedial Investigation Report for the Westinghouse Hematite Site", Rev. 1, January 2007

1-5 Leggette, Brashears & Graham, Inc., Remedial Investigation Feasibility Study Work Plan, Revision 0, May 9, 2003

1-6 Westinghouse Electric Company LLC, DO-04-010, "Hematite Radiological Characterization Report", Rev. 1.1., April 2006

1-7 Cabrera Services, "Buried Waste Evaluation Report, Festus, Missouri", Final, March 2007

1-8 Energy*Solutions* LLC, CS-HP-007, HEMATITE Supplemental Characterization Report, Rev. 0.; March 2008

1-9 Energy*Solutions* LLC, CS-313-062-002, Entire Site Characterization Report, draft Rev. 0.; March 2008 (Westinghouse No. DO-08-002)

1-10 NRC-8106, "An Aerial Radiological Survey of Hematite, Missouri and Surrounding Area"; EG&G Survey Report , June 1981

1-11 NUREG/CR 3387, "Radiological Survey of the Combustion Engineering Burial Site Hematite, Missouri"; July 1983.

1-12 NUREG -1757, Vol 2, Revision 1, "Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria"; September 2006.

1-13 NUREG-1575, Rev. 1, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), August 2000

Figure 1-1 Hematite Site

2.0 WORK SCOPE

The scope of this work plan includes soil sampling performed within the burial pit area, the gas line, the leach field, and the land area adjacent to the process buildings, see Figure 2-1. Approximately 146 sampling locations are anticipated.

The field activities include surface soil sampling with shovels or trowels; and sub-surface soil sampling by using a hand auger or split spoon sampler, or equivalent method. Soil samples will be screened in the field using instruments to detect radiological and chemical contaminants. Samples collected in close proximity to the gas line will be obtained using manual sample collection methods to reduce the potential for damaging the gas line. All other cores may be machine advanced if the drilling rig has access. In areas that cannot be accessed by the samling rig, hand augering is permissible as directed by the Project Engineer. Samples will be collected from the cores as indicated below. If core advance is refused, the Project Engineer (see Figure 2-2, Survey Plan Organization Chart) has the discretion to move the drilling rig by approximately 1 m in any direction and attempt to complete the sampling.

The samples to be collected at each coring location will typically be collected from specific depths of interest, and will typically include a surface sample (0 - 0.15 meter), a shallow volumetric sample (0.15 – 1.5 meter) and a deep volumetric sample (1.5 meter to groundwater or the predetermined depth listed in Table 2-1). Additional samples may be collected in the event that the field screening measurements appear to be elevated for radiological and/or non-radiological COC. Based on the anticipated range of the background count rate, a gross count rate of a sample or core that exceeds 1,500 cpm (net) may be potentially elevated, and may warrant the collection of an additional sample from that portion of the core section for radiological analysis. It is important that the log reflect the depth of the sample and how much was removed from the "depth of interest". The remaining soil in the section of the core will be blended for a second sample.

- An exception to the specific depths of interest may be made for the core samples collected from the Burial Pit when waste is expected to be encountered. The depths of interest for this location may include a surface sample (0-0.15 meter), a sample from 0.15 meter until waste is encountered, a sample from the volume of the waste, and a sample from beneath the volume of the waste. Sections of the core samples showing elevated radiation levels will be handled as indicated in the preceding paragraph.

- An exception to the specific depths of interest may be made for the core samples collected at the Gas Line. Three samples will be collected near the evaporation ponds directly adjacent to the gas line by hand augering in order to evaluate what is representative of the soil underneath the line. Sections of the core samples showing elevated radiation levels will be handled as indicated in the preceding paragraph.

2.1 BURIAL PIT

The burial pit effort is focused on developing a more complete 3-dimensional subsurface contour to provide better understanding of the location of the individual burial pits, associated overburden, depth of waste, and contamination levels immediately under an individual pit.

An estimate of 73 coring sampling locations is projected with at least three samples collected for the various depths and regions of interest at each location. (See Figure 5-1)

Three new monitoring wells will be installed to be used for water table draw-down testing. (See Figure 5-1) Monitoring wells will be constructed in accordance with the Missouri Well Construction Rules, 10 CSR 23-1.010 to 6.060. The wells will be surveyed for accurate location and elevation data.

2.2 NATURAL GAS LINE

Similarly, for the natural gas line which is adjacent to the burial pit area, a subsurface contour is needed along the southern edge of the radiologically impacted area, one-third of which is adjacent to the burial pit. Biased sampling is planned along the length of the gas line and on both sides in an alternating pattern. A graded approach was applied to the length of pipe along the evaporation ponds (potential migration of Tc-99 is suspected) by decreasing the distance between locations; thus increasing the probability of detection if contamination is present. VOCs and metals sampling will be concentrated along the evaporation ponds with a fewer quantity along the western section (below the site pond). Sampling along the gas main line is divided into three sections (See Figures 5-2 through 5-4).

- Section A – This section begins near Building 231 and is bounded by fences on both ends; this section is about 200 feet long.
- Section B – This section extends from the east end of Section A to a point southeast of building 252 (an intersection of the southwest side of Building 252 and the main); this section is about 360 feet and is adjacent to the evaporation ponds.
- Section C – This section extends from the east end of Section B to the end of the impacted area; this section is about 480 feet long.

Sampling at the gas line will be coordinated with a Missouri Gas Service representative and may include locating the gas line using an air knife/vacuum excavator and/or hand excavation to allow visual confirmation of the depth and location of the line, and to ensure the line is not damaged during the collection of samples. Note that the depth and location of the natural gas line may also be identified within other portions of the site using the methods described above as input to the engineering design.

2.3 LEACH FIELD

The original on-site sewage treatment system incorporated a design where all building locker room drains and plumbing were directed first to a buried hold-up tank and then to a connected leach field. Liquids containing radioactivity could have contaminated the piping, storage tank, and leach field. Five sampling locations are planned for the leach field which is no longer in service circa 1978.

2.4 LAND AREAS ADJACENT TO THE PROCESS BUILDINGS

To provide a basis for anticipated non-radiological waste buried under roadways and better bound the elevated areas which were identified during previous characterization studies, twenty-eight locations are planned within the soil areas near the northern, eastern and southern sides of Building 255.

2.5 BORING LOGS

A boring log will be made of each boring. Soils and materials encountered will be described in layman terms as to type, color, etc. The boring log notations represent an approximation of the observed changes of soil/material composition

The following information will be compiled for each boring log:

- Sample identification number and surface location (by GPS coordinates)
- Thickness of soil cover (if applicable)
- Depth where saturated waste/soil was encountered
- Thickness and description of waste (if present)
- Depth to bottom of hole
- Soil description
- % recovery in sampling device
- Field screening values and devices utilized

Soils will also be screened for VOC contamination during the sampling process using a photo ionization detector (PID). The screening will be conducted at the coring location and on removed cores.

The holes, except for the three new monitoring wells, will be filled with bentonite grout (or similar suited material) to preclude the vertical mobility of any contaminants via the sample hole. The spoils (excess soil or waste) from the cores and the spoils from the burial pit core borings will be treated as Investigative Derived Waste (IDW). Equipment will be decontaminated as described in the Radiation Protection Plan.

2.6 SAMPLE IDENTIFICATION AND ANALYSIS REQUIREMENTS

Because of earlier work in the areas, a unique sample identification is required. Sample nomenclature for this investigation is of the form SS-AA-###-AA for regular samples and SS-AA-###-EL-## for elevated radiation level samples; examples follow:

Burial Pit sample nomenclature with increasing location serial sequence from 001:

SS-BP-001-SF	Surface sample (0-0.15 m)
SS-BP-001-SV	Shallow Volumetric (0.15- to waste)
SS-BP-001-TT	Through the Waste (within the volume of waste)
SS-BP-001-DV	Deep Volumetric (beneath waste to groundwater, refusal or to design depth)
SS-BP-001-XX-EL-#	For any biased sample; XX represents one of the three subsurface designations above; # represents the start depth of the sample in feet.

Gas Line sample nomenclature with increasing serial sequence from 001:

SS-GA-001-SF	Surface sample (0-0.15 m)
SS-GA-001-SV	Shallow Volumetric (0.15-1.5 m)
SS-GA-001-DV	Deep Volumetric (1.5 m – to groundwater, refusal or to design depth; three samples under the line will be designated with DV)
SS-GA-001-XX-EL-#	For any biased sample; XX represents either of the two subsurface designations above; # represents the start depth of the sample in feet.

Samples collected in Sections B and C will be sequenced by substituting a B or C for the A; e.g., SS-GB-001-SF and SS-GC-001-SF. Location sequence 001 will restart in each section.

The Leach Field and Lands Adjacent to Process Buildings sample nomenclature with increasing serial sequence from 001 will be designated similarly with SS-LF and SS-LA, respectively:

SS-LF-001-SF	Surface sample (0-0.15 m)
SS-LF-001-SV	Shallow Volumetric (0.15-1.5 m)
SS-LF-001-DV	Deep Volumetric (1.5 m – to groundwater, refusal or to design depth)
SS-LF-001-XX-EL-#	For any biased sample; XX represents either of the two subsurface designations above; # represents the start depth of the sample in feet.
SS-LA-001-SF	Surface sample (0-0.15 m)

SS-LA-001-SV	Shallow Volumetric (0.15 m-1.5 m)
SS-LA-001-DV	Deep Volumetric (1.5m – to groundwater, refusal or to design depth)
SS-LA-001-XX-EL-#	For any biased sample; XX represents either of the two subsurface designations above; # represents the start depth of the sample in feet.

As all chemical sampling are biased samples, the location and depth nomenclature will be:

SS-GA-001-#-VOC, or Metals for the gas line sections; as before, samples collected in Sections B and C will be sequenced by substituting a B or C for the A. Location sequence 001 will restart in each section, <u>or</u>

SS-BP-001-#-VOC, or Metals for the burial pit area depending upon the test and # represents the start depth of the sample in feet; The area designator BP will be changed to follow the particular area as indicated above: GA, GB, GC, LF, and LA.

2.7 <u>LABORATORY ANALYTICAL REQUIREMENTS</u>

2.7.1 RADIOLOGICAL ANALYSIS

All radiological samples will each have a gamma spectroscopy analysis and a Tc-99 analysis. The gamma spectroscopy results will include results for Th-232 and K-40.

Those samples with both a U-235 result > 1 pCi/g *<u>and</u>* a U-238 result > 3 pCi/g (results must also be greater than MDCs) will receive an alpha spectroscopy analysis for U-234, U-235, and U-238.[1]

Certain samples as selected by the RSO will be analyzed for Th-232 by alpha spectroscopy. The radiological analysis methods are listed:

- Gamma spectroscopy (EPA 901.1 MOD: Gamma spectroscopy)
- Isotopic uranium and thorium (ASTM D3972-90M: alpha spectroscopy)
- Technicium-99 (ASTM C1387-98: liquid scintillation counting)

2.7.2 CHEMICAL ANALYSIS

Approximately 48 samples will be collected for volatile organics; 21 for metals and mercury. Selected samples will be submitted for analysis of the following parameters:

[1] Based on the samples collected during characterization, these limits would cause ~12% to have isotopic analysis performed. Thresholds may be changed if gamma results indicate that more or less than 12% of samples would be analyzed.

- Volatile organic compounds (EPA SW846 8260B: GC/MS)

- Metals (EPA 6010B: Inductively coupled plasma-atomic emission spectrometry) including Mercury (EPA 7471: Manual cold-vapor technique)

2.7.3 ANTICIPATED NUMBER AND ANALYSIS OF SAMPLES PER AREA

The quantity and type of samples and the analysis expected to be performed is indicated in Table 2-2.

2.8 ORGANIZATION AND RESPONSIBILITIES

The roles and responsibilities of project personnel are outlined below; an organization chart for this project indicating reporting and responsibility lines is provided in Figure 2-2 at the end of this section. Additional details on the roles and responsibilities of these personnel may be found in the Quality Plan, Health and Safety Plan, and the Radiation Protection Plan. Training requirements for all project personnel may be found on the Training Matrix in the Health and Safety Plan.

