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Our ref: HEM-10-97
Date: September 3, 2010

Subject: Submittal of Effluent and Environmental Monitoring Plan
(License No. SNM-00033, Docket No. 070-00036)

Reference: A) Westinghouse (E. K. Hackmann) letter to NRC (Document Control Desk), HEM-10-84, dated August 10, 2010, "Response to Request for Additional Information Concerning Hematite Decommissioning Plan: Chapter 11, Environmental Monitoring Program"

In the Reference A responses to the NRC's requests for additional information concerning Chapter 11 of the Hematite Decommissioning Plan, Westinghouse indicated that the Effluent and Environmental Monitoring Plan (EEMP) would be submitted under separate cover. That Plan is submitted herein.

The EEMP addresses requirements from the NRC and other regulators. Accordingly, not every requirement in the EEMP is based on SNM-33. For example, SNM-33 requires 9 ground water monitoring wells, while the EEMP reflects approximately 40 ground water monitoring wells (including those 9).

Please contact Mark A. Michelsen, Acting Licensing Manager of my staff at 314-810-3376 should you have questions or need any additional information.

Sincerely,

E. Kurt Hackmann
Director, Hematite Decommissioning Project

Attachment: 1) HDP-PO-EM-001, Revision 0, Effluent and Environmental Monitoring Plan

cc: J. J. Hayes, NRC/FSME/DWMEP/DURLD, w/ attachment
J. W. Smetanka, Westinghouse, w/o attachment
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ATTACHMENT 1

Effluent and Environmental Monitoring Plan
HDP-PO-EM-001, Revision 0

Westinghouse Electric Company LLC, Hematite Decommissioning Project

Docket No. 070-00036

Hematite Decommissioning Project

NUMBER: **HDP-PO-EM-001**

TITLE: **Effluent and Environmental Monitoring Plan**

REVISION: **0**

QUALITY-RELATED

REVISION LOG	
Revision No. Effect. Date	**Change(s)**
0 See EDMS Field "Final Approval Date"	This Revision 0 supersedes PO-EM-001, Revision 1, and is a complete re-write. This document has been extensively revised; therefore, sidebars indicating changes have not been utilized. - Divided document into sections corresponding to (1) Effluent Monitoring and Control Program, (2) Environmental Monitoring Program, (3) NPDES Monitoring, (4) ARAR Monitoring, and (5) Incorporated Storm Water Pollution Prevention. - Removed historical trending data, graphs and photos that did not add to the substance of the EEMP. - 8.4.4 and 9.3 address achievable MDCs and isotopic analysis in addition to gross alpha and gross beta radioactivity. - Added Appendix B figures showing planned changes in effluent, environmental, and outfall monitoring locations during the decommissioning. - Ceased ground water sampling at WS-31 since it duplicates monitoring at WS-30. Ceased ground water sampling at WS-29 since this well is planned to be abandoned since it could be a path for leachate to reach ground water. - Reconfigured ground water sampling to focus on usable ground water instead of vadose zone leachate wells or hybrid wells. - Added several ground water monitoring wells to obtain more data. - Added Appendix D for Data Quality Objectives.

Are Quality Records generated? **NO**.

TABLE OF CONTENTS

1.0 PURPOSE

The Westinghouse Hematite Decommissioning Project (HDP) Effluent and Environmental Monitoring Plan (EEMP) provides standards and requirements for monitoring the potential impact to the public and the environment from HDP activities.

2.0 POLICY

Per SNM-33 and the Westinghouse Environment, Health and Safety Manual (References 5.2 and 5.16), Hematite Decommissioning Project activities will be conducted in a manner that meets or exceeds regulatory requirements and minimizes adverse impact to the health and safety of the public, the employees and the environment. Decommissioning activities are to be conducted in accordance with As Low As Reasonably Achievable (ALARA) principles, with air and liquid effluents are minimized in a manner that is consistent with ALARA.

3.0 APPLICABILITY

This EEMP applies to staff personnel and contractors performing HDP work activities. The effluent and environmental monitoring sampling and analysis described in this and on the associated implementing procedures do not restrict the performance of additional effluent and/or environmental sampling and analysis as determined by the Radiation Safety Officer (RSO) or the Environmental, Health and Safety (EH&S) Manager.

4.0 DEFINITIONS/ACRONYMS

4.1 Definitions

4.1.1 Batch Release – Liquid effluents that are retained for treatment and/or analysis and released as a finite volume.

4.1.2 Best Management Practices – Effective, practical structural or nonstructural methods to prevent or reduce the movement of sediments or pollutants from the land to the surface water or ground water.

4.1.3 Composite Sample – A sample volume collected at constant intervals over a specified time period used to represent continuous effluent discharges.

4.1.4 Continuous Monitoring – Measurement of a sample parameter over an uninterrupted time period.

4.1.5 Continuous Release – Effluents that are monitored and released on an uninterrupted basis.

4.1.6 Effluent Limit – Annual average limit for a radionuclide as specified in 10 CFR 20, Appendix B, Table 2.

4.1.7 Engineering Controls – Measures utilizing equipment or machinery designed to reduce or mitigate potential exposure to a hazard or migration of a pollutant.

4.1.8 Environmental Air Sampling – Within the context of this plan, monitoring of airborne radioactivity at fixed locations that were selected as representative of ambient air around the HDP.

4.1.9 Erosion and Sedimentation Controls – Structural or nonstructural measures taken to prevent or reduce the movement of sediments or other pollutants from the land to the surface water or ground water.

4.1.10 Grab Sampling – A single sample or measurement collected over a short time period.

4.1.11 Investigation Level – Concentration observed in an individual sample when, if exceeded, initiates investigation into the cause of the elevated sample result.

4.1.12 Perimeter Sampling – Monitoring of airborne radioactivity with portable sampler(s) positioned downwind of decommissioning work activities.

4.1.13 Process Controls – Measures designed to reduce or mitigate potential exposure to a hazard or migration of a pollutant(s) that do not utilize equipment or machinery, e.g., procedural controls.

4.2 Acronyms

ARARs	Applicable or Relevant and Appropriate Requirements
BMP(s)	Best Management Practice(s)
CEDE	Cumulative Effective Dose Equivalent
CFR	Code of Federal Regulations
DQO	Data Quality Objective
EEMP	Effluent and Environmental Monitoring Plan
IDWTS	Investigation-Derived Waste Treatment System
lpm	liters per minute
MDC	minimum detectable concentration
MDNR	Missouri Department of Natural Resources
NPDES	National Pollutant Discharge Elimination System
POC	Project Oversight Committee
PQP	Project Quality Plan
QA/QC	Quality Assurance / Quality Control
TEDE	total effective dose equivalent
TRU	transuranic
TLD	thermo-luminescent dosimeter
TSS	Total Suspended Solids
VOC	Volatile Organic Compounds
WTS	Wastewater Treatment System

5.0 REFERENCES

5.1 Title 10 Code of Federal Regulations 20, Standards for Protection against Radiation

5.2 SNM-33, U.S. Nuclear Regulatory Commission (NRC), Material License No. SNM -33 for Westinghouse-Hematite

5.3 EPA QA/G-4, Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA/240/B-06/001, U.S. Environmental Protection Agency, February 2006

5.4 NRC Regulatory Guide 8.37, ALARA Levels for Effluents from Materials Facilities

5.5 National Climatic Data Center, Climatic Wind Data for the United States, November 1998.

5.6 Title 10 Code of Federal Regulations 70.59, Effluent Monitoring Reporting Requirements

5.7 HDP-PO-QA-001, Project Quality Plan (PQP)

5.8 MO-0000761, Missouri State Operating Permit under the National Pollutant Discharge Elimination System (NPDES), February 24, 2006

5.9 MO-ARAR013, Missouri Department of Natural Resources Clean Water Commission, Applicable or Relevant and Appropriate Monitoring Requirements, November 7, 2003

5.10 NRC Regulatory Guide 4.16, Monitoring and Reporting Radioactivity in Releases of Radioactive Materials in Liquid and Gaseous Effluents from Nuclear Fuel Processing and Fabrication Plants and Uranium Hexaflouride Production Plants

5.11 EO-06-003, Interim Groundwater Monitoring Plan

5.12 ANSI N545-1975, Performance, Testing, and Procedural Specifications for Thermoluminescence Dosimetry (Environmental Applications)

5.13 HASL-300, 1997, The Procedures Manual of the Environmental Measurements Laboratory, Environmental Measurements Laboratory, U.S. Department of Energy

5.14 ASTM D3972-90, 1990, Standard Test Method for Isotopic Uranium in Water by Radiochemistry, American Society for Testing and Materials

5.15 EPA Method 906.0, 1980, Prescribed Procedures for the Measurement of Radioactivity in Water, EPA600/4-80-032, U.S. Environmental Protection Agency

5.16 Westinghouse Environment, Health and Safety Manual

6.0 RESPONSIBILITIES

6.1 The Project Director is responsible for ensuring adequate monitoring of HDP activities as a demonstration that public and environmental protection responsibilities are integral to the HDP.

6.2 The RSO is responsible for ensuring that required environmental monitoring of radioactivity is performed, records are maintained, and results are reported.

6.3 The EH&S Manager is responsible for:

6.3.1 Ensuring monitoring is conducted in accordance with the EEMP.

6.3.2 Tracking radioactivity results and reporting chemical results as part of the overall EEMP.

6.3.3 Notifying the RSO and the Project Director when sample results indicate elevated conditions.

6.3.4 Ensuring the requirements for Best Management Practices (BMPs) for storm water are implemented.

6.4 Health Physics Technicians are responsible for collecting, analyzing, and documenting monitoring samples.

6.5 Remediation Work Supervision is responsible for applying the appropriate BMP to a specific work area involving the potential for causing soil or sediment migration.

7.0 GENERAL

The Hematite Decommissioning Project is a former nuclear fuel fabrication facility currently undergoing decommissioning. In 2001 the Hematite facility ceased operations after approximately 35 years and initiated the decommissioning process. The facility continues to monitor air and liquid effluents and environmental impacts resulting from historical operations and decommissioning activities pursuant to requirements of 10 CFR 20 (Reference 5.1), 10 CFR 70.59 (Reference 5.6), and SNM-33 (Reference 5.2). In addition, NRC Regulatory Guide 4.16 (Reference 5.10) is used to guide the monitoring. Remaining decommissioning activities at the site are expected to include continued site characterization, building demolition, soil excavation, waste handling, and final status surveys.

This Effluent and Environmental Monitoring Plan is structured to support the remaining decommissioning activities and is divided into five primary sections: (1) Radiological Effluent Control and Monitoring Program, (2) Environmental Monitoring Program, (3) National Pollutant Discharge Elimination System (NPDES) Monitoring, (4) Applicable or Relevant and Appropriate Requirements (ARARs) Monitoring, and (5) Storm Water Pollution Prevention. Tables 1 and 2 contain a summary of these monitoring requirements. Appendix D contains Data Quality Objectives for effluent and environmental monitoring.

Appendix A contains a detailed listing of sample identification, locations, reference documents (if any) being met by that sample, frequency, and analysis parameters. Sample identifications and locations no longer used are shown by strikeout to aid in future understanding of the past. Planned sample identifications and locations to be used during active decommissioning work are included for ease of transition in the future.

8.0 RADIOLOGICAL EFFLUENT CONTROL AND MONITORING PROGRAM

8.1 Purpose

The purpose of the Radiological Effluent Control and Monitoring Program is to evaluate the effectiveness of the operational controls so that effluent levels are maintained ALARA and within applicable standards. This program is designed to

comply with the regulatory requirements of 10 CFR 20, Appendix B, Table 2, Columns 1 and 2; and to protect workers, members of the general public, and the environment from unnecessary exposure to ionizing radiation during decommissioning activities.

8.2 Effluent ALARA Program and Commitment

HDP activities will be conducted in a manner that minimizes adverse impact to the health and safety of the public, the employees and the environment. Consistent with Regulatory Guide 8.37, "ALARA Levels for Effluents from Materials Facilities" (Reference 5.4), every reasonable effort will be made to ensure that decommissioning activities are conducted in accordance with ALARA principles, and that the concentrations in air and liquid effluents are minimized in a manner that is consistent with ALARA.