2.8.1 PROJECT DIRECTOR

The Project Director has overall responsibility of the sampling and survey effort and will authorize restart of work after a stop work order has been given. The managers from Quality Assurance, Operations, Radiation Protection, Environmental Health & Safety (EH&S), and Environmental Engineering report directly to the Project Director.

2.8.2 PROJECT MANAGER (OPERATIONS MANAGER)

The Operations Manager will act as the Project Manager (PM) and will manage site operations. The PM is responsible for oversight of contractor personnel and will coordinate with the RSO and other department leads to ensure overall quality, schedule and cost, project staffing, subcontractor management, and health, safety, and regulatory compliance are maintained. He will be responsible for implementing all contracts from award through project completion. He will coordinate the preparation of the project plans and required permits. With regard to Health & Safety and Quality Control, the PM will be the line manager with responsibility for compliance. The Radiation Protection Operations Manager and the Project Engineer will report to the PM

2.8.3 RADIATION SAFETY OFFICER (RSO)

The RSO will provide technical oversite of the survey and sampling effort. He will assist the Project Manager in overall quality, schedule and cost, project staffing, subcontract management, health, safety and regulatory compliance. He will provide technical direction relating to radiation protection and sampling and survey issue to the Radiation Protection Operations Manager (RPOM), Project Engineer and Health Physics Staff.

2.8.4 RADIATION PROTECTION OPERATIONS MANAGER

The RPOM will coordinate and supervise all field survey activities for this project. The RPOM will directly oversee day-to-day project activities and will be responsible for the implementation of the project tasks. In addition to safe production, the RPOM will ensure that the work is performed in accordance with the quality objectives. Activity planning and preparation and subcontractor management are also the responsibility of the RPOM. He will assure that samples are collected and archived according to this plan and related work packages.

2.8.5 PROJECT ENGINEER

The Project Engineer for this project will be responsible to implement the design and technical approach. He will coordinate all survey data, analytical results and sampling location information. He will ensure that all surveys and sampling are scheduled, performed and documented, and will take the lead in onsite data/document management. The Project Engineer will be in the field whenever significant project work is being performed and will coordinate with the RPOM and the PM to provide direction to the field crews including Health Physics Technicians (HPTs), labor support, rad waste specialist and drilling contractors. The Project Engineer will interface directly with the PM, RSO and RPOM in technical matters.

2.8.6 HEALTH PHYSICS TECHNICIANS

The health physics technicians (HPT) will perform radiation surveys and monitoring for VOC of the boreholes and cored soil. The HPTs will measure the radiation levels in each core hole at approximately one foot intervals and record the results on the boring logs. For each core section removed, the HPTs will record the depth, radiation levels, type of material or soil removed on boring logs provided in the work packages. HPTs will determine the need for biased samples. The HPT's will scan equipment and materials to support decontamination efforts for free release and to minimize the spread of contamination. HPT's will establish chain-of-custody for samples which will be archived until selected for analysis by the Project Engineer. The HPT's will record the core bore number on IDW containers.

2.8.7 VARIOUS SUPPORT

- Health Physicist – The Health Physicist will assist the Project Engineer and RPOM in the interpretation and implementation of this plan and related work packages. He will coordinate with the Criticality Engineer when radiation survey results approach the action levels requiring investigation.. He will assist in the writing of the report during operations and after samples are analyzed.
- Rad Waste (Specialist) – Rad Waste will be responsible for managing the waste segregation, material control; this includes logging IDW into the Material Control Area
- Operations – (Labor) Operations will provide the labor required for support of decontamination of tools and management of generated waste.

2.8.8 QUALITY ASSURANCE (QA)

The Quality Assurance representative will be responsible for the implementation of the Quality Assurance Plan. He is responsible for planning and supervising Quality Control (QC) activities. He will interface directly with the PM and RPOM in matters related to quality.

2.8.9 ENVIRONMENTAL HEALTH AND SAFETY (EH&S) MANAGER

The EH&S Manager will be responsible for day-to-day compliance monitoring of the Health and Safety Plan, including site-specific personnel training, maintenance of the medical monitoring program, Health and Safety programs implementation, personal protection equipment, respiratory protection and decontamination operations, and safety related operations support to the on-site work force.

2.9 HEALTH AND SAFETY ISSUES

This plan invokes the Health and Safety Plan and the RPP but the following items are emphasized.

2.9.1 STOP WORK PROCEDURES

The Hematite procedure PR-EHS-004, Stop Work Authority will be implemented in the event of imminent danger or when an individual recognizes an unsafe condition that cannot be corrected safely, quickly and effectively without work being stopped, or if further evaluation of a suspected unsafe condition is required.

Imminent danger is defined in the Hematite procedure as a hazard that could result in death, serious injury, environmental impairment or significant damage, and when immediate action is required.

All personnel will have Stop Work authority and be trained in this procedure. When a stop-work order has been given, the following actions shall occur:

- All work in the affected activity shall stop as soon as possible.
- The work place shall be placed in a safe condition.
- Workers shall notify the RPOM.
- Work shall not resume until appropriate safety reviews are performed and restart is authorized by the Project Director.

2.9.2 PYROPHORIC ITEMS

The draft HSA indicates that two fires may have occurred in open burial pits and the buried materials were assumed to be pyrophoric. Sealed containers were used after those fires. During sampling activities, items may be encountered such has partially filled drums, pipes or unknown materials. Should a fire occur, a Class D fire extinguisher will be used as one means to control it. Water should not be used without authorization from the EH&S Manager.

2.9.3 UTILITY LOCATION

No active utilities are reported within the areas to be sampled except the natural gas pipeline that runs on the south side of the property and the service line to Building 230. WEC will verify the absence of other utilities by contacting the Utility Locator service as well as by conducting a visual reconnaissance of the area. The overhead railroad signal wires along the proposed spur will be confirmed as abandoned and removed as necessary to provide access, or will be avoided in the event that the lines are in-service. Should a previously unidentified utility be encountered, a Stop Work will be issued until any associated hazards are adequately addressed.

2.10 REFERENCES FOR CHAPTER 2

2-1 NUREG -1757, Vol 2, Revision 1, "Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria"; September 2006.

2-2 NUREG-1575, Rev. 1, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), August 2000

2-3 Westinghouse Electric Company, "Hematite Quality Assurance Program Plan"

2-4 Westinghouse Electric Company, "Hematite Radiation Protection Program"

2-5 Westinghouse Electric Company, "Westinghouse Hematite Health and Safety Plan"

2-6 Westinghouse Electric Company, "Fundamental Nuclear Material Control Plan"

2-7 Westinghouse Electric Company, "Nuclear Criticality Safety Policy and Procedures," NISYS-NCS-1180 Documents

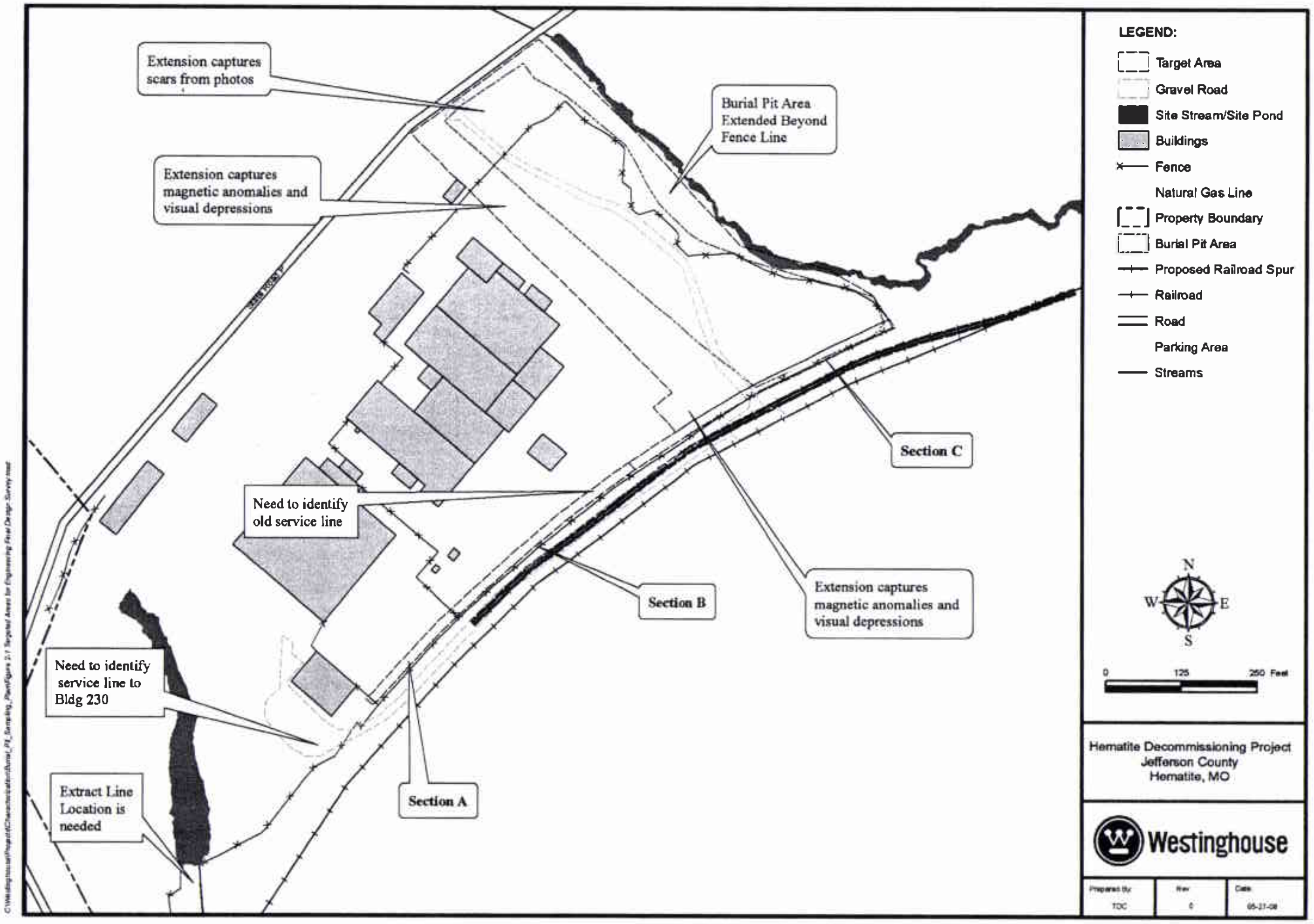


Figure 2-1 Targeted Areas for Engineering Final Design Survey

Figure 2-2

Survey Plan Organization Chart

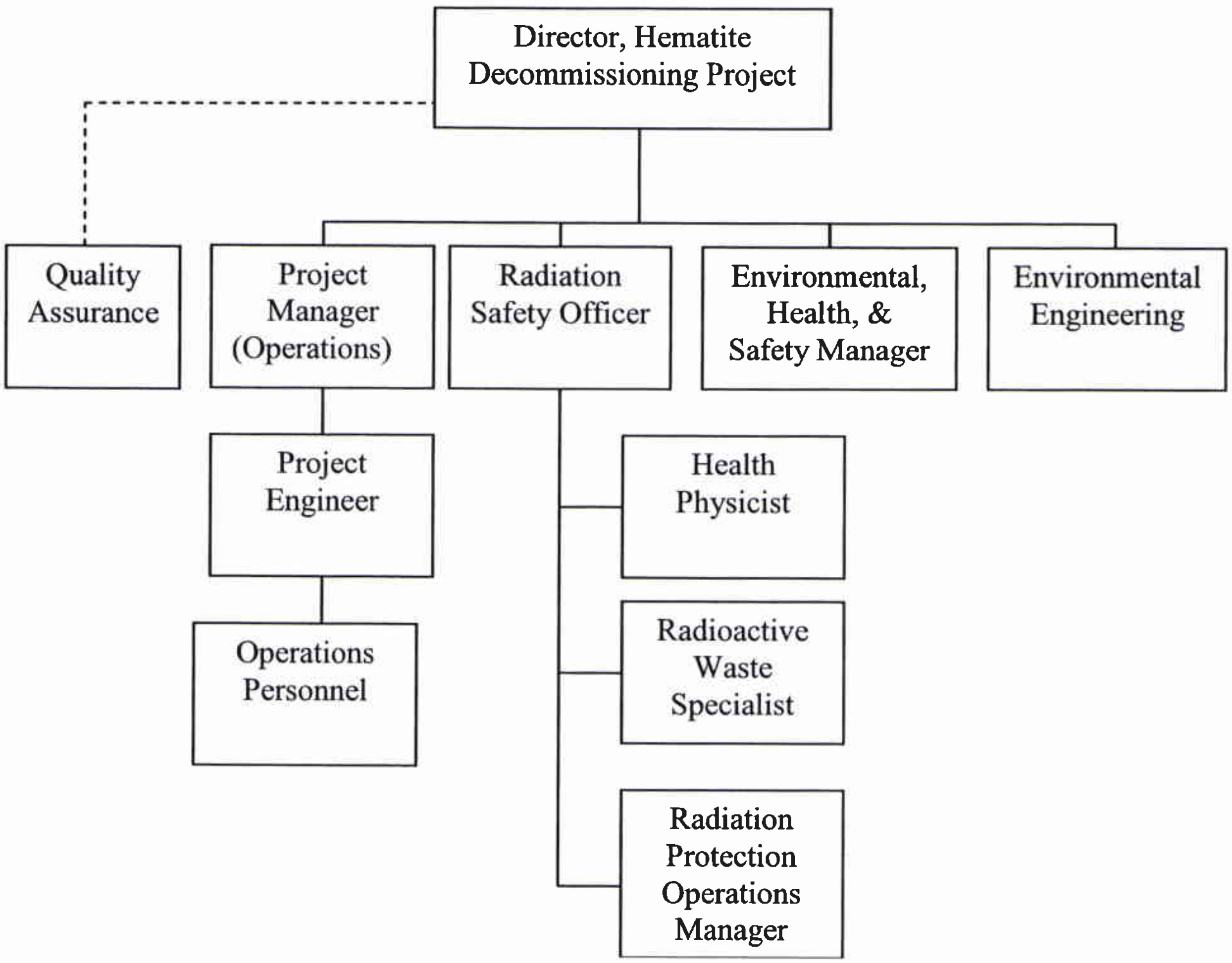


Table 2-1
Number and Approximate Depths of Cores Per Area

Area	Section	N	Depth (ft)
Burial Pit		73	16 *
Gas Line	A (Off line)	4	16
	B (Off Line - North side)	7	16
	B (Off Line - South side)	8	10
	C (Off Line)	8	10
	A, B, C (On Line)	10	See footnote
	B (Under Line)	3	5-6
Leach Field		5	10
Adjacent Soils		28	10

Footnote: The depth of the sample is to be coordinated with the Missouri Gas representative.

* 3 Sample locations used for wells will be 30 ft. in depth.

Table 2-2
Anticipated Number and Analysis of Samples Per Area

Area	Sub-area	Number of Borings	Depth Indicator	Radiological Analyses			Chemical Analyses	
				Gamma Spec	Alpha Spec (U-234, U-235 & U-238)	Tc-99	VOCs	Metals
Burial Pit Area	None	73	SF	73	9	73		
			SV	33	4	33	5	1
			TT	40	5	40	8	3
			DV	73	9	73	8	3
			EL	10	1	5	3	3
Gas Line	A	5	SF	5	1	5		
			SV	5	1	5	1	1
			DV	4		4	1	1
			EL	1	1	1	3	
	B	24	SF	24	1	24		
			SV	24	3	24	2	1
			DV	15	2	15	5	1
			EL	4	4	4	1	1
	C	11	SF	11	1	11		
			SV	11	1	11	1	1
			DV	6	1	6	1	1
			EL	1	1	1	1	1
Leach Field	None	5	SF	5	1	5		
			SV	5	1	5	1	
			DV	5	1	5	1	
			EL	1	1	1	1	1
Land Adjacent to Process Buildings	None	28	SF	28	3	28		
			SV	28	3	28	1	
			DV	28	3	28	1	
			EL	1	1	1	1	1
TOTALS		146		441	57	436	46	20
Quality control apportionment				22	3	22	2	1
TOTALS				463	60	458	48	21

Notes:
SF: Surface Sample; SV: Shallow Volumetric; DV: Deep Volumetric; EL: Elevated Level
The Burial Pit SF samples include surface samples for the suspect elevated sampling areas. At the discretion of the PM, certain samples may receive a Th-232 alpha spectroscopy analysis.

3.0 DATA QUALITY OBJECTIVES

This plan addresses both radiological and non-radiological COC, and is part of a series of Plans and Documents that together provide the requirements for completing the work. These additional Plans/Documents include the following:

- Waste Management Plan – Investigation Derived Waste Management Plan
- Health and Safety Plan – Project Specific H&SP
- Quality Assurance Plan
- Radiation Protection Plan
- Fundamental Nuclear Material Control Plan
- Nuclear Criticality Safety Policy and Procedures
- Site Work Control

A listing of applicable Westinghouse-Hematite procedures is provided in Appendix C of this Plan.

3.1 PROBLEM DESCRIPTION

Elevated concentrations of radiological and non-radiological contaminants were identified in soil during characterization studies and additional sampling is desired to better define the associated locations and depth of soil requiring excavation.

This information will be used to increase the efficiency of the excavation by determining whether overburden can be quickly removed in lifts (e.g., 1 to 3 feet) with little probability of commingling buried waste. This information may also identify volumes of soil between burial pits that may be left in place, and suggest whether or not a small burial pit can be "surgically" excavated. Information associated with the following may also be obtained:

- Exact location of individual pits
- Thickness of cover soils atop the burial pits
- Waste thickness within individual burial pits
- Characteristics (both radiological and chemical) of waste material
- Characteristics (both radiological and chemical) of soil around and below the burial pits
- Potential for VOC air emissions from waste and soil.

Information regarding the radiological and chemical constituents in soil adjacent and atop the natural gas line will provide input to excavation modeling, and if needed, to estimate the risk associated with any residual radioactivity that is currently inaccessible for excavation due to limitations associated with structural stability of the gas line.

3.2 DECISION IDENTIFICATION

This data collection effort is designed to provide necessary information to guide planning for remediation (if required) as well as survey and release activities. The output from this study is also designed to provide input appropriate for the development of remediation and post remediation survey plans. The output from this study will not result in a specific decision but will provide input appropriate for future planning.

3.3 INPUTS TO THE DECISION

Obtain surface and subsurface soil samples from the impacted soils area to supplement existing radionuclide and chemical concentration data. All sample locations are considered biased and selected based upon professional judgment. All depressions (sunken areas) observed in the burial pit area were selected for evaluation.

Field instruments will be used primarily in a scan mode and Minimum Detectable Concentrations (MDCs) for soil work are established per Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM). Laboratory lower limits of detection for radioactivity target 10 percent of the proposed Derived Concentration Guideline Level (DCGL), but must be less than 50 percent of the proposed DCGL. QC samples will be selected from samples which provide a wide spectrum of positive results for comparisons.

3.4 BOUNDARIES OF THE STUDY

This plan addresses a remedial investigation survey for both chemical and radiological concerns of the burial pit area, the gas line, the leach field, and land areas adjacent to the process buildings. Surface and subsurface soil locations are as selected by professional judgment of the health physics staff.

3.5 DECISION RULE

Activity or concentration measurements are indicators that contaminants are or are not present. As suggested in MARSSIM, the sum of ratios of the concentrations measured to respective DCGLs will be used as a key to levels of residual concentrations. Concentrations need to be addressed in the remediation action plan to include the delineation of decontamination boundaries at and below the ground surface. Results of logs and sample analysis are indicative of field conditions to be used with professional judgment.

For the Burial Pits, additional rules are applied as follows:

- A sample core filled with soil will be indicative that a burial pit was not located.
- A sample core or drill cuttings (spoils) that contain waste materials will be indicative that a burial pit was located (whether or not contaminated).
- A sample core that has poor material recovery and has radioactive contamination, determined by core scan, may be indicative that a contaminated burial pit was located.
- A sample core that has poor material recovery will be an indicator that potentially a burial pit was located.

- A drilling refusal may be an indicator that material in a pit may have been located.

Laboratory sample results will be considered valid if there are no discrepancies in results of quality control samples or if any discrepancies are resolved. Guidance found in NRC Inspection Procedure 84750 will be used to determine data quality and if ratios can not be determined, review and follow-up actions will be per that document. Professional judgment will be used for sample results that are negative or less than MDC or a resolution less than 4. Comparisons test are expected on individual radionuclides and the results of these tests will be included in the final report.

- Divide the first result for each sample by its associated uncertainty to obtain the resolution. (Note: For purposes of this plan, the uncertainty is defined as the relative standard deviation, one sigma, of the lab results as calculated from counting statistics.)
- Divide each first result by the corresponding second result to obtain the ratio (First result/second result).
- The measurements are in agreement if the value of the ratio falls within the limits shown in Table 3-1 for the corresponding resolution.

3.6 LIMITS ON DECISION ERRORS

Results of data collected may support final status surveys as biased samples but they may be reported separately from routine final status data. Additional remedial surveys may be required during and post excavation activities. MARSSIM probability errors for final status surveys are not applicable to this type of survey.

3.7 DESIGN FOR COLLECTING DATA

No specific criteria is established by the NRC regarding biased sampling of volumetric and subsurface soils. Professional judgment determined what locations would compliment previous characterization sampling efforts. A linear and biased relationship was used along the gas line.

The sampling plan is optimized to establish radionuclide concentrations at the various depths which are of concern based on DCGL development models, i.e., core intervals for samples match those used during DCGL development.

3.8 REFERENCES FOR CHAPTER 3

3-1 NUREG -1757, Vol 2, Revision 1, "Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria"; September 2006.

3-2 NUREG-1575, Rev. 1, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), August 2000

3-3 Westinghouse Electric Company, "Hematite Quality Assurance Program Plan"

3-4 NRC INSPECTION MANUAL- INSPECTION PROCEDURE 84750, "Radioactive Waste Treatment, And Effluent and Environmental Monitoring," March 15, 1994.

Table 3-1

Criteria for Accepting the Measurements

Resolution	Ratio
<4	-
4-7	0.5-2.0
8-15	0.6-1.66
16-50	0.75-1.33
51-200	0.80-1.25
>200	0.85-1.18

4.0 SURVEY INSTRUMENTATION

Survey instrumentation is considered Measuring and Test Equipment in the Hematite Quality Assurance Program Plan Section 7.12. The Control of Inspection, Measuring, and Test Equipment (Section 7.12) address the requirements placed on survey instrumentation used in this remedial HPD investigation survey. Field survey instruments which will be used are from the Health Physics Department (HPD) and the Environmental Health and Safety Department which have established procedures to meet the WEC Hematite QA Plan including: Identification of Measuring and Test Equipment, Calibration Procedures, Records, Adequacy of Measurement Reference Standard, Environmental Controls, Intervals of Calibration, Traceability and Labeling. Any contractor providing instrumentation must meet these requirements. The following narrative and tables are based upon manufacturer data; however, the project Health Physicist will determine action or investigation levels based upon real field conditions. This information will be implemented in the work packages for Investigation Levels (ILs).