The primary method for minimizing radioactivity in airborne effluents is based on controlling the generation of dust containing airborne radioactivity during contaminated soil movement and excavation. The primary method for minimizing radioactivity in liquid effluents is based first on minimizing the amount of water that may become contaminated from contact with contaminated soil and material being remediated, and secondly by processing impacted water to remove the radioactivity to the extent practical.

Consistent with Reference 5.4, the numerical ALARA goals for air and liquid effluent concentrations have been initially established at 20 percent of the applicable values in 10 CFR 20, Appendix B, Table 2, Columns 1 and 2, respectively. The results of monitoring are compared to the regulatory limits, investigation levels, and the ALARA goals. The ALARA goals may be adjusted periodically so as to be within the range of the actual monitoring results, and at the same time present a reasonable challenge to continuously strive to reduce effluent concentrations.

To supplement the retrospective review of efforts to minimize radioactivity in effluents from the ALARA perspective, an investigation level for individual air and liquid effluent samples has been established at 50 percent of the applicable values in 10 CFR 20, Appendix B. This investigation level serves as a near real-time indicator of the potential for a trend that could jeopardize the ALARA goal if not addressed in a timely manner. If an individual effluent sample result exceeds this investigation level, the RSO will be notified and a review of the associated decommissioning activity(s) will be conducted. The review will assess conditions such as the source of contamination, the work practices and equipment being used, and/or mitigation measures. Changes to work methods and/or engineering controls will be implemented, as appropriate, to reduce effluent concentrations to levels that are ALARA.

The review shall also evaluate whether the isotopic mixture may differ from that previously understood, thus warranting isotopic analysis. Considerations to determine that a change in isotopic mixture may have occurred include isotopic results of soil or other media associated with the origin of the sample.

The effluent limits, ALARA goals, and investigation levels are summarized in Table 1, Effluent Monitoring Program.

8.3 Identification of Effluent Sources

The effluent sources that can potentially transfer radioactive material from the facility to the environment are discussed below. The analytical methods and parameters for these samples are indicated in Table 1, Effluent Monitoring Program.

8.3.1 Airborne Sources

During remediation activities, contaminated soil, sediment and dust from building demolition could become airborne in the form of particulates. Effluents from this airborne pathway are sampled at downwind locations near the perimeter of the work area by portable sampler(s), and supplemented by the fixed location samplers illustrated on Figure 1, Existing Sampling Locations for Air, Surface Water, and Sediment. Sampling for these types of releases is described in Section 8.4.1. From on-site meteorological data, prevailing winds on-site are generally from the south-southwest or from north-northeast (essentially parallel to State Road P and the adjacent hill). Per Reference 5.5, the average wind speed is 4.3 m/sec.

8.3.2 Sanitary Wastewater

Sanitary wastewaters flow to the site sanitary system from sinks, toilets, showers and drinking fountains. Historically, this system received process wastewater, laundry water, and wastewater from laboratory sinks. The system includes an extended aeration sewage treatment process in which sanitary sewer effluents are discharged to a tank where they are treated with chlorine and sodium sulfite (for dechlorination) before discharge into the Site Creek immediately below the Site Pond dam. Effluents from this water pathway are sampled at locations illustrated on Figure 1, Existing Sampling Locations for Air, Surface Water, and Sediment, at location SFW-A (sample ID: WS-18).

8.3.3 Storm Water

Storm water runoff from the parking lot and building roof drains flows to the north end of the site pond. The sampling location at the discharge from the site pond is illustrated on Figure 1, Existing Sampling Locations for Air, Surface Water, and Sediment, at location SFW-B (sample ID: WS-19). Other site storm water discharges are not considered part of the Effluent Monitoring and Control Program and are authorized under the HDP site NPDES permit (see Section 10).

8.3.4 Water Treatment System

A Wastewater Treatment System (WTS) is installed for treating water (ground water and storm water) collected during excavation and other decommissioning activities that generate wastewater. The effluent may either be released on a batch or continuous basis provided that current

operational knowledge of the system operation meets the effluent discharge limits. The sample collection and analysis frequency for this location is (1) for batch release, prior to the release of each batch, and (2) for continuous release, continuously composited and analyzed weekly. Effluent samples from this pathway are obtained after treatment; this sample location is denoted as SFW-A2 on Figure 1, Existing Sampling Locations for Air, Surface Water, and Sediment, for sample ID WS-55.

An Investigative-Derived Waste Treatment System (IDWTS) may be used for treating smaller volumes of water. The effluent is released on a batch basis. The sample collection and analysis frequency for this location is prior to the release of each batch. Effluent samples from this pathway are obtained after treatment from an effluent retention tank; this sample location is denoted as SFW-A1 on Figure 1, Existing Sampling Locations for Air, Surface Water, and Sediment, for sample ID WS-54.

8.4 Effluent Monitoring Program

8.4.1 Air Effluent Sampling

A measurable amount of airborne radioactivity may be created during decommissioning activities such as building demolition, soil excavation, and waste handling. The concentration of airborne radioactivity for a specific work activity shall be estimated prior to the start of the work. In developing the estimate, personnel may consider results from similar previous work, the fraction of contamination that may become airborne, and conservative assumptions about unknown conditions.

Perimeter Sampling of air effluents shall be performed using low-volume portable sampling pumps when work activities involve the potential to generate, at the perimeter of the work activities, airborne radioactivity concentrations in excess of 20 percent of the annual limits specified in 10 CFR 20, Appendix B, Table 2, Column 1.

The number and location(s) of portable perimeter air sampler(s) should be selected at a downwind location near the perimeter of the work area, with consideration for the location and nature of the work activities and environmental conditions such as wind direction. (Independent of the portable perimeter air sampling, occupational air concentrations within the work area will be measured using personal air sampling pumps or additional low-volume portable sampling pumps in accordance with radiation protection procedures.)

In addition to portable perimeter samplers, fixed location air samplers are positioned at fixed locations near the edge of the Central Tract Area to support the Environmental Monitoring Program, as discussed in Section 9.2. The ALARA goals, investigation levels, and regulatory limits in Table 1, Effluent Monitoring Program, for airborne effluents will also be applied to these fixed monitoring locations.

8.4.2 Liquid Effluent Sampling

The type on analysis, frequency of collection, sampling locations, ALARA goals, investigation levels, and regulatory limits that apply to the Effluent Control and Monitoring Program are provided in Table 1, Effluent Monitoring Program. The sampling locations for liquid effluents are illustrated on Figure 1, Existing Sampling Locations for Air, Surface Water, and Sediment.

8.4.3 Analysis of Air Effluent Samples

Effluent air samples shall be analyzed for gross alpha radioactivity and gross beta radioactivity. The radionuclides assumed to be present in gross alpha and beta radioactivity are uranium (Class Y) and Th-234, respectively. The analysis for samples from portable perimeter air samplers are discussed in this section; the analysis for samples from samples from fixed location air samplers are discussed in Section 9.3.

The Minimum Detectable Concentration (MDC) target for gross alpha analysis of perimeter air samples is established at 50 percent of the applicable 10 CFR 20 Appendix B, Table 2, Column 1 limits[1] (with a target goal of 20 percent where practical). The MDC target for gross beta analysis of air effluents is established at 5 percent of the applicable 10 CFR 20 Appendix B, Table 2, Column 1 limits.

The review of effluent air sample results shall include consideration of whether the isotopic mixture may differ from that previously understood, thus warranting isotopic analysis. Considerations to determine that a change in isotopic mixture may have occurred include isotopic results of soil or other media associated with the origin of the sample.

Isotopic analysis of perimeter air samples shall be performed when investigation levels in Table 1, Effluent Monitoring Program, are exceeded. The methods of isotopic analysis for uranium and Tc-99 are based on DOE EML A-01-R and DOE TC-02-RC (Reference 5.13), respectively, or equivalent. The MDC target for isotopic analysis for uranium in perimeter air samples is established at 20 percent of the applicable 10 CFR 20 Appendix B, Table 2, Column 1 limits. The MDC target for isotopic analysis of Tc-99 in perimeter air samples is established at 5 percent of the applicable 10 CFR 20 Appendix B, Table 2, Column 1 limits.

[1]The volume of air that can be sampled on a daily basis limits the MDC that can be achieved for alpha radioactivity within a reasonable counting time. To achieve an MDC for gross alpha radioactivity at 2.5E-15 μCi/ml would require a 10-hour count time for the sample and 10-hour count time for background radioactivity. Thus, the MDC for samples collected on a daily frequency is set at the ALARA Investigation Limit of 50 percent of the license limit, instead of 5 percent as recommended by Regulatory Guide 4.16.

8.4.4 Analysis of Liquid Effluent Samples

Liquid effluent samples shall be analyzed for gross alpha radioactivity and gross beta radioactivity. The review of effluent air sample results shall include consideration of whether the isotopic mixture may differ from that previously understood, thus warranting isotopic analysis. Considerations to determine that a change in isotopic mixture may have occurred include isotopic results of soil or other media associated with the origin of the sample.

Consistent with Reference 5.10, isotopic analysis of effluent water samples shall be performed when radioactivity concentrations are in excess of 10 percent of the annual limits specified in 10 CFR 20, Appendix B, Table 2, Column 2. The methods of isotopic analysis for uranium and Tc-99 in liquids are based on ASTM 3972-90M and USEPA 906.0M (References 5.14 and 5.15), respectively, or equivalent.

Where batch processing is used, the concentration in liquid effluent will be controlled by an evaluation of laboratory results to determine suitability for release, or by process knowledge and retrospective confirmation of the concentrations based on subsequent laboratory analysis. Process knowledge will be based on the liquid being consistent in terms of source (e.g., same location) and method of generation (e.g., precipitation) as a liquid where previous sample results are known.

Consistent with Reference 5.10, the MDC target for laboratory analysis of gross beta and gross alpha analysis of liquid effluents is established at 5 percent of the applicable 10 CFR 20 Appendix B, Table 2, Column 2 limits. For on-site analysis using a proportional counting system, the MDC target is 25 percent of the applicable 10 CFR 20 Appendix B, Table 2, Column 2 limits. The MDC targets for laboratory analysis of isotopic uranium and Tc-99 in liquid samples are 1.0 pCi/L and 3.0 pCi/L, respectively.

8.5 ALARA Measures to Reduce Air and Liquid Effluent Concentrations

Process and engineering controls shall be implemented based on the specific work activity planned and its potential for increasing occupational exposure and/or effluent concentrations. Effluent controls for various decommissioning activities will be incorporated into written procedures or work instructions/work plans for the subject activity. Examples of effluent control measures are expected to be dust prevention, dust suppression, surface water diversion, erosion control, and water treatment.

Techniques to control or reduce fugitive dusts typically include (1) decontamination or deconstruction measures designed to minimize dust generation, and (2) localized water spray to suppress dust and reduce particulate transport by wind.

Erosion and sedimentation controls are to be utilized for work activities impacting site soils and may be temporary or permanent. Both temporary and permanent erosion and sediment controls are designed to protect nearby surface water from

sediments and other potential contaminants. These controls will be specified based on best management practices. Typical measures for soil erosion and sedimentation control include, but are not limited to, use of filter fabric (silt fence), erosion control blankets, barriers and/or channels to direct flows, check dams in swales to reduce sediment transport, retention/detention ponds to allow sediments to settle, and seeding and mulch for stabilization of soils after work activities are completed.

The systems used to collect water treat water prior to discharge incorporate particulate filters to remove particulate matter, and/or activated carbon. In addition, the Water Treatment System uses ion exchange media.

8.6 Review and Reports

The HDP site Effluent Monitoring Program applies the effluent ALARA goals, investigation levels, regulatory levels to air and liquid samples as shown in Table 1, Effluent Monitoring Program. On a near real-time basis, individual samples are compared to investigation levels. If an investigation level is exceeded, then the RSO shall be notified and a review of the associated decommissioning activity(s) will be conducted. The review will assess remedial actions, the source of contamination, the potential for contamination to become airborne or reach liquid effluents, the equipment being used, and control, treatment, and/or mitigation measures. Changes to work methods and/or engineering controls will be implemented, as appropriate, to reduce effluent concentrations to ALARA levels.

Per SNM-33 (Reference 5.2), a semi-annual RSO report to the Project Director shall include effluent release data. The report shall identify trends in the reported data to reveal:

- Areas where exposures and releases can be lowered consistent with ALARA.
- Potential problems involving effluent releases or equipment for measuring effluents and exposures.