4.1 RADIATION SURVEY INSTRUMENTS

Specific radiation measurements for this study will be made with a NaI scintillator probe, or equivalent, for gamma measurements of ground surface areas cores, samples, and down hole logging. This type of probe is well suited for this work and can be coupled with a Ludlum Model 2350 (or equivalent). The radiation protection staff will also use instruments routinely required for alpha and beta contamination detection such as the Ludlum 43-89 probe. MARSSIM's Table 6.7 NaI (Tl) Scintillation Detector Scan MDCs for Common Radiological Contaminants establishes surface soil scan MDCs and weighted cpm/µR/h for a 2 inch by 2 inch detector as indicated in Table 4-1. A smaller NaI probe (1 inch by 1 inch) may be used for down hole measurements and correlations will be determined post sample analysis for cpm versus pCi/g.

The soil cores will be monitored for potential total uranium (and progeny) contamination utilizing a Ludlum 44-9 pancake Geiger Mueller (GM) detector, or equivalent. Scan measurements of soil cores will be accomplished with a 44-9 probe scanning the soil core at a speed of 1.5 in/sec. Direct scan measurements will be performed over the length of the soil core with a 44-9 probe and rate meter and observing the average count rate over a time of several seconds. All results will be recorded in counts per minute. The Leggette, Brashears & Graham, Inc., "Remedial Investigation Feasibility Study Work Plan", established that:

> Using MARSSIM methodology, the calculated scan MDC sensitivities for a Ludlum 44-9 pancake GM probe or equivalent for this radiological survey when using a 60% false positive and a 95% true positive proportion is:
>
> - For a 100 cpm background and contribution from naturally occurring beta emitters in the soil the scan MDC is 5,090 dpm/100 cm^2.
> - For a 100 cpm background and contribution from naturally occurring beta emitters in the soil the scan MDC is 72 pCi/g.

Using MARSSIM methodology, the calculated direct measurement sensitivities for a Ludlum 44-9 pancake GM probe or equivalent for this radiological survey when using Type I and Type II errors set at 0.05 is:

- For a 100 cpm background and contribution from naturally occurring beta emitters in the soil the LLD = 50 counts.
- For a 100 cpm background the static MDC is 23 pCi/g.

Table 4-2 lists the radiation field survey probes and meters and their applicability. The RPOM may elect to combine certain probes with a data logger and/or GPS to assist with data quality control. All meters and probes can be changed out with equivalent types.

4.2 CHEMICAL SURVEY INSTRUMENTS

VOC contamination measurements will be performed with a PID to screen excavated soils and debris to detect the presence of total VOCs. The PID selected is a MultiRae PID, or equivalent instrument, that is calibrated monthly and tested daily. The PID has a broad VOC detection range of 1 to 10,000 parts per million (ppm). The above process may also be complimented using a portable X-Ray Fluorescence (XRF) unit if RCRA metals are suspected to be present.

4.3 REFERENCES FOR CHAPTER 4

4-1 NUREG -1757, Vol 2, Revision 1, "Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria"; September 2006.

4-2 NUREG-1575, Rev. 1, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), August 2000

4-3 NUREG-1507, "Minimum Detectable Concentrations With Typical Radiation Survey Instruments for Various Contaminants and Field Conditions," June 1998

4-4 Westinghouse Electric Company, "Hematite Quality Assurance Program Plan"

4-5 Westinghouse Electric Company, "Hematite Radiation Protection Program"

4-6 Westinghouse Electric Company, "Westinghouse Hematite Health and Safety Plan"

4-7 Westinghouse Electric Company, "Fundamental Nuclear Material Control Plan"

4-8 Westinghouse Electric Company, "Nuclear Criticality Safety Policy and Procedures," NISYS-NCS-1180 Documents

Table 4-1

Response for a 2" by 2" NaI Detector

Radioactive Material	Scan MDC (pCi/g)	Weighted cpm/μR/h
Depleted Uranium (0.24% Enriched Uranium)	56	3790
Natural Uranium	80	3990
3% Enriched Uranium	96	4520
20% Enriched Uranium	107	4940
50% Enriched Uranium	118	5010
75% Enriched Uranium	132	5030
Th-232+C*	18.3	830

*Th-232+C represents Th-232 and the entire decay chain in equilibrium.

Table 4-2

Selected Instrument Type and Use*

Radiation Probe/ Meter	Type	Radiation Detected	Active Area	Range or 4-π Efficiency	Use
Model 44-10/ Model 2241-2	NaI	gamma	Not applicable	0.0 microR/hr - 9999 R/hr; 0 cpm - 999k cpm	Gamma walkover, criticality, bore hole logging, exposure rate
Model 44-2/ Model 2350	NaI	gamma	Not applicable	6 digit display in rem/hr, Sv/hr, R/hr, cpm, cps, dpm, dps, rad(r), Gray(G), C/kg, Ci/cm squared, or Bq/cm squared	Gamma exposure rate, criticality, bore hole logging, exposure rate
Model 44-9 /Model3	Geiger Mueller	alpha-beta	15 cm^2	5%-^{14}C; 22%-^{90}Sr/^{90}Y; 19%-^{99}Tc; 32%-^{32}P; 15%-^{239}Pu	Sample core scans, contamination
Model 43-89/Model 2224 or Model 3	dual phosphor	alpha-beta	125 cm^2	16% - ^{239}Pu; 5% - ^{99}Tc; 16% - ^{90}S/^{90}Y	Contamination control
Model 19	NaI	gamma	Not applicable	50 microR/ hour	Gamma exposure rate

* The Ludlum Model 2350 meter may be used with all probes.

5.0 SURVEY SAMPLING AND DESIGN

This section develops the sampling locations for this effort and Appendix A provides the GPS coordinates for each location.

5.1 DETERMINATION OF BIASED SAMPLE LOCATIONS

Survey sampling locations were selected for known areas of elevated concentrations, depressions in the burial pit areas, and for areas of specific concern such as the leach field. Specific survey units have not yet been defined for this facility and these samples may not represent those areas/volumes selected for final status surveys. All sample locations are deemed as biased locations.

5.2 REFERENCE COORDINATE SYSTEM

All sampling locations will be referenced to GPS coordinates at 1 foot accuracy. Survey maps will be generated that indicate the locations of grids and sampling locations. Figure 5-1 illustrates an overall sampling location plan for the Burial Pit area including the leach field and surrounding areas.

5.3 SAMPLE DISTRIBUTION FOR THE GAS LINE

The distribution of samples along the gas line is established to provide a better understanding of the radiological and chemical constituents adjacent and atop the natural gas line. For the three sections shown in Figure 2-1, five sampling locations are planned for Section A, 24 for Section B, and 11 for Section C. The pattern is a saw-tooth design with points set equidistant and different for each section.

Figures 5-2 through 5-4 illustrate the sampling pattern for the Gas Line Sections. Figure 5-2 Sampling Locations for Section A of Gas Line, Figure 5-3 Sampling Locations for Section B of Gas Line and Figure 5-4 Sampling Locations for Section C of Gas Line identify the specific sampling locations for these sections. Appendix A contains the GPS coordinates.

5.4 GAMMA SURVEYS

A gross gamma walkover survey will be performed over 100% of the surface for the three known elevated areas out to a radius of 20 feet. These areas are identified in Figure 5-1. The results of these measurements will provide semi-quantitative data regarding the potential for elevated surface contamination. Gross gamma walkover surveys may be performed using a NaI detector, coupled to appropriate ratemeter/scalers, and data may be (but not required to be) linked with Global Positioning System (GPS)receiver/data loggers or equivalent.

The survey will be performed following MARSSIM protocol by walking straight parallel lines over an area while moving the detector in a serpentine motion, 2 inches to 4 inches above the ground surface. Survey passes will be approximately 1 meter apart and the scan rate will be approximately 1.5 feet per second.

The collection of surface samples to delineate the edge of the elevated area will be at the discretion of the RSO, up to three per elevated area.

5.5 SAMPLE IDENTIFICATION AND CONTROL

Sample identification and control is covered by the Hematite Quality Assurance Program Section 7.8. This section addresses the requirements placed on samples obtained during this survey.

- All samples will be identified using an alphanumeric code as indicated in Section 2.6 of this Plan. All samples will be identified using the alphanumeric code for the purpose of identification, traceability, and clear association with sample location.

- All samples will be stored in a controlled area provided by HPD. Samples will be inspected prior to being placed in the storage area for identification, damage, packaging, and traceability to records. Packaging and identification shall be consistent with the conditions and duration of storage.

- All samples will be tracked from the time the sample is obtained through final disposition or disposal of the sample. All samples will be retained indefinitely unless authorization for disposal is provided by HPD. This tracking includes the use of a Chain-of-Custody record or similar form to track samples that are sent offsite for analysis.

5.6 GRADED APPROACH TO SAMPLE ANALYSIS REQUIREMENTS

Contractor laboratories for this effort will be selected from the Westinghouse qualified suppliers list. Gamma spectroscopy will be performed on 100 percent of the soil samples to provide an estimate of the uranium, and thorium levels as well as other gamma emitting radionuclides. Earlier characterization work indicates that ~12% of the sampling effort will yield gamma spectroscopy levels of 3 pCi/g as U-238 and 1 pCi/g as U-235. When both these levels are positively exceeded and >MDC, measurements for U-234, U-235/236, and U-238 may be performed by alpha spectroscopy. Liquid scintillation analysis will be performed on 100 percent of the soil samples for Tc-99. It is expected that selected laboratories will hold samples for at least six months after analysis. The following table summarizes the fraction of soil samples analyzed and the minimum detectable concentration (MDC) by sample analysis type.

5.7 MANAGEMENT OF INVESTIGATIVE DERIVED WASTE (IDW)

This section identifies the requirements to ensure the proper management of IDW generated during the field investigation activities performed as part of this remedial investigation. IDW will be characterized and managed according to the procedures described in the Waste Management Plan. IDW materials include:

- Decontamination solids
- Drilling solids
- Personal Protective Equipment (PPE) and/or associated general trash.
- IDW liquids

IDW liquids will be collected at the various points of generation and transported to a drop off point for consolidation and processing.

IDW solid management practices are described below. IDW, which is comprised of trash and/or PPE, will be collected and containerized at the plant site, and managed in accordance with the Waste Management Plan (WMP). For cuttings and excess drilling waste, the volume is expected to be about 75 cubic yards.

- Drill solids will be screened with field instrumentation (e.g., PID or radiation survey meter).
- Cuttings will be collected in mini-super sacks (1 yd^3) or other approved containers as required by Waste Management.

5.8 REFERENCES FOR CHAPTER 5

5-1 NUREG -1757, Vol 2, Revision 1, "Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria"; September 2006.