As required by 10 CFR 70.59, HDP will submit to NRC, on a semi-annual basis, a report on the results of effluent sample analyses.

Per SNM-33 (Reference 5.2), the annual RSO report to the POC shall include site effluent data. This annual review will cover the content and implementation of the effluent ALARA program and will include:

- An analysis of trends in release concentrations, environmental monitoring data, and radionuclides handled.
- A determination of whether HDP operational changes are needed to achieve the ALARA effluent goals.
- An evaluation of all designs and mitigation methods for modifications.
- Recommendations for changes in facilities, procedures, or work processes that are necessary to achieve ALARA goals.

8.7 Quality Assurance

Chapter 13 of the Decommissioning Plan addresses general quality assurance requirements for activities conducted at the HDP site. Surveillances and audits of EEMP programs are conducted to verify compliance with 10 CFR 20 requirements as they relate to effluent monitoring and control. As a minimum, an annual audit of the EEMP is conducted at the HDP site.

Effluent samples are collected and analyzed in accordance with site procedures that address applicable sample chain of custody, handling, storage and analysis requirements as outlined in the HDP Project Quality Plan (PQP) (Reference 5.7). These procedures contain the appropriate level of detail to ensure that handling, storage, and analysis requirements are conducted in accordance with the HDP PQP. Environmental samples that are shipped to vendor laboratories for analysis are handled in accordance with the quality assurance and quality control (QA/QC) programs for the individual laboratory. QA/QC programs for vendor laboratories are reviewed and validated by the HDP quality assurance organization.

8.8 Program Revision Criteria

Revisions to the Effluent Control and Monitoring Program contained in this document may be made without prior NRC approval for the following conditions, provided POC approval is obtained:

- Adequate justification is provided to discontinue sampling an effluent discharge location, or
- Adequate justification is provided to relocate an effluent monitoring location (e.g., remediation must occur at the original location and effluent flow path is altered), and
- Adequate justification is provided that the change does not otherwise necessitate a change to the license application.

The following are examples of changes that *require* prior NRC approval:

- Ceasing effluent monitoring of a specific location listed in SNM-33 without evaluation to ensure that the potential for effluent from this pathway no longer exists;
- Collecting samples less often than specified in SNM-33.

Appendices A and B contain the planned effluent monitoring locations during active decommissioning work.

9.0 ENVIRONMENTAL MONITORING PROGRAM

9.1 Purpose

The purpose of the HDP Environmental Monitoring Program is to provide the means for assessing the effects of decommissioning activities on the public and on the environment. This Environmental Monitoring Program provides a basis for monitoring the long term environmental trends resulting from historical operations and decommissioning activities. As decommissioning progresses

specific sampling locations may be rendered unavailable; Section 9.6 provides an evaluation basis for choosing alternate sampling locations.

9.2 Environmental Sampling

This section describes the specific environmental samples collected pursuant to the HDP site Environmental Monitoring Program. Air particulate, soil, sediment, vegetation, ground water, and surface water monitoring shall be conducted as indicated in Table 2, Environmental Monitoring Program. In addition to sampling of environmental media, monitoring of external exposure to radiation using thermo-luminescent dosimeters (TLDs) is also performed to ensure compliance with 10 CFR 20.1301. Figures 1, 2, and 3 include the environmental monitoring locations. Specific effluent sources that can potentially transfer radioactive material from the facility to the environment are discussed in Section 8.3.

Table 2, Environmental Monitoring Program, represents the minimum number of required samples to be collected; additional or more frequent samples may be taken as required for special studies and evaluations as deemed necessary by the EH&S Manager or the RSO. Table 2, Environmental Monitoring Program, also lists the minimum required sample analyses for the sample media; additional or more detailed analysis may also be performed at the discretion of the EH&S Manager or the RSO.

9.2.1 Environmental Air Sampling

Four fixed-position air samplers are strategically placed around the Central Tract as shown in Figure 1, Existing Sampling Locations for Air, Surface Water, and Sediment. These locations were selected to provide radial symmetry around the facility taking into account the natural terrain features and building locations. These air samplers also serve to provide supplemental information to the Effluent Monitoring Program.

Samples shall be collected and analyzed as shown in Table 2, Environmental Monitoring Program. In order to meet the MDC targets, long sample collection times are required to draw a large volume of air through the filters of these environmental air samplers. An elapsed time between collection and analysis is preferred to allow for the decay of radon progeny. Screening analysis of a sample may be done before allowing for radon decay for the final analysis.

Collection of background air sample(s) may be used to provide useful information regarding radioactivity concentrations in air at a location that is unaffected by decommissioning activities. While not required by regulations, a background air sample (identified as "AS-E" on Figure 1, Existing Sampling Locations for Air, Surface Water, and Sediment) is also collected.

9.2.2 Environmental Surface Water Sampling

Surface water samples shall be collected from seven site locations as specified in Table 2, Environmental Monitoring Program. Figure 1, Existing

Sampling Locations for Air, Surface Water, and Sediment, shows the locations of the seven sample points.

9.2.3 Environmental Sediment Sampling

A grab sediment sample from the confluence of the Site Creek and Joachim Creek shall be collected and analyzed as shown in Table 2, Environmental Monitoring Program. Figure 1, Existing Sampling Locations for Air, Surface Water, and Sediment, shows collection location SD-H for this sample (sample ID: SS-17).

9.2.4 Environmental Ground Water Sampling

Ground water sampling within the Environmental Monitoring Program at the HDP site shall consist of sampling of monitoring wells for environmental radioactivity at an off-site well, on-site well, three locations downgradient of the Process Buildings, three locations downgradient of the evaporation pond, and three locations downgradient of the burial pit area. Figure 3, Existing Sampling Locations for Ground Water, identifies these minimum monitoring locations and other locations based on the Interim Ground Water Monitoring Plan (IGMP) (Reference 5.11) that are being monitored; not all IGMP locations are included in the EEMP.

These wells are grouped into three categories: wells that access leachate that is not usable (water in the vadose zone), wells that access ground water that is usable (true ground water below the vadose zone), and hybrid wells that access a mixture of usable ground water and vadose zone leachate. Figure 3, Existing Sampling Locations for Ground Water, also identifies those wells that will be monitored until they require removal due to interference with remediation work. Table 2, Environmental Monitoring Program, provides the ground water sample collection frequency and analyses requirements. Appendix C provides a diagram of a typical ground water monitoring well.

Although not required by SNM-33, sampling for volatile organic compounds (VOCs) generally occurs in conjunction with ground water sampling events.

9.2.5 Environmental Soil Sampling

Soil sampling within the Environmental Monitoring Program at the HDP site shall consist of four grab soil samples collected and analyzed as shown in Table 2, Environmental Monitoring Program. Figure 2, Existing Sampling Locations for Soil, Vegetation, and TLDs, shows the locations for such sample points.

9.2.6 Environmental Vegetation Sampling

Vegetation samples from four locations shall be collected and analyzed as shown in Table 2, Environmental Monitoring Program, and shown on Figure 2, Existing Sampling Locations for Soil, Vegetation, and TLDs. Vegetation samples provide data regarding atmospheric deposition and to a lesser extent biological uptake from the soil and water.

9.2.7 Environmental External Exposure

The monitoring of external exposure at the HDP site pursuant to 10 CFR 20.1301 is performed using TLDs placed at locations at the edge of the Central Tract as shown in Figure 2, Existing Sampling Locations for Soil, Vegetation, and TLDs. While not required by regulations, a background environmental dosimeter (identified as "TLD-G" on Figure 2, Existing Sampling Locations for Soil, Vegetation, and TLDs) is also utilized for the site. The TLDs shall contain two calcium-fluoride elements and two lithium-fluoride elements, or equivalent, and be designed to withstand weather conditions. ANSI Standard N545-1975 (Reference 5.12) may be referenced when establishing performance requirements for environmental dosimetry.

These TLDs are collected and analyzed quarterly to measure the integrated gamma dose for each location. External dose exceeding 10 mrem per quarter, after subtracting background radiation results, shall be investigated to determine the cause; any potential mitigation measures shall be approved by the RSO.

9.3 Environmental Sample Analysis

Fixed location air samples shall be analyzed for gross alpha radioactivity and gross beta radioactivity. Consistent with Reference 5.10, additional analysis should be performed based on direction from the RSO in consideration of whether the radionuclide composition of potential effluents is known and whether the fixed location air samples exceed 10 percent of regulatory limits in Table 1, Effluent Monitoring Program.

For air samples, the methods of isotopic analysis for uranium and Tc-99 are DOE EML A-01-R and DOE TC-02-RC, respectively, or equivalent.

Water samples (surface or ground) shall be analyzed for gross alpha radioactivity and gross beta radioactivity. Consistent with Reference 5.10, additional isotopic analysis should be performed based on direction from the RSO in consideration of whether the radionuclide composition of potential effluents is known and whether a sample exceed 10 percent of the regulatory limits in Table 1, Effluent Monitoring Program. The methods of isotopic analysis for uranium and Tc-99 in liquids are ASTM 3972-90M and USEPA 906.0M, respectively, or equivalent.

The MDC target for gross beta and gross alpha analysis of fixed location air samples and liquid environmental samples are established at 5 percent of the applicable 10 CFR 20 Appendix B, Table 2, Column 2 limit (Reference 5.10), except that liquid samples undergoing on-site analysis using a proportional counting system have an MDC target of 25 percent of this limit. The MDC target for laboratory analysis of liquid samples for isotopic uranium and Tc-99 are 1.0 pCi/L and 3.0 pCi/L, respectively. The MDC target for laboratory analysis of fixed location air samples for isotopic uranium and Tc-99 is 5 percent of the applicable 10 CFR 20 Appendix B, Table 2, Column 2 limit (Reference 5.10).

9.4 Quality Assurance

Chapter 13 of the Decommissioning Plan addresses general quality assurance requirements for activities conducted at the HDP site. Surveillances and audits of the Environmental Monitoring Program are periodically conducted to verify compliance with 10 CFR 20 requirements as they relate to environmental monitoring. As a minimum, an annual audit of the Environmental Monitoring Program is conducted at the HDP site.

Effluent samples are collected and analyzed in accordance with site procedures that address applicable sample chain of custody, handling, storage and analysis requirements as outlined in the HDP PQP. These procedures contain the appropriate level of detail to ensure that handling, storage, and analysis requirements are conducted in accordance with the HDP PQP. Environmental samples that are shipped to vendor laboratories for analysis are handled in accordance with the quality assurance and quality control (QA/QC) programs for the individual laboratory. QA/QC programs for vendor laboratories are reviewed and validated by the HDP quality assurance organization.

9.5 Review and Reports

The quarterly environmental monitoring results shall be reviewed for trends using the Mann-Kendall test, or equivalent. The Mann-Kendall test is a non-parametric test and, as such, is not dependent upon assumptions of distribution, missing data, or irregularly-spaced monitoring periods. In addition, data reported as being less than the detection limit (DL) can be used. The test can assess whether a time-ordered dataset exhibits an increasing or decreasing trend, within a predetermined level of significance. While the Mann-Kendall test can use as few as four data points, often this is not enough data to detect a trend.

If an adverse trend is identified in the sampling data, the EH&S Manager and RSO shall be notified and a review of the associated decommissioning activity(s) will be conducted. The review should assess remedial actions, the source of contamination, the potential for contamination to become airborne or reach liquid effluents, the equipment being used, and control, treatment, and/or mitigation measures. Changes to work methods and/or engineering controls should be implemented, as appropriate, to reduce effluent concentrations to ALARA levels.

9.6 Revision Criteria

Revisions to the Environmental Control and Monitoring Program contained in this document may be made without prior NRC approval for the following conditions, provided POC approval is obtained:

- Adequate justification is provided to discontinue sampling at an environmental monitoring location, or
- Adequate justification is provided to relocate an environmental monitoring location, and
- Adequate justification is provided that the change does not otherwise necessitate a change to the license application.

The following are examples of changes that *require* prior NRC approval:

- Ceasing environmental monitoring of any location listed in SNM-33 without specifying a replacement location as described above.
- Decreasing the frequency of collecting samples specified in SNM-33.