5-2 NUREG-1575, Rev. 1, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), August 2000

5-3 NUREG-1507, "Minimum Detectable Concentrations With Typical Radiation Survey Instruments for Various Contaminants and Field Conditions," June 1998

5-4 Westinghouse Electric Company, "Hematite Quality Assurance Program Plan"

5-5 Westinghouse Electric Company, "Hematite Radiation Protection Program"

5-6 Westinghouse Electric Company, "Westinghouse Hematite Health and Safety Plan"

5-7 Westinghouse Electric Company, "Fundamental Nuclear Material Control Plan"

5-8 Westinghouse Electric Company, "Nuclear Criticality Safety Policy and Procedures," NISYS-NCS-1180 Documents

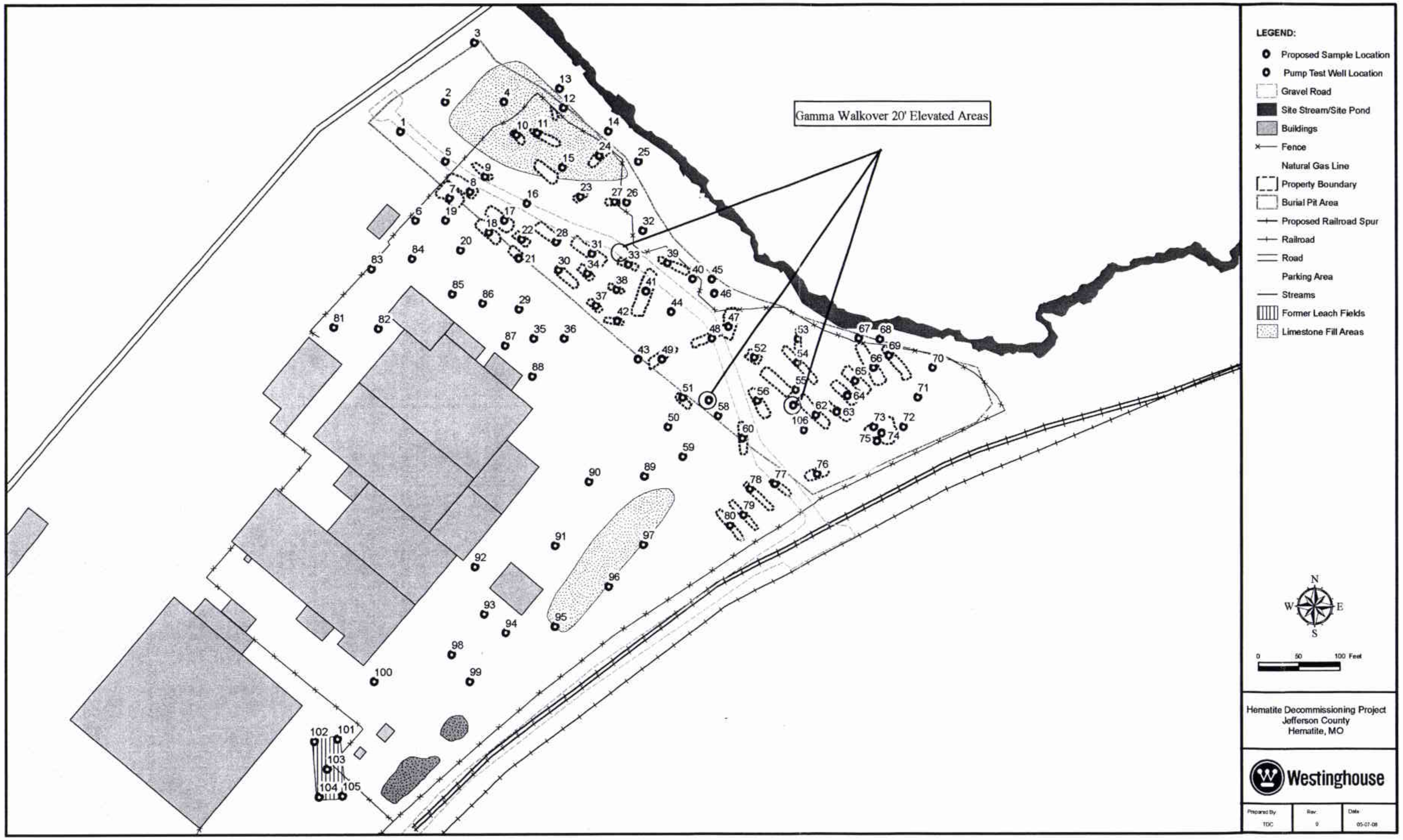


Figure 5-1 Sampling Locations for Burial Pit Area, Leach Area, and Selected Areas

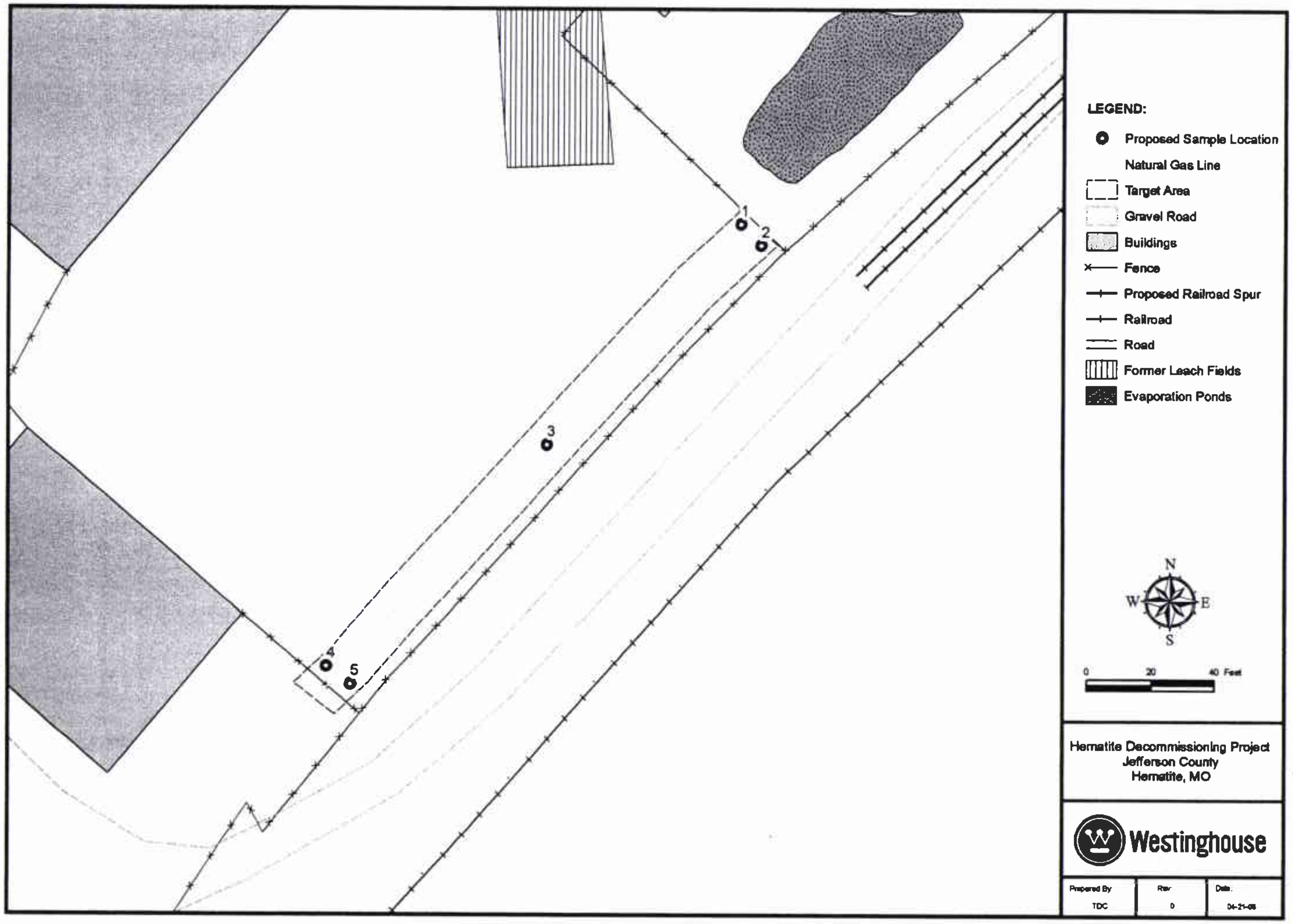


Figure 5-2 Sampling Locations for Section A of the Gas Line

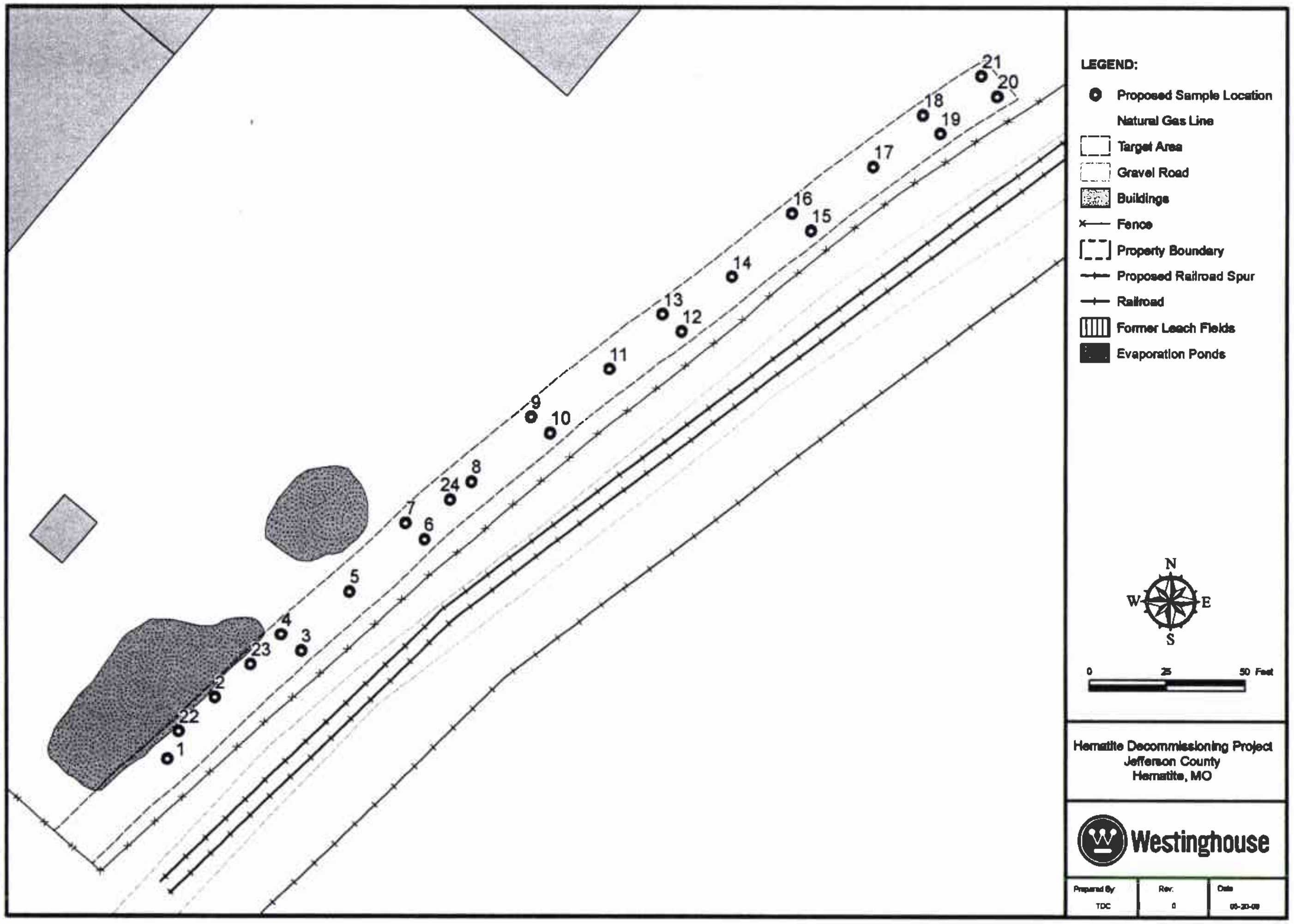


Figure 5-3 Sampling Locations for Section B of the Gas Line

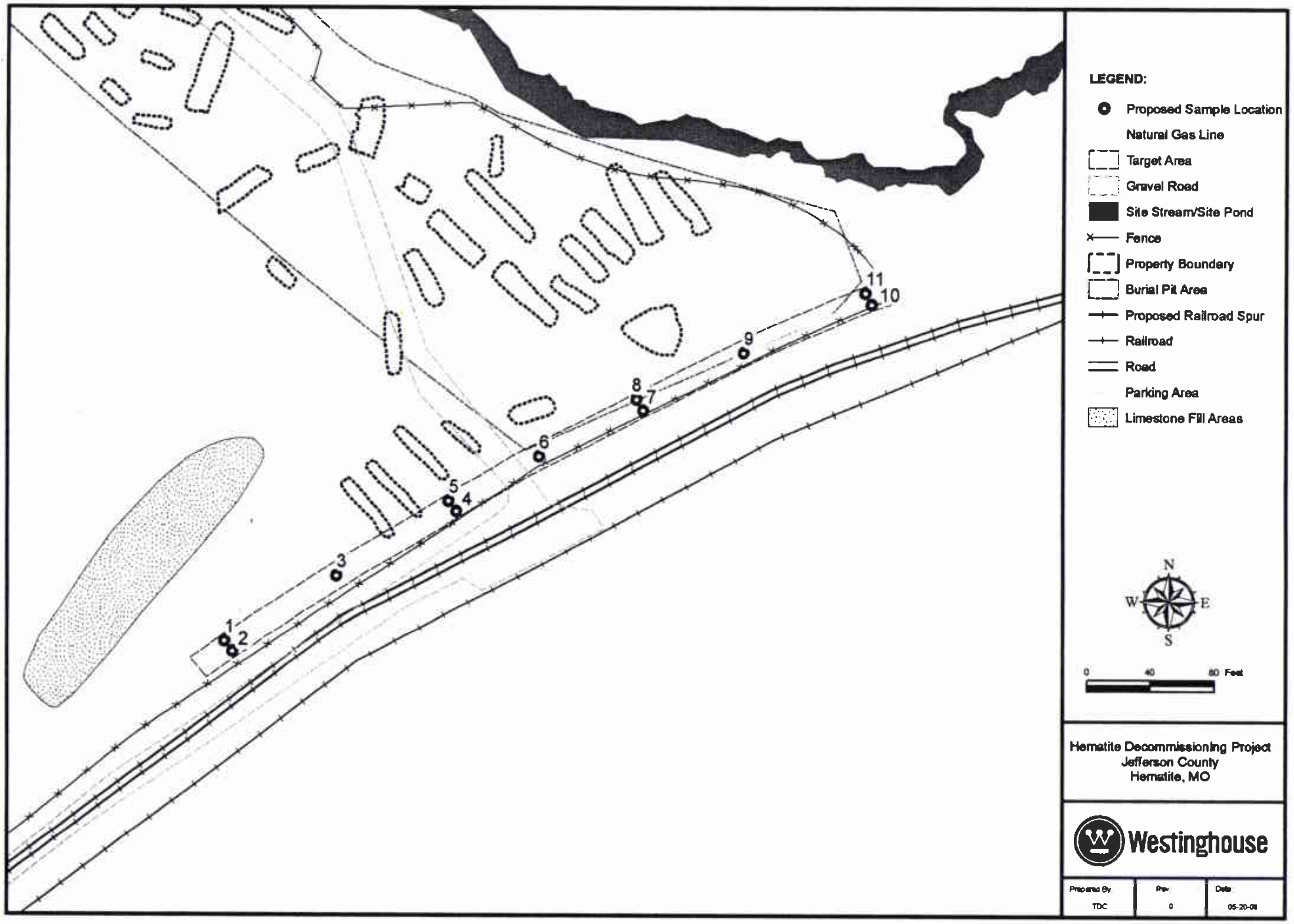


Figure 5-4 Sampling Locations for Section C of the Gas Line

Table 5-1

Minimum Detection Requirements

Type	Radionuclide Suite	MDC (pCi/g)
Gamma Spectroscopy	U-235, U-238, Th-232, Am-241, and K-40	1
Alpha Spectroscopy	Th-232, U-234, U-235, and U-238	1
Liquid Scintillation	Tc-99	10

6.0 WORK PROCESS

1.1 WORK PREREQUISITES

The following prerequisites will be met before coring begins.

- The RSO or a designated, authorized acting RSO shall be on site during field sampling activities.
- Permission from the gas line (Missouri Natural Gas) when collecting the gas line samples..
- An adequate number of sampling locations will be marked to assure that work can commence.
- Verify instrument numbers, calibration to reference standards, calibration dates, and equipment operability according to WEC procedures.
- All contractors will review all applicable WEC polices and procedures.
- Dig-rite, a Missouri statewide wide call center concerning excavation, shall be notified and utilities marked prior to work.
- Penetration Permit shall be completed.
- Radiation Work Permit (RWP) shall be completed.
- A project specific Accident and Hazards Analysis shall be completed.
- A sample storage location shall be established.
- Training shall be completed for asbestos issues, use of the PID and Class D fire extinguisher.
- Pre-job brief by the PM or designee shall be completed for all personnel taking part in this activity prior to start.
- The Project Engineer will assemble and stage for use, sample containers, waste material containers (1 yd^3), sample log sheets, and sampler decon materials.
- Heat Stress monitoring shall be in place, if applicable.
- First aid treatment kit shall be upgraded to include calcium gluconate.
- All equipment, supplies and hand tools shall be inspected and ready for use.
- Appropriate PPE shall be staged and ready for use as applicable.
- Applicable site procedures referenced in appendix C are available as necessary.

6.2 REQUIRED EQUIPMENT, INSTRUMENTS, MATERIAL AND SUPPLIES

The following is a listing of the required equipment, instruments, material and supplies to perform this work effort:

- Hearing protection, eye protection, leather palm gloves, safety toe shoes, and hardhat. Radiological PPE
- Portable eye wash station
- GPS meter, tape measures, or equivalent
- NaI Detector with Ludlum 2350 survey meter or equivalent (calibrated with a cable that is approximately 25 feet long and one with a 3-5 feet length.)

- Ludlum 43-89 Alpha/Beta Probe and survey meter or equivalent
- Ludlum 44-9 GM probe with survey meter or equivalent
- Multi Rae Plus PID
- Sampling Rig for use with soil sampling devices
- Manual auger for sampling on top of gas line
- Decon supplies (spray bottles, rags, tubs, Alconox, etc.)
- Bentonite clay/chips hole fill material
- Marker, Flags, Stakes and Paint
- Class D Fire Extinguisher
- Rope marked at ~1 ft intervals for NaI logging work; hose clamp to connect rope to probe.
- Disposal bags (1 yd^3); mini super-sacks or approved waste container
- Sample blending containers and final sample containers for radiological analysis
- Sample containers for chemical work
- Sample preparation tables (2) with plastic sheeting
- Spoon cleaning station table with plastic sheeting
- Communication radios

6.3 PROCESS/WORK STEPS

NOTE: The performance and sequence of the following activities may be altered with authorization from the Project Engineer based on the situation. The process that will be typically implemented is illustrated in Figure 6-1.

6.3.1 LOCATE AND MARK SAMPLING LOCATIONS

- Sample locations are indicated on Figures 5-1 through 5-4. Each sampling location will be identified preferably using GPS; otherwise with a tape measure, laser rangefinder, etc.
- The sample locations will be marked using marking paint, construction flags, and/or stakes depending on the conditions where the sample will be taken. All locations markings will include the sample numbers from Figures 5-1 through 5-4.
- If there are interferences such as trees, rocks, fences, etc. that precludes the sample location indicated, the location will be offset in any direction as directed by the Project Engineer. Any location change must be noted on the field sample log sheet.

6.3.2 SOIL SURFACE GAMMA SCANS

A gross gamma walkover survey will be performed over 100% of the surface for any elevated area selected for further investigation out to a radius of approximately 20 feet.

6.3.3 SURFACE SAMPLES

Surface samples will be collected for any elevated area, and at all other sampling locations.

A 0 to 0.15m surface sample may be collected when obtaining core samples as discussed in section 6.3.4 or by using hand tools. The sample will be placed into a standard zip lock bag, or other container approved by the Project Engineer, and labeled with the sample identification number, and depth bgs. The sample information will be recorded on sample log sheets as indicated by the log.

6.3.4 OBTAINING CORE SAMPLES

The sampling rig or hand auger will be used to obtain surface and subsurface samples as appropriate. In the Burial Pit, soil samples will be obtained with a split spoon sampler, or equivalent such as (plastic sleeving) methods.

- If using a hand auger, segregate the soil as an individual interval for each successive 0.15 meter in depth.
- Advance the sampler to the desired depth and retrieve the sampler. The length of the core will be variable and may be collected in acrylic sleeves or in a split spoon sampler.
- For samples in the burial pit area, scan the core or augered material in accordance with WP-2008-06 Appendix B to estimate inventory and enrichment prior to collecting the sample.
- Scan the core, if a sleeve is present open the sleeve first, or scan the sample if the sample is collected by a hand auger, using a PID to detect the presence of VOC; and using GM detector or other approved instrumentation to detect the presence of radioactivity.
- Record the soil characteristic information on the log sheet and identify the portion of the core showing the highest for VOC and radioactivity.
- Within each of the depths of interest and if there is an elevated count on the core, collect a sample for radiological analysis at the location of most elevated count rate, and/or of materials (e.g., waste, stained soil) that are of specific interest.
- Prior to homogenizing the soil obtained from that depth of interest, collect any additional sample(s) for laboratory analysis of VOC and/or metals and place into an approved sample container.
- Collect a composite sample of the soil from the depth of interest and homogenize

- Clean sampling equipment by brushing with water and phosphate-free soap
- IDW material will be placed into the mini super-sack or other approved container.
- Continue the steps above to the required sampling intervals.
- If down-hole logging of gamma radiation is required, advance the gamma detector down the bore hole and record the count rate obtained at approximately 1 foot intervals on the log sheet. Note that this measurement may be performed during sampling or post sampling depending upon the sampling rig.
- After sampling and the gamma log at a location is complete, the hole will be filled with Bentonite clay/chips from the bottom up to preclude the vertical mobility of any contaminants via the sample hole. Bentonite may be directly placed in the saturated zone. For the well locations, in the unsaturated zone, Bentonite should be placed in increments of one foot layers and potable water added to each layer. Other boring locations may be hydrated after Bentonite is placed in the boreholes.
- Samples will be moved to the sample storage location and logged into the inventory in compliance with WEC-Hematite QAPP Section 7.8.
- After all sampling is completed, all sampling equipment will be cleaned and surveyed for unconditional release prior to removal from the site.
- At the completion of all work indicated the original survey records, including work instructions, will be submitted to the PM.

6.4 REFERENCES FOR CHAPTER 6

6-1 NUREG -1757, Vol 2, Revision 1, "Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria"; September 2006.

6-2 NUREG-1575, Rev. 1, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), August 2000

6-3 Westinghouse Electric Company, "Hematite Quality Assurance Program Plan"

6-4 Westinghouse Electric Company, "Hematite Radiation Protection Program"

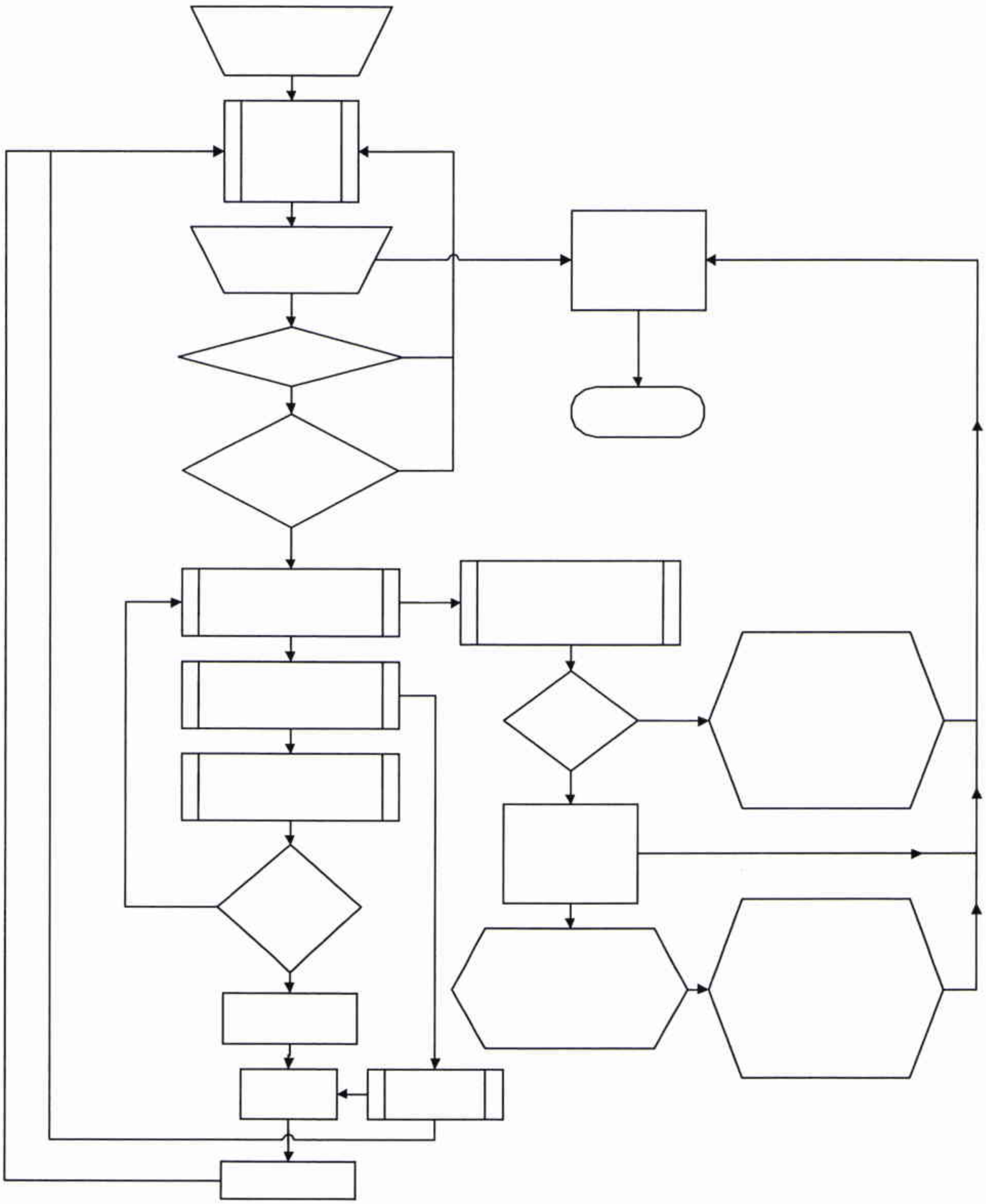
6-5 Westinghouse Electric Company, "Westinghouse Hematite Health and Safety Plan"