Appendices A and B contain the planned environmental monitoring locations during active decommissioning work. (NRC and/or MDNR approval will be obtained for these planned locations where required) Figure 3, Existing Sampling Locations for Ground Water, already reflects groundwater monitoring locations applicable during remediation.

10.0 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) MONITORING

Per the Federal Water Pollution Control Act, the authority granted to the State of Missouri, and the Missouri Clean Water Law, the Missouri Department of Natural Resources (MDNR) issued NPDES State Operating Permit No. MO-0000761 (Reference 5.8) to Westinghouse Electric Co. for discharges from the HDP site.

10.1 Permit Requirements

The HDP site NPDES permit requires that Outfalls #001 through #006 and the Hematite Post Office water supply well be monitored for gross alpha radiation, gross beta radiation, and water chemistry parameters as shown in Table 3, Summary of NPDES Sampling Requirements. Samples and measurements shall be representative of the nature and volume, respectively, of the monitored discharge. All outfall samples shall be taken at the outfall locations before the effluent joins or is diluted by any body of water or substance, unless specified otherwise in the site NPDES permit. Oral notification and written notification (unless waived by MDNR) of failure to comply with the daily maximum limits shall be made to MDNR within 24 hours and 5 days, respectively, of becoming aware of the non-compliance. The notification shall describe the violation, its cause, the time period, and steps taken to prevent recurrence.

10.2 Description of Outfalls

Six outfalls have been identified for sampling under NPDES permit number MO-0000761. Outfalls #001 - #003 are long-term sampling points and Outfalls #004 - #006 have been added to support planned decommissioning activities. In addition to treated wastewater discharges, these outfalls include locations from which point-source discharges of site runoff could occur. Figure 1 shows the location of each of the outfalls. All outfalls shall be visibly marked in the field. The following is a description of these outfalls:

Number	Description
Outfall #001 (Location SFW-A)	Discharge from the site Sanitary Wastewater Treatment Plant to the Site Creek downstream of the Site Pond. The WTS and IDWTS discharge to the same piping, after the flow totalizer for the Sanitary Wastewater Treatment Plant. Per NPDES permit requirements, discharges from the WTS and IDWTS shall not be in progress during sampling of Outfall #001.
Outfall #002 (Location SFW-B)	Discharge from the Site Pond to the Site Creek.
Outfall #003 (Location SFW-C)	Discharge to the Site Pond from the Water Treatment System and site storm drains, including storm water runoff from the parking lot and building roofs.
Outfall #004 (Location SFW-D)	Discharge from the east culvert, which collects runoff from paved and unpaved areas east of Building 260 and conveys it to the Northeast Site Creek.
Outfall #005 (Location SFW-E)	Discharge from paved and unpaved areas southwest of the main buildings to a drainage north of the Union Pacific railroad tracks which coveys it to the Site Creek.
Outfall #006 (Location SFW-F)	Outfall is within the Northeast Site Creek, which collects non-point-source runoff from paved and unpaved areas on the eastern side of the HDP.

10.3 Reporting

A summary of the monitoring data required by Table 3, Summary of NPDES Sampling Requirements, shall be submitted to the MNDR on a quarterly basis in accordance with the following schedule:

- April 28th for the months of January through March,
- July 28th for the months of April through June,
- October 28th for the months of July through September, and
- January 28th for the months of October through December.

For each measurement or sample taken, the following data shall be recorded:

- Date, exact place, and time of sampling or measurement,
- Individual(s) who performed the sampling or measurement,
- Date(s) analyses were performed,
- Individual(s) who performed the analysis,
- Analytical techniques or methods used, and
- Analytical results.

If the measurement is performed more frequently than required by the permit using the analysis methods specified by the permit, the results of such monitoring shall be included in the results calculation and reporting of the values required in the Monitoring Report form. Such increased frequency shall also be indicated. If

there is no discharge for a given outfall for the report period, the outfall will be reported as "no discharge", or equivalent.

The reports shall refer to the State Operating Permit number (MO-0000761) and the facility name (Westinghouse Electric Co. LLC) and shall be signed and submitted to the St. Louis Regional Office at the address below:

Missouri Department of Natural Resources
St. Louis Regional Office
7545 S. Lindbergh, Suite 210
St. Louis, MO 63125

10.4 Records

A record of all monitoring information, including all calibration and maintenance records, copies of all reports required by the State Operating Permit and records of all data used to complete the application for the permit shall be retained for a period of at least (3) three years from the date of the sample, measurement, report or application. This period may be extended by request of the MDNR at any time.

10.5 Revision Criteria

Revisions to the NPDES portion of this EEMP may be made, provided they do not alter those requirements specified in the NPDES permit (Reference 5.8). Revisions to the NPDES permit itself shall be approved by MDNR. It is expected that NPDES permitted discharges at the HDP site will change as a result of equipment (piping) removal and completion of decommissioning work activities.

Figure B-1, Planned Sampling Locations for Air, Surface Water, and Sediment, in Appendix B contains the planned NPDES outfall locations that will be utilized upon approval of the Decommissioning Plan.

11.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARAR) MONITORING

The MDNR's Clean Water Commission issued an ARAR determination for the HDP site to address liquid waste treatment and discharge monitoring during site investigation activities (Reference 5.9). The IDWTS or WTS are utilized to treat liquid wastes with the resulting effluent meeting the Reference 5.9 ARAR standards.

11.1 Permit Requirements

Borehole and excavation water shall be treated through two carbon filtration units. The treated water may be discharged to either Outfall #001 or other discharge point of HDP's choosing. Table 4, Summary of ARAR-Based Sampling Requirements, contains the effluent limits and monitoring requirements. Oral notification and written notification (unless waived by MDNR) of failure to comply with these daily maximum limits shall be made to MDNR within 24 hours and 5 days, respectively, of becoming aware of the non-compliance. The notification shall describe the violation, its cause, the time period, and steps taken to prevent recurrence.

11.2 Periodic Reporting

A summary of the monitoring data required by Table 4, Summary of ARAR-Based Sampling Requirements, shall be submitted to the MDNR on a monthly basis when ARAR-based discharges occur. The report shall be issued by the 28th of the month following the month of the discharge(s).

For each measurement or sample taken, the following information shall be recorded:

- Date, exact place, and time of sampling or measurement,
- Individual(s) who performed the sampling or measurement,
- Date(s) analyses were performed,
- Individual(s) who performed the analysis,
- Analytical techniques or methods used, and
- Analytical results.

If the measurement is performed more frequently than required by the permit using the analysis methods specified by the permit, the results of such monitoring shall be included in the results calculation and reporting of the values required in the Monitoring Report form. Such increased frequency shall also be indicated. If there is no discharge for the report period, the system/outfall will be reported as "no discharge", or equivalent

The reports shall be submitted to the appropriate MDNR regional office and to the Division of Geology and Land Survey, PO Box 250, Rolla, MO, 65401.

11.3 Records

A record of all monitoring information, including all calibration and maintenance records and strip chart recordings, copies of all reports required by this ARAR determination, and records of all data used to complete the application for the permit shall be retained for a period of at least (3) three years from the date of the sample, measurement, report or application. This period may be extended by request of MDNR at any time.

Revisions to the ARAR portion of this EEMP may be made with the exception of those requirements specified in the ARAR determination. Revisions to the ARAR determination itself shall be approved by MDNR.

12.0 STORM WATER POLLUTION PREVENTION

In accordance with the requirements of the State of Missouri General Land Disturbance Permit, HDP will employ temporary controls to manage the flow of storm water associated with precipitation events. These controls are collectively referred to as Best Management Practices (BMPs). A Storm Water Pollution Prevention Plan has been developed that lists the BMPs available for use at the HDP.

12.1 Storm water BMPs shall be installed to prevent the migration of site soil and sediment to waterways traversing the site, including the Northeast Site Creek, Site Creek, and Joachim Creek. A Subject Matter Expert for BMPs will approve the specific application of a BMP. Examples include:

- Earthen berms to keep surface water from entering impacted areas.
- Coverings/tarps to keep precipitation from soil stockpiles.
- Sumps within excavation areas during remediation.
- A French drain from the railroad loading area to a collection pond.
- Temporary Storage Tanks (Baker Tanks) within/near excavation areas.

12.2 The EH&S Manager or designee shall maintain a listing of installed BMPs for active and non-active work areas. The listing shall be updated at the time of installation or removal of BMPs for a work location or on a minimum monthly basis while remediation is in progress.

12.3 The EH&S Manager or designee shall inspect installed BMPs in active work areas weekly or within 72 hours after a significant precipitation event. The inspection shall assess the effectiveness of the BMP and any corrective actions required to maintain the BMP.

12.4 The EH&S Manager shall determine who is a Subject Matter Expert regarding the design, installation, and evaluation of BMPs installed to support the site remediation. Designation of personnel to be a Subject Matter Expert, to maintain the BMP listing, or to perform BMP inspections shall be documented in a memorandum summarizing the individual(s) qualification and training in regards to storm water control.

13.0 FORMS

None.

14.0 APPENDICES

Appendix A: Summary of Effluent and Environmental Monitoring Locations

Appendix B: Figures of Planned Effluent and Environmental Monitoring Locations

Appendix C: Typical Ground Water Monitoring Well

Appendix D: Data Quality Objectives

TABLE 1
EFFLUENT MONITORING PROGRAM

Sample Medium	Sampling Points (Sample ID)	Collection Frequency	Sample Type	Type of Analysis[a]	Annual Average ALARA Goal[b] (μCi/ml)	Investigation Level[c] (μCi/ml)	Regulatory Limit[b] (μCi/ml)
Air Effluent	Perimeter (Portable) – Locations as described in Section 8.4.1	Continuous: Analyze Daily during operation	Particulate	Gross Alpha	1.0E-14	2.5E-14	5.0E-14
				Gross Beta	4.0E-11	1.0E-10	2.0E-10
	Four (4) Fixed Locations around the HDP (AS-A, AS-B, AS-C, AS-D)[f]	Continuous and Analyze Weekly	Particulate	Gross Alpha	1.0E-14	2.5E-14	5.0E-14
				Gross Beta	4.0E-11	1.0E-10	2.0E-10
Liquid Effluent	Site Dam (Sample WS-19 at Outfall #002, Location SFW-B)	Continuous: Analyze Weekly	Composite	Gross Alpha	6.0E-8	1.5E-7	3.0E-7
				Gross Beta	1.0E-6	2.5E-6	5.0E-6
	Sanitary Wastewater Treatment Plant Discharge (Sample WS-18 at Outfall #001, Location SFW-A)	Weekly	Grab, but planned to be replaced with a composite sampler	Gross Alpha	6.0E-8	1.5E-7	3.0E-7
				Gross Beta	1.0E-6	2.5E-6	5.0E-6
	Water Treatment System Discharge (Sample WS-55 at Location SFW-A2[d]); or IDWTS Discharge (Sample WS-54 at Location SFW-A1)	Batch Release: Prior to each release; or	Grab	Gross Alpha	6.0E-8	1.5E-7	3.0E-7
		Continuous Release: Continuous and Analyze Weekly	Composite	Gross Beta	1.0E-6	2.5E-6	5.0E-6

[a]Analytical procedures that provide equivalent data quality (e.g., gamma spectroscopy, liquid scintillation, kinetic phosphorescence analysis, or alpha spectroscopy) also may be selected based upon the sample medium.
[b]Values reflect the annual average concentration.
[c]Values reflect the results obtained from individual samples.
[d]The sampling location is within Building 230, even though the discharge is at Outfall #003.
[f]Fixed location samplers may be used to supplement the information obtained from effluent monitoring.