6-6 Westinghouse Electric Company, "Fundamental Nuclear Material Control Plan"

6-7 Westinghouse Electric Company, "Nuclear Criticality Safety Policy and Procedures," NISYS-NCS-1180 Documents

Figure 6-1

Sampling Model Work Flow Chart



7.0 QUALITY ASSURANCE AND QUALITY CONTROL

7.1 GENERAL PROVISIONS

All work will be performed in a quality manner and under the auspice of the Hematite Quality Assurance Program Plan along with this Sampling Plan for Engineering Final Design, Hematite work package requirements and implementing procedures. General provisions of the quality control measures include:

- Selection of personnel
- Written procedures
- Instrumentation Selection Calibration and Operation
- Survey Documentation
- Chain of Custody
- Records Management
- Independent Review of Survey Results
- Training

7.2 QUALITY CONTROL SAMPLES AND EVALUATIONS

Quality control samples will be collected at a rate of one duplicate per 20 target samples (5%) for all radiological and chemical analyses.

Sample results will be evaluated per the NRC Inspection Procedure 84750, "Radioactive Waste Treatment, And Effluent and Environmental Monitoring." If possible, samples will be selected which have a wide and useful range of positive results.

7.3 REFERENCES FOR CHAPTER 7

7-1 NUREG -1757, Vol 2, Revision 1, "Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria"; September 2006.

7-2 NUREG-1575, Rev. 1, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), August 2000

7-3 Westinghouse Electric Company, "Hematite Quality Assurance Program Plan"

7-4 Westinghouse Electric Company, "Nuclear Criticality Safety Policy and Procedures," NISYS-NCS-1180 Documents

7-5 NRC INSPECTION MANUAL- INSPECTION PROCEDURE 84750, "Radioactive Waste Treatment, And Effluent and Environmental Monitoring," March 15, 1994.

8.0 ENGINEERING SUMMARY REPORT

8.1 REPORT CONTENTS

This report will include all relevant information to support the engineering design, and other information that may be needed to support the validity of the data in the event that the data are used for other purposes. This information will include:

- Sample coordinate locations,
- Laboratory data from radiological and chemical analysis,
- 3-D contour maps of the subsurface conditions,
- Radiological and chemical field measurement results,
- Depths at which soil and waste samples were collected,
- Descriptions of physical characteristics/classification of subsurface soils encountered
- Description of depth to water from each borehole,
- Descriptions of observed waste, including results of field radioactivity and VOC screening.
- Observations made during field investigations, (e.g., odors, staining)
- Photographs, and
- Approved deviations from this Plan that may become necessary.

Records of radiological surveys and instrumentation performance checks will be maintained according to project work procedures.

8.2 REFERENCES FOR CHAPTER 8

8-1 NUREG -1757, Vol 2, Revision 1, "Consolidated Decommissioning Guidance: Characterization, Survey, and Determination of Radiological Criteria"; September 2006.

8-2 NUREG-1575, Rev. 1, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), August 2000

8-3 Westinghouse Electric Company, "Hematite Quality Assurance Program Plan"

8-4 Westinghouse Electric Company, "Hematite Radiation Protection Program"

8-5 Westinghouse Electric Company, "Westinghouse Hematite Health and Safety Plan"

8-6 Westinghouse Electric Company, "Fundamental Nuclear Material Control Plan"

8-7 Westinghouse Electric Company, "Nuclear Criticality Safety Policy and Procedures," NISYS-NCS-1180 Documents

Appendix A

GPS COORDINATES

Sampling Locations for Burial Pit Area, Leach Field, and Selected Areas

ID	Area	X	Y	Depth	Purpose
1	Burial Pit	827215.3612	865328.34	16	Horizontal Delineation of BP
2	Burial Pit	827267.8612	865363.34	16	Horizontal Delineation of BP
3	Burial Pit	827302.8612	865433.34	16	Horizontal Delineation of BP
4	Burial Pit	827337.8612	865363.34	16	Vertical Delineation of BP
5	Burial Pit	827267.8612	865293.34	16	Horizontal Delineation of BP
6	Adjacent Soil	827232.8612	865223.34	10	Adjacent area investigation
7	Burial Pit	827272.7448	865249.5991	16	Vertical Delineation of BP
8	Burial Pit	827297.2999	865257.2866	16	Vertical Delineation of BP
9	Burial Pit	827315.151	865275.0809	16	Vertical Delineation of BP
10	Burial Pit	827353.1593	865324.4233	16	Vertical Delineation of BP
11	Burial Pit	827377.6964	865326.6584	16	Vertical Delineation of BP
12	Burial Pit	827407.6066	865356.1403	16	Vertical Delineation of BP
13	Burial Pit	827403.0282	865379.1228	16	Horizontal Delineation of BP
14	Burial Pit	827460.3612	865328.34	16	Horizontal Delineation of BP
15	Burial Pit	827406.3	865285.6	16	Well Location, Horizontal Delineation of BP
16	Burial Pit	827365.1258	865243.4426	16	Horizontal Delineation of BP
17	Burial Pit	827337.8612	865223.34	16	Vertical Delineation of BP
18	Burial Pit	827319.5915	865209.0716	16	Vertical Delineation of BP
19	Adjacent Soil	827267.8612	865223.34	10	Adjacent area investigation
20	Adjacent Soil	827285.3612	865188.34	10	Adjacent area investigation
21	Burial Pit	827355.3617	865178.6499	16	Vertical Delineation of BP
22	Burial Pit	827358.6126	865201.0212	16	Vertical Delineation of BP
23	Burial Pit	827427.2887	865251.1293	16	Vertical Delineation of BP
24	Burial Pit	827449.7594	865299.457	16	Vertical Delineation of BP
25	Burial Pit	827496.4617	865292.7093	16	Horizontal Delineation of BP
26	Burial Pit	827482.4571	865244.4157	16	Horizontal Delineation of BP
27	Burial Pit	827467.9373	865245.1643	16	Vertical Delineation of BP
28	Burial Pit	827398.6995	865197.4628	16	Vertical Delineation of BP
29	Adjacent Soil	827355.3612	865118.34	10	Adjacent area investigation
30	Burial Pit	827401.1531	865164.5028	16	Vertical Delineation of BP
31	Burial Pit	827440.6137	865183.8986	16	Vertical Delineation of BP
32	Burial Pit	827501.5419	865211.1327	16	Horizontal Delineation of BP
33	Burial Pit	827484.2786	865170.9828	16	Vertical Delineation of BP
34	Burial Pit	827435.4775	865160.3602	16	Vertical Delineation of BP
35	Adjacent Soil	827372.8612	865083.34	10	Adjacent area investigation
36	Adjacent Soil	827407.8612	865083.34	10	Adjacent area investigation

Sampling Locations for Burial Pit Area, Leach Field, and Selected Areas (Continued)					
37	Burial Pit	827445.0226	865122.3892	16	Vertical Delineation of BP
38	Burial Pit	827469.86	865141.2043	16	Vertical Delineation of BP
39	Burial Pit	827530.1282	865172.8463	16	Vertical Delineation of BP
40	Burial Pit	827559.8	865154	16	Horizontal Delineation of BP and Well Location
41	Burial Pit	827504.5935	865139.2297	16	Vertical Delineation of BP
42	Burial Pit	827470.8149	865103.901	16	Vertical Delineation of BP
43	Burial Pit	827495.3612	865058.7567	16	Horizontal Delineation of BP
44	Burial Pit	827534.4182	865114.6374	16	Horizontal Delineation of BP
45	Burial Pit	827582.8612	865153.34	16	Horizontal Delineation of BP
46	Burial Pit	827617.8612	865153.34	16	Horizontal Delineation of BP
47	Burial Pit	827602.7882	865097.0831	16	Vertical Delineation of BP
48	Burial Pit	827582.8612	865083.34	16	Vertical Delineation of BP
49	Burial Pit	827523.4168	865058.7567	16	Vertical Delineation of BP
50	Adjacent Soil	827530.3612	864978.34	10	Adjacent area investigation
51	Burial Pit	827547.8612	865013.34	16	Vertical Delineation of BP
52	Burial Pit	827634.0313	865060.7531	16	Vertical Delineation of BP
53	Burial Pit	827683.8713	865082.4534	16	Vertical Delineation of BP
54	Burial Pit	827683.2919	865053.9397	16	Vertical Delineation of BP
55	Burial Pit	827680.8929	865022.0973	16	Vertical Delineation of BP and Well Location
56	Burial Pit	827637.3449	865009.3501	16	Vertical Delineation of BP
57	Burial Pit	827578.5791	865010.0461	16	Horizontal Delineation of BP
58	Burial Pit	827589.9446	864991.3609	16	Horizontal Delineation of BP
59	Adjacent Soil	827547.8612	864943.34	10	Horizontal Delineation of BP
60	Burial Pit	827619.5974	864965.0414	16	Vertical Delineation of BP
61	Burial Pit	827677.9742	865003.9664	16	Horizontal Delineation of BP
62	Burial Pit	827706.2293	864992.2289	16	Vertical Delineation of BP
63	Burial Pit	827731.5418	864995.9789	16	Vertical Delineation of BP
64	Burial Pit	827743.9724	865015.0761	16	Vertical Delineation of BP
65	Burial Pit	827753.3821	865032.715	16	Vertical Delineation of BP
66	Burial Pit	827775.3612	865048.34	16	Vertical Delineation of BP
67	Burial Pit	827757.8612	865083.34	16	Horizontal Delineation of BP
68	Burial Pit	827782.8603	865082.2685	16	Horizontal Delineation of BP
69	Burial Pit	827793.6553	865063.1013	16	Horizontal Delineation of BP
70	Burial Pit	827845.3612	865048.34	16	Horizontal Delineation of BP
71	Burial Pit	827827.8612	865013.34	16	Horizontal Delineation of BP
72	Burial Pit	827810.3612	864978.34	16	Horizontal Delineation of BP