TABLE 2
ENVIRONMENTAL MONITORING PROGRAM

Sample Medium	Sampling Points	Collection Frequency	Sample Type	Type of Analysis[a]
Air	Four (4) Fixed Locations around the HDP (Locations AS-A, AS-B, AS-C, AS-D)	Continuous and Analyze Weekly	Particulate	Gross Alpha, Gross Beta
Surface Water	Outfall #003 (Location SFW-C)	Quarterly	Grab	Gross Alpha, Gross Beta
	Outfall #004 (Location SFW-D)	Quarterly	Grab	Gross Alpha, Gross Beta
	Outfall #005 (Location SFW-E)	Quarterly	Grab	Gross Alpha, Gross Beta
	Outfall #006 (Location SFW-F)	Quarterly	Grab	Gross Alpha, Gross Beta
	Joachim Creek Upstream of Site Creek Outfall (Sample WS-11 at Location SFW-J)	Monthly	Grab	Gross Alpha, Gross Beta
	Joachim Creek Downstream of Site Creek Outfall (Sample WS-12 at Location SFW-M)	Monthly	Grab	Gross Alpha, Gross Beta
	Joachim Creek and Site Creek Confluence (Sample WS-6 at Location SFW-H)	Quarterly	Grab	Gross Alpha, Gross Beta
Ground Water	On-Site Well (Sample WS-53 at Location GW-A, Well No. BR-04-JC)	Monthly	Grab	Gross Alpha, Gross Beta
	Off-Site Well (Sample WS-4 at Location GW-R, Hematite Post Office)	Quarterly	Grab	Gross Alpha, Gross Beta
	Three (3) Evaporation Pond Monitoring Wells (Locations GW-U, GW-G, GW-Y)	Quarterly	Grab	Gross Alpha, Gross Beta
	Three (3) Process Buildings Monitoring Well (Location GW-T, GW-Z, GW-S)	Quarterly	Grab	Gross Alpha, Gross Beta
	Three (3) Burial Area Monitoring Wells (Locations HB-F, GW-BB, GW-W)	Quarterly	Grab	Gross Alpha, Gross Beta
Soil	Four (4) Site Area Locations (Locations SL-A, SL-B, SL-C, SL-D)	Quarterly	Grab	Gross Alpha, Gross Beta, Alpha Spect., Liq. Scint.

TABLE 2
ENVIRONMENTAL MONITORING PROGRAM

Sample Medium	Sampling Points	Collection Frequency	Sample Type	Type of Analysis[a]
Vegetation	Four (4) Site Area Locations (Locations VG-A, VG-B, VG-C, VG-D)	Quarterly	Grab	Gross Alpha, Gross Beta, Alpha Spect., Liq. Scint.
Sediment	Joachim Creek and Site Creek Confluence Below Site Dam (Sample SS-17 at Location SD-H)	Annually	Grab	Gross Alpha, Gross Beta, Alpha Spect., Liq. Scint.

[a]Analytical procedures that provide equivalent data quality (e.g., gamma spectroscopy, liquid scintillation, kinetic phosphorescence analysis, or alpha spectroscopy) also may be selected based upon the sample medium. For gross alpha radioactivity or gross beta radioactivity, isotopic analysis may also be performed as directed by HP Supervision.

TABLE 3
SUMMARY OF NPDES SAMPLING REQUIREMENTS

	Parameter	Units	Daily Maximum	Weekly Average	Monthly Average	Frequency	Type
Outfall #001	Flow	MGD	*	N/A	*	Monthly	Totalizing Ultrasonic
	Biochemical Oxygen Demand	mg/l	N/A	45	30	Quarterly	Composite[b]
	Total Suspended Solids	mg/l	N/A	45	30	Quarterly	Composite[b]
	pH	SU	6-9	N/A	N/A	Quarterly	Grab
	Ammonia as N	mg/l	*	N/A	*	Quarterly	Grab
	Fecal Coliform[c]	#/100 ml	1000	N/A	400	Quarterly	Grab
	Total Residual Chlorine[c]	mg/l	0.019 (0.13 ML)[d]	N/A	0.01 (0.13 ML)[d]	Quarterly	Grab
	Gross Alpha/Gross Beta	pCi/l	N/A	N/A	*	Quarterly	Grab
Outfalls #002-#006	Flow	MGD	*	N/A	N/A	Quarterly	Grab
	Total Suspended Solids	mg/l	N/A	45	30	Quarterly	Grab
	pH	SU	6-9	N/A	N/A	Quarterly	Grab
	Gross Alpha/Gross Beta	pCi/l	N/A	N/A	*	Quarterly	Grab

Note for all Outfalls: No discharge of floating solids or visible foam in other than trace amounts.
*Monitoring requirement only.
[b]Made from a minimum of four grab samples collected within a 24-hour period with a minimum of two hours between each sample.
[c]Limits and monitoring requirements applicable only from April 1 through October 31.
[d]ML denotes minimum quantification level. The effluent limit is less than the ML for the DPD Colormetric Method #4500-CLG. This method, or equivalent, shall be used and the actual results reported. Only measured results greater than or equal to the ML are considered violations of the permit. This ML does not authorize the discharge of chlorine in excess of the permit limit.

TABLE 4
SUMMARY OF ARAR-BASED SAMPLING REQUIREMENTS

Parameter	Units	Daily Maximum	Monthly Average	Frequency	Type
Flow	MGD	*	*	Weekly	24 hr total
Total Suspended Solids	mg/l	45	30	Weekly	Grab
Oil and Grease	mg/l	15	10	Weekly	Grab
pH	SU	6-9	6-9	Weekly	Grab
Trichloroethylene	µg/l (ppb)	5	*	Weekly	Grab
Tetrachloroethylene	µg/l (ppb)	5	*	Weekly	Grab
1,1 Dichloroethylene	µg/l (ppb)	7	*	Weekly	Grab
CIS 1,2 Dichloroethylene	µg/l (ppb)	70	*	Weekly	Grab
Trans-1,2 Dichloroethylene	µg/l (ppb)	100	*	Weekly	Grab
1,1,1 Trichloroethane	µg/l (ppb)	200	*	Weekly	Grab
1,1,2 Trichloroethane	µg/l (ppb)	5	*	Weekly	Grab
Vinyl Chloride	µg/l (ppb)	2	*	Weekly	Grab
Gross Alpha	pCi/l	*	*	Weekly	Grab
Gross Beta	pCi/l	*	*	Weekly	Grab
Total Uranium	pCi and µg/l	*	*	Weekly	Grab
Technetium 99	pCi and µg/l	*	*	Weekly	Grab

Note for all ARAR discharges: No discharge of floating solids or visible foam in other than trace amounts.
*Monitoring requirement only.

FIGURE 1
EXISTING SAMPLING LOCATIONS FOR AIR, SURFACE WATER, AND SEDIMENT

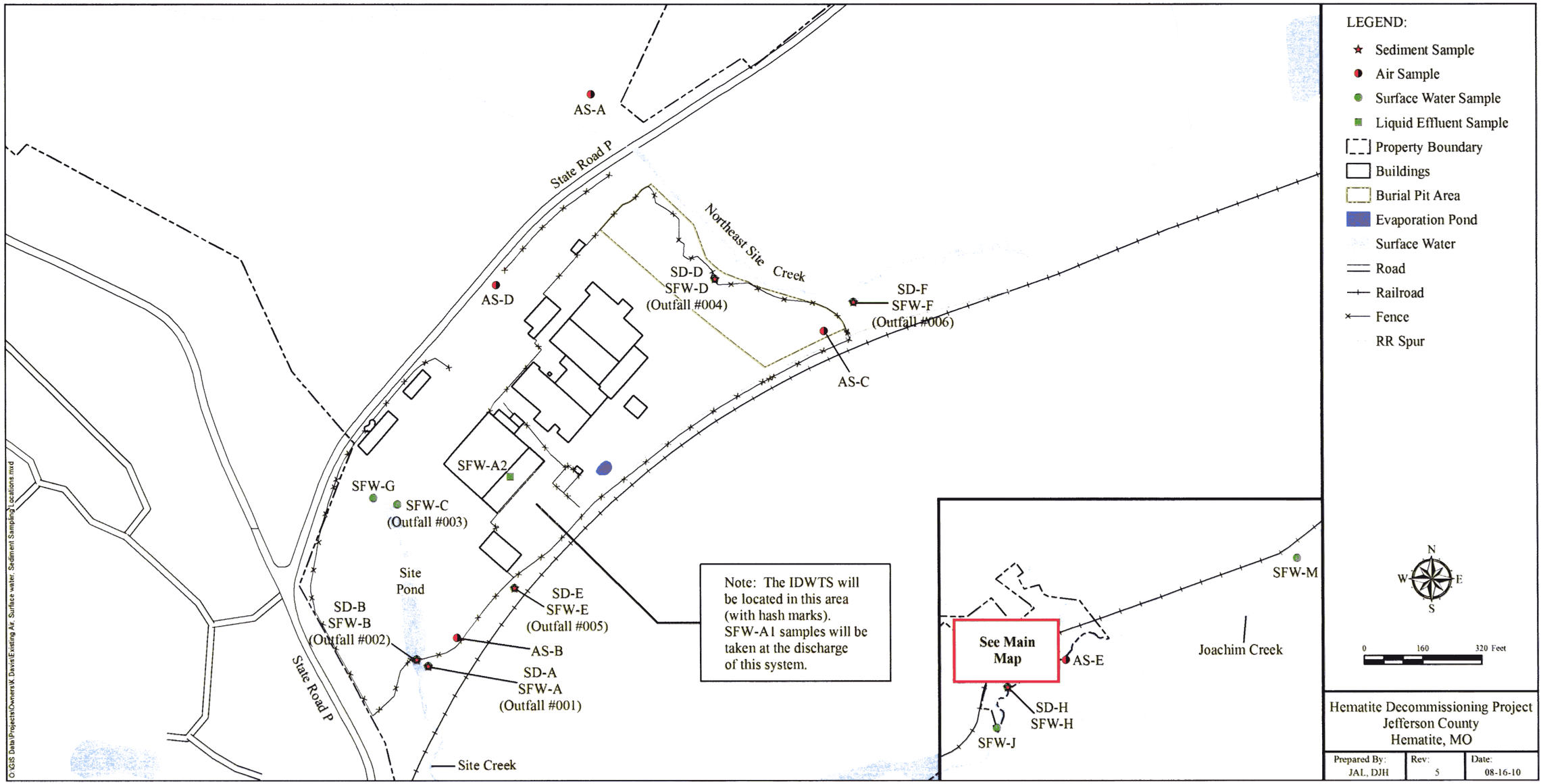
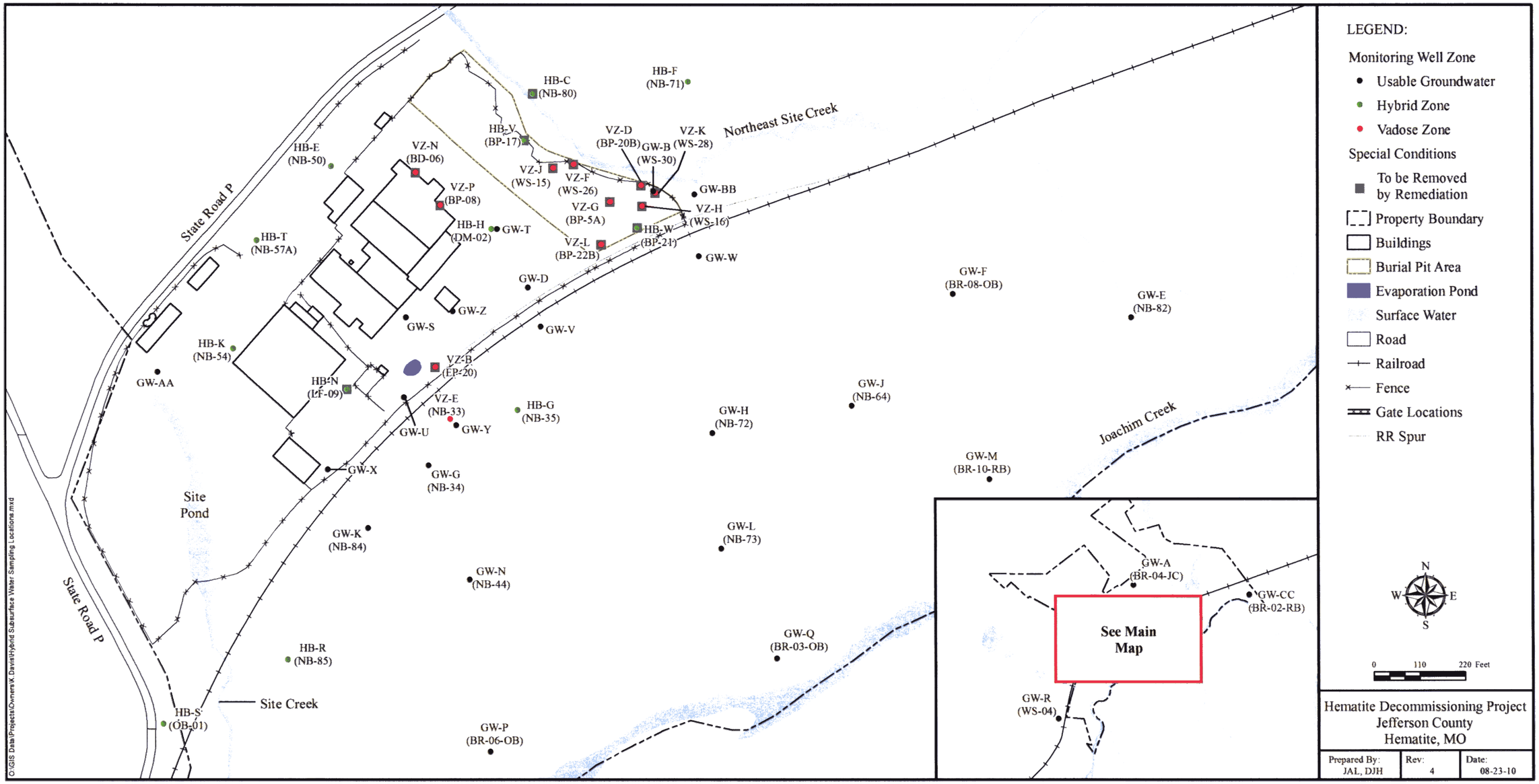


FIGURE 2
EXISTING SAMPLING LOCATIONS FOR SOIL, VEGETATION, AND TLDS

FIGURE 3
EXISTING SAMPLING LOCATIONS FOR GROUND WATER



APPENDIX A
SUMMARY OF EFFLUENT AND ENVIRONMENTAL MONITORING LOCATIONS

Location	Sample ID	Location on Figures	Ref. Doc.	Sample Freq.	Analysis Parameters	Notes
Air Samples:						
Edge of Central Tract	AS-1, AS-2, AS-3, AS-4	AS-A, AS-B, AS-C, AS-D	SNM-33	Weekly	Gross Alpha Gross Beta	Continuous sampling. Plan to move AS-A to Central Tract side of State Road P.
Additional at Edge of Central Tract	AS-6, AS-7	AS-F, AS-G	Planned	Weekly	Gross Alpha Gross Beta	Continuous sampling. These locations are supplemental to the locations identified in the Decommissioning Plan.
Off-site Background	AS-5	AS-E	N/A	Quarterly (Weekly)[a]	Gross Alpha Gross Beta	Background only. Continuous sampling. Alternate location PW-19.
~~Exhaust Stacks~~	N/A	N/A	~~SNM-33~~	~~Weekly~~	~~Gross Alpha Gross Beta~~	No longer any exhaust. Exhaust systems dismantled.
Surface Water Samples:						
Outfall #001 - Sanitary WasteWater Treatment Plant, IDWTS Discharge, and WTS Discharge	WS-1	SFW-A	NPDES	Quarterly	Gross Alpha Gross Beta Flow[b], BOD, TSS, pH, Ammonia as N, Fecal Coliform, Total Res. Chlorine[c]	Weekly sample WS-18 satisfies the gross alpha and beta requirement.
	WS-18	SFW-A	SNM-33	Weekly	Gross Alpha Gross Beta (Flow[b])[a]	Liquid effluent sample – grab, but planned to be replaced with a composite sampler.
	WS-54	SFW-A1	MDNR ARAR, SNM-33	Prior to Batch	Gross Alpha Gross Beta	Liquid effluent sample – grab.
	WS-55	SFW-A2	SNM-33	Prior to Batch; or Weekly if Continuous Discharge	Gross Alpha Gross Beta	Liquid effluent sample – grab if batch or composite if continuous discharge.
Outfall #002 - Site Pond Dam	WS-2	SFW-B	NPDES	Quarterly	Gross Alpha Gross Beta Flow[b], TSS, pH (oil & grease, flouride)[a]	Weekly sample WS-19 satisfies the gross alpha and gross beta requirement.

APPENDIX A
SUMMARY OF EFFLUENT AND ENVIRONMENTAL MONITORING LOCATIONS

Location	Sample ID	Location on Figures	Ref. Doc.	Sample Freq.	Analysis Parameters	Notes
	WS-19	SFW-B	SNM-33	Weekly	Flow[b] Gross Alpha Gross Beta	Liquid effluent sample - weekly composite.
Outfall #003 - Storm Drain	WS-3	SFW-C	NPDES	Quarterly	Gross Alpha Gross Beta Flow[b], TSS, pH	Weekly sample WS-20 satisfies the gross alpha and gross beta requirement.
	WS-20	SFW-C	N/A	Weekly	Flow[b], Gross Alpha Gross Beta	
Outfall #004 East Culvert	WS-50	SFW-D	NPDES	Quarterly	Gross Alpha Gross Beta Flow[b], TSS, pH (VOC)[a]	During Burial Pit excavation work, this Outfall is expected be rendered dry or relocated. For example, after excavated areas are restored, runoff over clean backfill is planned to be directed to the Northeast Site Creek. Wherever this redirection occurs would be Outfall #004.
Outfall #005 South Culvert	WS-51	SFW-E	NPDES	Quarterly	Gross Alpha Gross Beta Flow[b], TSS, pH (VOC)[a]	
Outfall #006 Northeast Site Creek	WS-52	SFW-F	NPDES	Quarterly	Gross Alpha Gross Beta Flow[b], TSS, pH (VOC)[a]	
Site Creek	WS-5	SFW-G	N/A	Quarterly	Gross Alpha Gross Beta	Provides background for Site Creek.
Site Creek Confluence with Joachim Creek	WS-6	SFW-H	SNM-33	Quarterly	Gross Alpha Gross Beta	
Joachim Creek above Site Creek Outfall	WS-11	SFW-J	SNM-33	Monthly	Gross Alpha Gross Beta	Provides background for Joachim Creek.
Joachim Creek Downstream	WS-12	SFW-M	SNM-33	Monthly	Gross Alpha Gross Beta	
Ditch North of Burial Pit Area to Northeast Site Creek	WS-56	SFW-K	Planned	Quarterly	Gross Alpha Gross Beta Flow[b], TSS, pH	

APPENDIX A
SUMMARY OF EFFLUENT AND ENVIRONMENTAL MONITORING LOCATIONS

Location	Sample ID	Location on Figures	Ref. Doc.	Sample Freq.	Analysis Parameters	Notes
Ditch from the Laydown Area to Northeast Site Creek	WS-57	SFW-L	Planned	Quarterly	Gross Alpha Gross Beta Flow[b], TSS, pH	
~~East Creek~~	~~WS-21~~	N/A	~~SNM-33~~			Deleted SNM-33 commitment ~2000 because creek seldom flows. Replaced by WS-52.
Ground Water Samples (Vadose Zone and Useable Ground Water):						
Off-site Well (Hematite Post Office)	WS-04	GW-R	SNM-33 NPDES	Quarterly	Gross Alpha Gross Beta (VOC)[a]	
On-site Well (Field Northeast of developed area)	BR-04-JC (WS-53)	GW-A	SNM-33 IGMP	Monthly	Gross Alpha Gross Beta (VOC)[a]	Replaced WS-10, Plant Well.
~~Plant Well~~	~~WS-10~~	N/A	~~SNM-33~~			Well no longer in use. Replaced by WS-53.
Northeast of Process Buildings	BD-06	VZ-N	IGMP	Semi-Annually	Gross Alpha Gross Beta (VOC)	Monitor until removed due to remediation.
Northeast of Process Buildings	BD-08	VZ-P	IGMP	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	Monitor until removed due to remediation.
South of Process Buildings	GW-T	GW-T	SNM-33 IGMP	Quarterly	Gross Alpha Gross Beta (Liq. Scint.)[a] (VOC)	
South of Process Buildings	GW-S	GW-S	SNM-33 IGMP	Quarterly	Gross Alpha Gross Beta (Liq. Scint.)[a] (VOC)[a]	
~~South Vault~~	~~WS-13~~	N/A	~~SNM-33~~	~~Quarterly~~	~~Gross Alpha Gross Beta (Liq. Scint.)~~[a]	Replaced by GW-Z to strictly monitor useable ground water.
South of South Vault and Process Buildings	GW-Z	GW-Z	SNM-33 IGMP	Quarterly	Gross Alpha Gross Beta (Liq. Scint.)[a] (VOC)	Replaces GW-Z to strictly monitor useable ground water.
Within Burial Pit Area	WS-15	VZ-J	N/A	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	Monitor until removed due to remediation.
Within Burial Pit Area	WS-16	VZ-H	N/A	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	Monitor until removed due to remediation.

APPENDIX A
SUMMARY OF EFFLUENT AND ENVIRONMENTAL MONITORING LOCATIONS

Location	Sample ID	Location on Figures	Ref. Doc.	Sample Freq.	Analysis Parameters	Notes
~~Burial Well # 2 (Located within burial pit area)~~	~~WS-14~~	N/A	~~N/A~~			Discontinued ~ 1999 because of high VOC and mixed waste concerns.
~~Burial Area Monitoring Well~~	~~WS-29~~	N/A	~~N/A~~	~~Quarterly~~	~~Gross Alpha Gross Beta~~	To be abandoned since it is a hybrid well in impacted soil.
~~Upgradient of Burial Pit Area~~	~~WS-23~~	N/A	~~N/A~~	~~Quarterly~~	~~Gross Alpha Gross Beta~~	Removed due to interference.
Within Burial Pit Area	BP-17	HB-V	IGMP	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	Monitor until removed due to remediation.
Within Burial Pit Area	NB-80	HB-C	IGMP	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	Monitor until removed due to remediation.
Within Burial Pit Area	WS-30, ~~WS-31~~	GW-B	IGMP	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	WS-31 not monitored since WS-30 meets monitoring needs. Monitor until removed due to remediation.
Within Burial Pit Area	BP-5A	VZ-G	N/A	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	Monitor until removed due to remediation.
Within Burial Pit Arles	BP-22B	VZ-L	IGMP	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	Monitor until removed due to remediation.
Within Burial Pits	WS-26	VZ-F	N/A	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	Monitor until removed due to remediation.
Within Burial Pits	WS-28	VZ-K	N/A	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	Monitor until removed due to remediation.
Within Burial Pits	BP-21	HB-W	N/A	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	Monitor until removed due to remediation.
Within Burial Pits	BP-20B	VZ-D	IGMP	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	Monitor until removed due to remediation.
Downgradient of Burial Pits	NB-71	HB-F	SNM-33 IGMP	Quarterly	Gross Alpha Gross Beta (VOC)[a]	
Downgradient of Burial Pits	GW-W	GW-W	SNM-33 IGMP	Quarterly	Gross Alpha Gross Beta (VOC)[a]	
Downgradient of Burial Pits	GW-BB	GW-BB	SNM-33 IGMP	Quarterly	Gross Alpha Gross Beta (VOC)[a]	Replaces WS-17B to strictly monitor useable ground water.