Sampling Locations for Burial Pit Area, Leach Field, and Selected Areas (Continued)					
73	Burial Pit	827775.3612	864978.34	16	Vertical Delineation of BP
74	Burial Pit	827784.6556	864971.0303	16	Vertical Delineation of BP
75	Burial Pit	827778.8983	864961.5388	16	Vertical Delineation of BP
76	Burial Pit	827707.8265	864922.5067	16	Vertical Delineation of BP
77	Burial Pit	827656.4724	864910.9442	16	Vertical Delineation of BP
78	Burial Pit	827628.4168	864904.8678	16	Vertical Delineation of BP
79	Burial Pit	827620.4654	864874.2081	16	Vertical Delineation of BP
80	Burial Pit	827604.5626	864862.0553	16	Vertical Delineation of BP
81	Adjacent Soil	827136.6488	865097.0305	10	Adjacent area investigation
82	Adjacent Soil	827189.0018	865095.3046	10	Adjacent area investigation
83	Adjacent Soil	827180.9475	865166.0673	10	Adjacent area investigation
84	Adjacent Soil	827228.698	865178.1488	10	Adjacent area investigation
85	Adjacent Soil	827275.8732	865136.1514	10	Adjacent area investigation
86	Adjacent Soil	827311.7453	865125.1506	10	Adjacent area investigation
87	Adjacent Soil	827338.5816	865075.1688	10	Adjacent area investigation
88	Adjacent Soil	827370.7989	865038.3491	10	Adjacent area investigation
89	Adjacent Soil	827502.3659	864919.9744	10	Adjacent area investigation
90	Adjacent Soil	827436.7119	864913.4922	10	Adjacent area investigation
91	Adjacent Soil	827396.8229	864838.0471	10	Adjacent area investigation
92	Adjacent Soil	827301.8847	864813.2305	10	Adjacent area investigation
93	Adjacent Soil	827312.8036	864757.1865	10	Adjacent area investigation
94	Adjacent Soil	827338.7043	864735.0762	10	Adjacent area investigation
95	Adjacent Soil	827396.5047	864742.3984	10	Adjacent area investigation
96	Adjacent Soil	827459.4541	864789.4942	10	Adjacent area investigation
97	Adjacent Soil	827500.8774	864839.0389	10	Adjacent area investigation
98	Adjacent Soil	827274.4261	864709.4924	10	Adjacent area investigation
99	Adjacent Soil	827295.7471	864677.5893	10	Adjacent area investigation
100	Adjacent Soil	827183.2999	864677.7701	10	Adjacent area investigation
101	Leach Field	827140.3173	864610.2382	10	Horz / Vert Delineation of LF
102	Leach Field	827113.5662	864607.6185	10	Horz / Vert Delineation of LF
103	Leach Field	827128.0395	864574.755	10	Horz / Vert Delineation of LF
104	Leach Field	827118.6814	864541.8385	10	Horz / Vert Delineation of LF
105	Leach Field	827145.7893	864542.9948	10	Horz / Vert Delineation of LF
106	Burial Pit	827691.1717	864974.614	16	Horizontal Delineation of BP

Sampling Locations for Sections A, B, and C of the Gas Line

ID	Area	Section	X	Y	Depth	Purpose
1	Gas Line	A	827190.5245	864521.3682	16	Delineation Near Gas Line
2	Gas Line	A	827196.9449	864514.6965	16	Delineation Near Gas Line
3	Gas Line	A	827128.9837	864451.5717	4 - 5	Delineation Near Gas Line
4	Gas Line	A	827059.372	864381.9287	16	Delineation Near Gas Line
5	Gas Line	A	827066.8962	864376.2318	16	Delineation Near Gas Line
1	Gas Line	B	827229.6843	864544.2645	10	Delineation near Gas Line
2	Gas Line	B	827244.5525	864564.3158	10	Delineation near Gas Line
3	Gas Line	B	827269.5523	864580.8876	4 - 5	Delineation near Gas Line
4	Gas Line	B	827262.6493	864587.063	10	Delineation near Gas Line
5	Gas Line	B	827284.2743	864600.5558	16	Delineation near Gas Line
6	Gas Line	B	827309.4594	864616.2253	4 - 5	Delineation near Gas Line
7	Gas Line	B	827302.0627	864622.8238	10	Delineation near Gas Line
8	Gas Line	B	827324.1357	864635.0718	16	Delineation near Gas Line
9	Gas Line	B	827342.6969	864656.6538	4 - 5	Delineation near Gas Line
10	Gas Line	B	827349.3178	864650.6195	16	Delineation near Gas Line
11	Gas Line	B	827367.0832	864672.5254	10	Delineation near Gas Line
12	Gas Line	B	827390.205	864685.2685	4 - 5	Delineation near Gas Line
13	Gas Line	B	827383.0199	864691.867	10	Delineation near Gas Line
14	Gas Line	B	827405.524	864702.482	16	Delineation near Gas Line
15	Gas Line	B	827433.0847	864716.4414	4 - 5	Delineation near Gas Line

Sampling Locations for Sections A, B, and C of the Gas Line (Continued)						
ID	**Area**	**Section**	**X**	**Y**	**Depth**	**Purpose**
16	Gas Line	B	827425.1238	864723.322	10	Delineation near Gas Line
17	Gas Line	B	827452.5056	864737.2277	16	Delineation near Gas Line
18	Gas Line	B	827467.6342	864754.5649	4 - 5	Delineation near Gas Line
19	Gas Line	B	827474.4667	864746.8381	16	Delineation near Gas Line
20	Gas Line	B	827493.0959	864759.07	10	Delineation near Gas Line
21	Gas Line	B	827486.8713	864767.6944	10	Delineation near Gas Line
22	Gas Line	B	827232.7949	864553.2683	5 - 6	Hand Auger Below Line
23	Gas Line	B	827255.8226	864574.7402	5 - 6	Hand Auger Below Line
24	Gas Line	B	827317.4375	864629.5089	5 - 6	Hand Auger Below Line
1	Gas Line	C	827509.8364	864782.2379	10	Delineation Near Gas Line
2	Gas Line	C	827515.7615	864774.434	10	Delineation Near Gas Line
3	Gas Line	C	827581.4154	864822.8515	4 - 5	Delineation Near Gas Line
4	Gas Line	C	827657.5158	864862.9003	10	Delineation Near Gas Line
5	Gas Line	C	827651.9729	864870.7322	10	Delineation Near Gas Line
6	Gas Line	C	827708.562	864898.2345	4 - 5	Delineation Near Gas Line
7	Gas Line	C	827776.2221	864925.8661	10	Delineation Near Gas Line
8	Gas Line	C	827770.8202	864933.839	10	Delineation Near Gas Line
9	Gas Line	C	827840.0129	864963.7684	4 - 5	Delineation Near Gas Line
10	Gas Line	C	827920.1334	864996.0529	10	Delineation Near Gas Line
11	Gas Line	C	827915.1546	865004.7311	10	Delineation Near Gas Line

Appendix B

LOGGING FORM (EXAMPLE)

Area ________ Hole Number [ ] Date Started [ ]

Name of Drilling Company [ ] Date Completed [ ]

Name of Driller [ ]

DEPTH IN FEET	DESCRIPTION OF MATERIAL	% RECOVERY	PID VALUES (ppm)	GM SCAN (cpm)	GAMMA LOG (cpm)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					

Disposition of Hole

☐ Backfilled

☐ Well

Westinghouse Electric Company
Hematite Facility
3300 State Road P
Festus, Missouri 63028

HPT

Signature [ ]
Print Name [ ] Date [ ]

Project Engineer

Signature [ ]
Print Name [ ] Date [ ]

Appendix C

Procedure Listing

Procedure Number and Revision	Title	Approval Date
PO-GM-002	Training Plan	8/10/2005
PO-GM-005	Project Emergency Plan	1/26/2004
PO-GM-006	Physical Security Plan	11/21/2005
PR-GM-002	Training of Hematite FFCF Project Personnel	7/28/2005
PR-GM-005	Qualification of Instructors	8/8/2005
PR-GM-101	Initial Emergency Actions	1/21/2004
PR-GM-103	Emergency Operations	1/21/2004
PR-GM-104	Incident Assessment and Classification	1/21/2004
PR-GM-105	Incident Notification	1/21/2004
PR-GM-106	Emergency Decontamination	1/21/2004
PR-GM-201	Security Guard Responsibilities	2/8/2005
PR-GM-202	Escort Responsibilities	1/20/2004
PR-GM-203	Security Badging	8/4/2006
PO-DO-001	Project Management Plan	12/7/2007
PR-DO-007	Oversight of Contractor Operations	3/3/2004
PR-DO-019	Packaging of Radioactive Waste	5/4/2005
PR-DO-022	Equipment Inspection	9/12/2005
PR-DO-023	Site Work Control	9/21/2007
MCP-HE-OP-205	Radioactive Material Handling	9/19/2005
PO-QA-001	Hematite Quality Assurance Program Plan	2/14/2008
PO-QA-002	Transportation Quality Assurance Plan	9/22/2005
PR-QA-005	QA Oversight/ Surveillances and Audits	2/14/2008
PR-QA-006	Chain of Custody	10/5/2007
PR-QA-008	Document Control	7/14/2005
PR-QA-009	Records Management	11/3/2005
PO-WM-001	Waste Management and Transportation Plan	9/2/2005
PO-WM-002	Hazardous Material Transportation Security Plan	1/21/2004
PO-WM-003	Investigation-Derived Waste Management Plan	5/21/2004
PR-WM-001	Shipping and Receiving Radioactive Material	8/1/2007
PRWM-004	Investigative Derived Waste Inventory Tracking System	8/31/2004
PR-WM-005	IDWTS Operations and Sampling	9/1/2004
PO-HP-001	Radiation Protection Plan	3/27/2008
PO-HP-002	ALARA Program	2/11/2004
PR-HP-004	High Sample Follow -Up	1/26/2004
PR-HP-005	Tennelec LB5100 Calibration and Operation	3/1/2006
PR-HP-006	Liquid Sample Analysis	11/16/2005
PR-HP-014	Radiation Exposure Monitoring	12/7/2005
PR-HP-015	Health Physics Oversight	4/13/2005
PR-HP-021	Donning and Doffing Radiological Protective Clothing	9/22/2005

Procedure Number and Revision	Title	Approval Date
LVI-HP-003	Radiological Limits	5/6/2005
LVI-HP-005	Personal Protective Equipment	4/14/2005
LVI-HP-010	Personnel and Equipment Decontamination	5/3/2004
LVI-HP-011	Radiological Monitoring	4/3/2008
LVI-HP-012	Health Physics Oversight	5/4/2004
LVI-HP-020	Radiological Posting and Labeling	4/7/2008
LVI-HP-021	Radiation Work Permits	9/27/2004
LVI-HP-024	Contamination Control	5/13/2005
LVI-HP-030	Radiological Instrumentation	9/27/2004
LVI-HP-031	Operation of the Tennelec	9/13/2004
PO-EHS-001	Health and Safety Plan	10/10/2005
PR-EHS-002	Incident Reporting and Investigation	10/10/2005
PR-EHS-004	Stop Work Authority	10/10/2005
PR-EHS-006	IH & IS Equipment Instructions	10/10/2005
PR-EHS-008	Fire Protection	10/10/2005
PR-EHS-009	Personal Protective Equipment	10/10/2005
PR-EHS-011	Bloodborne Pathogens Exposure	1/26/2004
PR-EHS-012	Environmental Health and Safety Oversight	9/23/2005
MCP-HE-HS-200	Respiratory Protection	10/10/2005
MCP-HE-HS-201	Heat Stress Prevention	5/21/2004
MCP-HE-HS-203	Lockout/Tagout	10/1321/2005
MCP-HE-HS-204	Hot Work Plan	10/3/2005
MCP-HE-HS-208	Fall Protection Standard Operating Procedure	2/9/2004
MCP-HE-HS-213	Hearing Conservation	10/10/200510 /3/2005
PR-MCA-001	Material Control and Accounting	5/31/2005
PR-MCA-002	Scale Calibration	5/31/2005
PR-MCA-003	Physical Inventory	7/11/2005
PR-MCA-005	Investigation of SNM Loss or Theft	10/30/2003