APPENDIX A
SUMMARY OF EFFLUENT AND ENVIRONMENTAL MONITORING LOCATIONS

Location	Sample ID	Location on Figures	Ref. Doc.	Sample Freq.	Analysis Parameters	Notes
~~Technetium Soil Area~~	~~WS-17B~~	N/A	~~SNM-33~~	~~Quarterly~~	~~Gross Alpha Gross Beta (Liq. Scint.)[a] (VOC)[a]~~	Replaced by GW-D for Tc-99 monitoring. Replaced by GW-BB for SNM-33 required monitoring of burial pits since GW-BB is downgradient.
Technetium Soil Area	GW-D	GW-D	IGMP	Semi-Annually	Gross Alpha Gross Beta (Liq. Scint.)[a] (VOC)[a]	Replaces WS-17B to strictly monitor useable ground water.
~~North Monitoring Well (Evaporation Ponds)~~	~~WS-7~~	N/A	~~SNM-33~~	~~Quarterly~~	~~Gross Alpha Gross Beta (Liq. Scint.)[a]~~	Replaced by GW-U.
~~Southeast Monitoring Well (Evaporation Ponds)~~	~~WS-8~~	N/A	~~SNM-33~~	~~Quarterly~~	~~Gross Alpha Gross Beta~~	Replaced by GW-Y.
~~Southwest Monitoring Well (Evaporation Ponds)~~	~~WS-9~~	N/A	~~SNM-33~~	~~Quarterly~~	~~Gross Alpha Gross Beta~~	Replaced by NB-34 (GW-G).
South of Evaporation Ponds	GW-U	GW-U	SNM-33 IGMP	Quarterly	Gross Alpha Gross Beta (Liq. Scint.)[a] (VOC)[a]	Replaces WS-7.
Across Railroad Tracks form Evaporation Ponds	GW-Y	GW-Y	SNM-33 IGMP	Quarterly	Gross Alpha Gross Beta (Liq. Scint.)[a] (VOC)[a]	Replaces WS-8.
Southeast of Evaporation Ponds	EP-20	VZ-B	IGMP	Semi-Annually	Gross Alpha Gross Beta (Liq. Scint.)[a] (VOC)[a]	Monitor until removed due to remediation.
Across Railroad Tracks form Evaporation Ponds	NB-33	VZ-E	IGMP	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	
Across Railroad Tracks form Evaporation Ponds	NB-34	GW-G	SNM-33 IGMP	Quarterly	Gross Alpha Gross Beta (VOC)[a]	Replaces WS-9.
Former Leach Field	LF-09	HB-N	IGMP	Semi-Annually	Gross Alpha Gross Beta (Liq. Scint.)[a] (VOC)[a]	Monitor until removed by remediation.
Cistern Burial Area Near Barns	GW-AA	GW-AA	IGMP	Quarterly	Gross Alpha Gross Beta (Liq. Scint.)[a] (VOC)[a]	Install to strictly monitor useable ground water.

APPENDIX A
SUMMARY OF EFFLUENT AND ENVIRONMENTAL MONITORING LOCATIONS

Location	Sample ID	Location on Figures	Ref. Doc.	Sample Freq.	Analysis Parameters	Notes
Near Western-most Buildings	GW-X	GW-X	IGMP	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	
Downgradient	GW-V	GW-V	IGMP	Quarterly	Gross Alpha Gross Beta (Liq. Scint.) (VOC)[a]	Quarterly monitoring for radioactivity.
Downgradient	NB-35	HB-G	IGMP	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	
Downgradient	NB-82	GW-E	IGMP	Quarterly	Gross Alpha Gross Beta (VOC)[a]	
Downgradient	BR-08-OB	GW-F	IGMP	Quarterly	Gross Alpha Gross Beta (VOC)[a]	
Downgradient	NB-72	GW-H	IGMP	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	
Downgradient	NB-64	GW-J	IGMP	Quarterly	Gross Alpha Gross Beta (VOC)[a]	
Downgradient	NB-84	GW-K	IGMP	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	
Downgradient	NB-73	GW-L	IGMP	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	
Downgradient	BR-10-RB	GW-M	IGMP	Quarterly	Gross Alpha Gross Beta (VOC)[a]	
Downgradient	NB-44	GW-N	IGMP	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	
Downgradient	BR-06-OB	GW-P	IGMP	Quarterly	Gross Alpha Gross Beta (VOC)[a]	
Downgradient	BR-03-OB	GW-Q	IGMP	Quarterly	Gross Alpha Gross Beta (VOC)[a]	
Downgradient	NB-85	HB-R	IGMP	Quarterly	Gross Alpha Gross Beta (VOC)[a]	
Downgradient	OB-01	HB-S	IGMP	Quarterly	Gross Alpha Gross Beta (VOC)[a]	

APPENDIX A
SUMMARY OF EFFLUENT AND ENVIRONMENTAL MONITORING LOCATIONS

Location	Sample ID	Location on Figures	Ref. Doc.	Sample Freq.	Analysis Parameters	Notes
Upgradient	NB-54	HB-K	IGMP	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	
Upgradient	NB-57A	HB-T	IGMP	Quarterly	Gross Alpha Gross Beta (VOC)[a]	
Upgradient	NB-50	HB-E	IGMP	Quarterly	Gross Alpha Gross Beta (VOC)[a]	
Eastern Edge of Property	BR-02-RB	GW-CC	N/A	Semi-Annually	Gross Alpha Gross Beta (VOC)[a]	
Soil Samples:						
Surface of the Burial Area	SS-12	SL-A	SNM-33	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	Planned to be replaced by SL-E.
Across State Road P near the Electrical Substation	SS-13	SL-B	SNM-33	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	
West of the Site Pond	SS-14	SL-C	SNM-33	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	Planned to be replaced by SL-G.
Between the Site Pond and Building 231	SS-15	SL-D	SNM-33	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	Planned to be replaced by SL-G.
East of the Laydown Area	SS-16	SL-E	Planned	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	Will replace SL-A.
Across the Railroad Tracks from the Developed Area	SS-18	SL-F	Planned	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	
Southwest of the Site Pond	SS-19	SL-G	Planned	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	Will replace SL-C and SL-D.
Next to State Road P by the Parking Lot	SS-20	SL-H	Planned	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	

APPENDIX A
SUMMARY OF EFFLUENT AND ENVIRONMENTAL MONITORING LOCATIONS

Location	Sample ID	Location on Figures	Ref. Doc.	Sample Freq.	Analysis Parameters	Notes
East of the Burial Area	SS-21	SL-J	Planned	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	
Sediment Sample:						
Outfall #001 Outfall #002 Outfall #004 Outfall #005 Outfall #006	SS-53 SS-54 SS-50 SS-51 SS-52	SD-A SD-B SD-D SD-E SD-F	N/A	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	
Site Creek Confluence with Joachim Creek	SS-17	SD-H	SNM-33	Annual	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	
In Site Creek, Downstream of Site Pond and Outfall #001	SS-22	SD-J	Planned	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	Will replace SD-A, SD-B.
Ditch north of Burial Pit Area to Northeast Site Creek	SS-56	SD-K	Planned	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	
Ditch from the Laydown Area to Northeast Site Creek	SS-57	SD-L	Planned	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	
Vegetation Samples:						
Surface of the Burial Area	VS-12	VG-A	SNM-33	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	Planned to be replaced by VG-E.
Across State Road P near the Electrical Substation	VS-13	VG-B	SNM-33	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	
West of the Site Pond	VS-14	VG-C	SNM-33	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	Planned to be replaced by VG-G.
Between the Site Pond and Building 231	VS-15	VG-D	SNM-33	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	Planned to be replaced by VG-G.
East of the Laydown Area	VS-16	VG-E	Planned	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	Will replace VG-A.

APPENDIX A
SUMMARY OF EFFLUENT AND ENVIRONMENTAL MONITORING LOCATIONS

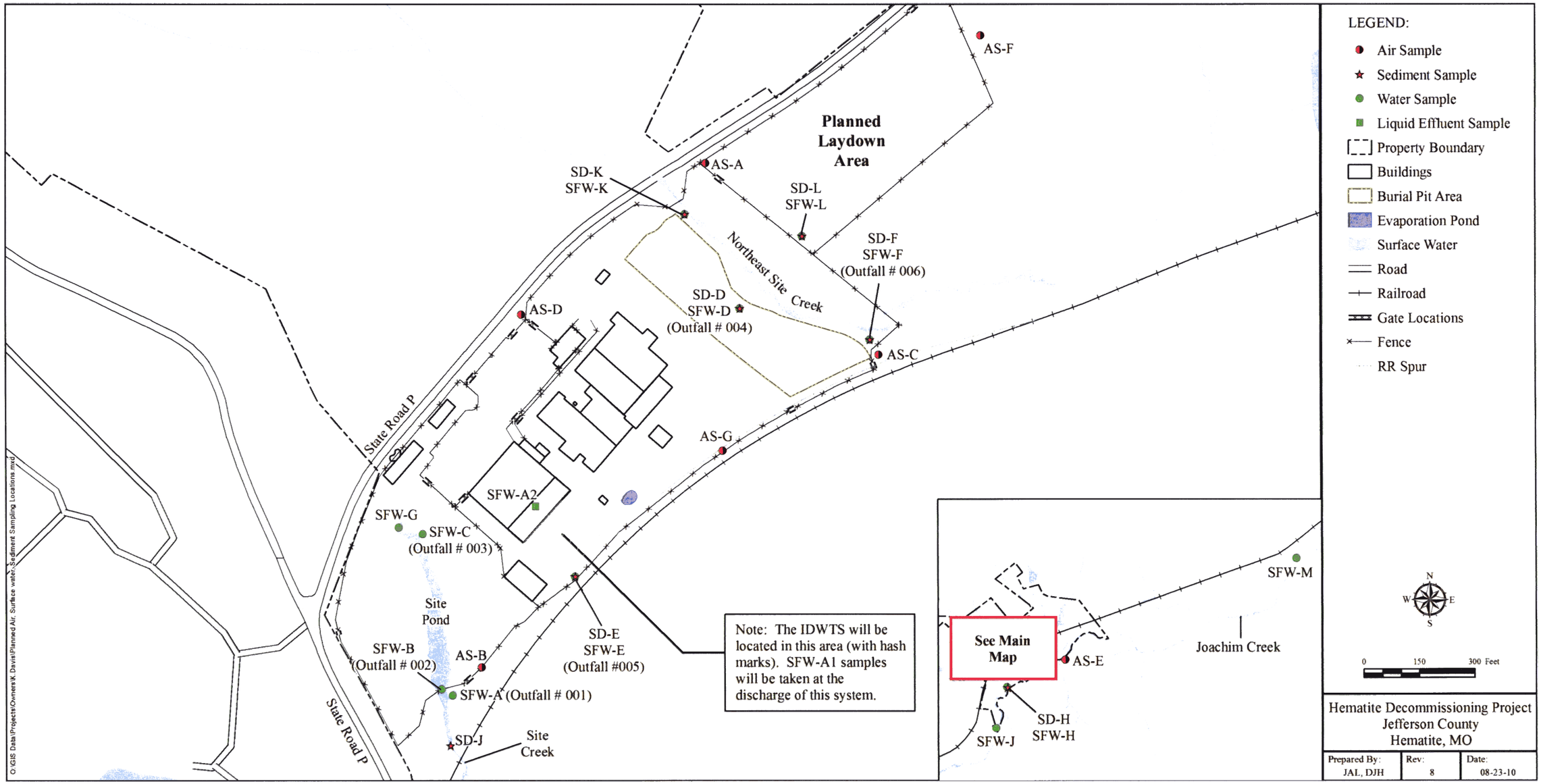
Location	Sample ID	Location on Figures	Ref. Doc.	Sample Freq.	Analysis Parameters	Notes
Across the Railroad Tracks from the Developed Area	VS-18	VG-F	Planned	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	
Southwest of the Site Pond	VS-19	VG-G	Planned	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	Will replace VG-C and VG-D.
Next to State Road P by the Parking Lot	VS-20	VG-H	Planned	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	
East of the Burial Area	VS-21	VG-J	Planned	Quarterly	Gross Alpha Gross Beta Alpha Spect. Liq. Scint.	
Dose Monitoring:						
West and North along State Road P – 6 locations	TLD-1 to TLD-6	TLD-A, B, C, D, E, F	10 CFR 20.1301	Quarterly	mrem	
Background	TLD-7	TLD-G	N/A	Quarterly	mrem	Not required – background reference only.
Along Railroad Tracks	TLD-8 to TLD-12	TLD-H, J, K, L, M	Planned	Quarterly	mrem	
Edge of Planned Laydown Area	TLD-13 to TLD-18	TLD-N, P, Q, R, S, T	Planned	Quarterly	mrem	

[a]HDP practice, but not the minimum requirement.
[b]Flow as a monitoring requirement only.
[c]Limits and monitoring requirements applicable only from April 1 through October 31.

Note: The locations of planned sampling for future Decommissioning work are approximations. Actual locations will depend on ground topography and potential interferences.

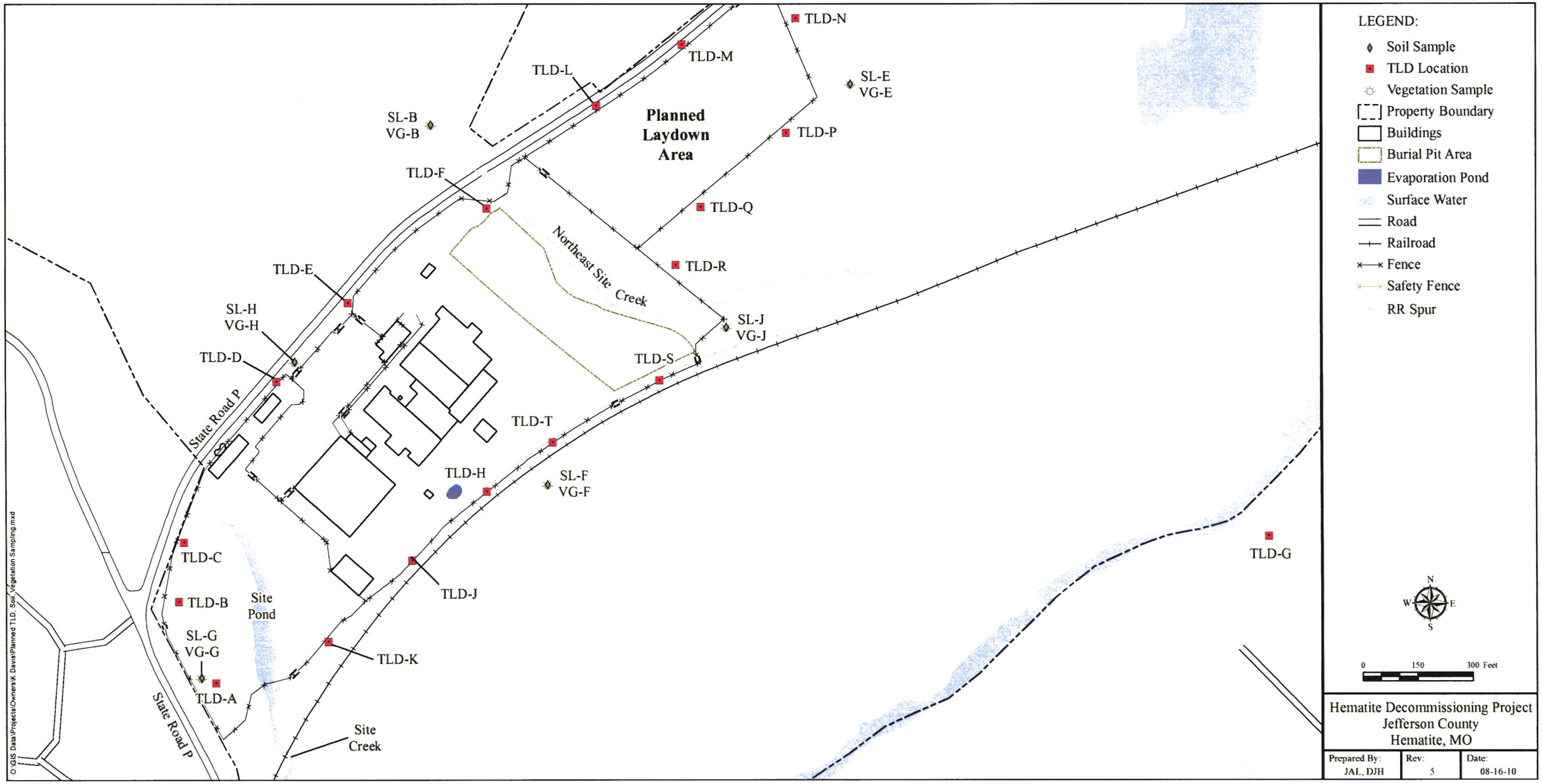
APPENDIX B
FIGURES OF PLANNED EFFLUENT AND ENVIRONMENTAL MONITORING LOCATIONS

Figure B-1
Planned Sampling Locations for Air, Surface Water, and Sediment

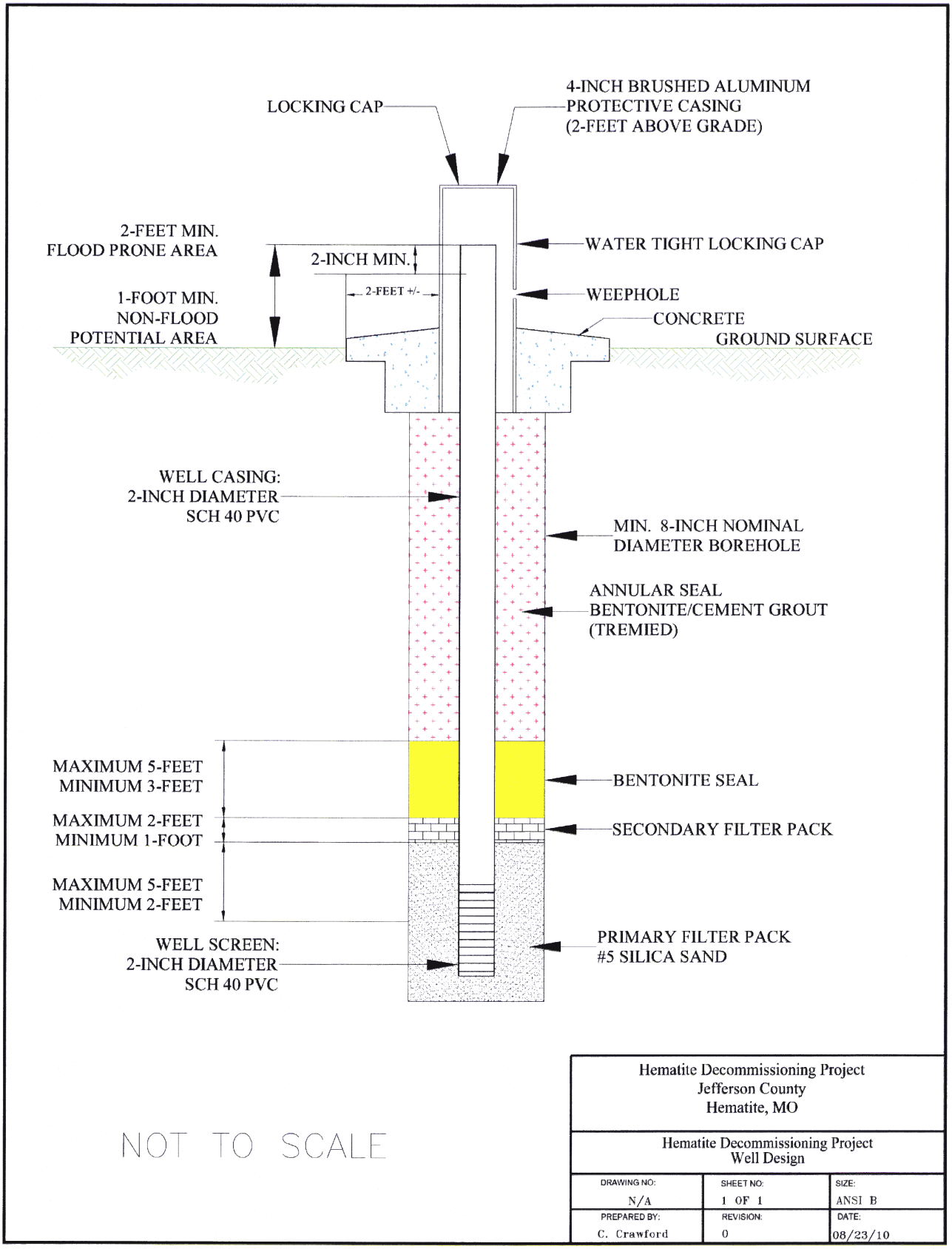


APPENDIX B
FIGURES OF PLANNED EFFLUENT AND ENVIRONMENTAL MONITORING LOCATIONS

Figure B-2
Planned Sampling Locations for Soil, Vegetation, and TLDs



APPENDIX C
TYPICAL GROUND WATER MONITORING WELL



NOT TO SCALE

Hematite Decommissioning Project Jefferson County Hematite, MO		
Hematite Decommissioning Project Well Design		
DRAWING NO: N/A	SHEET NO: 1 OF 1	SIZE: ANSI B
PREPARED BY: C. Crawford	REVISION: 0	DATE: 08/23/10

APPENDIX D
DATA QUALITY OBJECTIVES

Data are needed as part of the EEMP to evaluate the impacts the site is having on the environment through past activities, during the remedial action, and during the post-remedial action phase. The data needs for the Hematite site were developed in accordance with the DQO process outlined in the U.S. Environmental Protection Agency's Guidance on Systematic Planning Using the Data Quality Objectives Process (Reference 5.3).

The DQO process is a scientific data collection planning process consisting of seven prescribed steps designed to ensure that the type, quality, and quantity of data collected is appropriate for environmental decision-making. DQOs define the purpose of the data collection effort, clarify what the data should represent to satisfy this purpose, and specify the performance requirements for the quality of information to be obtained from the data. These outputs are then used in the final step of the DQO process to develop a data collection design that meets all requirements and constraints. DQOs are developed on a site-specific basis.

The DQO process for effluent and environmental monitoring consists of the following elements corresponding to the steps of the DQO process:

Step 1 – State the Problem
The primary objective for the EEMP at the Hematite site is to obtain adequate, sufficient, and defensible field and analytical data necessary to properly characterize the environmental conditions, monitor the effluent releases, and evaluate the effects of the remedial actions and to ensure the safety of human health and the environment.

Step 2 – Identify the Decision
The EEMP should provide adequate and sufficient field measurements and analytical data to evaluate whether contaminants from the Hematite site may be migrating to other areas off of the facility through surface water, groundwater, soil dispersion or air emissions. The sampling activities described within this EEMP will also provide information necessary to determine if implementation of the selected remedial actions is having a beneficial effect on the site groundwater through source removal. Sufficient and adequate data will be collected to support an evaluation of future groundwater actions.

Step 3 – Identify Decision Inputs
Existing data from previous investigations have been evaluated and used to direct the current, proposed sampling activities for this EEMP. Data collected per this EEMP will be compiled into comprehensive data set to properly evaluate conditions at the Hematite site with respect to the environmental conditions, the nature and extent of contamination, and the risks to human health and the environment. In addition, the data will be used to establish final groundwater conditions by supplying input into the groundwater remedy selection.

Step 4 – Define Study Boundaries
The study area for the Hematite site is based upon the contaminants being studied. The radiological contamination is generally confined to the Central Tract area of the facility, while the volatile compounds within the bedrock groundwater have migrated off-property to the south of Joachim Creek.

APPENDIX D
DATA QUALITY OBJECTIVES

- Air samples will be collected at or near the edge of the Central Tract of the site and downwind of work areas.
- Surface water will be sampled at the outfalls as indicated in the NPDES permit. Sediment associated with surface water features will be sampled at or near the outfalls and at the confluence of the site creek with Joachim Creek.
- Ground water sampling locations have been selected to provide data from locations downgradient of the source areas based on previous characterization work. Additional wells have been added that indicate a difference between the clay overburden layer and the sand overburden layer. Therefore, those monitoring wells within the leachate zone (clay and silty clay overburden) will only be sampled during the remediation phase, until the time that the wells are removed due to excavation. Future groundwater sampling at the site will focus on the three transmissive zones for groundwater (overburden sand/gravel, Jefferson City bedrock, and the Roubidoux bedrock) during the remedial phase and long-term.
- Soil and vegetation will be sampled at or near the edge of the Central Tract of the site to provide information on potential contamination from atmospheric disposition and potential plant uptake of contaminants from the soil.
- TLD monitoring will be conducted at or near the edge of the Central Tract of the site to evaluate potential direct dose.

Step 5 – Develop Decision Rules
Decision rules to be adopted for the EEMP are primarily with respect to a comparison of site media concentrations to the effluent release criteria or the results of samples taken at a background location.

Step 6 – Evaluate Decision Errors
Decision errors can be reduced when sampling and analytical errors are minimized. The analysis and validation of sample concentrations will be performed in general accordance with the procedures contained in the HDP PQP. Care will be taken to ensure that a sufficient number of samples will be collected, generally on an annual basis, from the site to calculate statistically valid representative concentrations and to provide input data for proposed computer modeling. The Mann-Kendall test, or equivalent, will be used for trending data and requires a minimum of four data points to assess a trend.

Step 7 – Optimize the Design
Sample locations and analytical parameters for each media were selected to provide sufficient spatial coverage and data to aid in the determination of the nature and extent of contaminant concentrations.