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NITRIC ACID TANK CAR AND AREA REMOVAL ACTION AND CLOSURE FINAL REPORT OCTOBER 1993

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FINAL REPORT

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FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

Nitric Acid Tank Car and Area

Removal Action and Closure

FINAL REPORT

October1993

U.S. DEPARTMENT OF ENERGY

48 54

Fernald Environmental Management Project

FINAL REPORT

NITRIC ACID TANK CAR AND AREA Removal Action and Closure

October 1993

FERNALD ENVIRONMENTAL RESTORATION
MANAGEMENT CORPORATION

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CONTENTS

CONTENTS (continued)

TABLES

FIGURES

ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AEA	Atomic Energy Act
ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
ASL	analytical support level
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R.	Code of Federal Regulations
CPID	Closure Plan Information and Data
CRU3	CERCLA/RCRA Unit 3
DAC	Derived Air Concentration
DAL	Decontamination Action Level
DCG	Derived Concentration Guide
DI	de-ionized
DOE	U.S. Department of Energy
DQO	Data Quality Objective
EDE	effective dose equivalent
Fed. Reg.	Federal Register
FEMP	Fernald Environmental Management Project
FERMCO	Fernald Environmental Restoration Management Corporation
FID	flame ionization detector
FMPC	Feed Materials Production Center
FS	feasibility study
HASP	Health and Safety Plan
HNO_3	nitric acid
HWMU	hazardous waste management unit
LEL	lower explosive limit
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDA	minimum detectable beta-gamma activity
NAR	nitric acid recovery
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NESHAP	National Emission Standards for Hazardous Air Pollutants
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
O.A.C.	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
OSHA	Occupational Safety and Health Administration
OU	operable unit
OVA	organic vapor analyzer
PEL	permissible exposure limits
PID	photoionization detector

ACRONYMS AND ABBREVIATIONS (continued)

PPE	personal protective equipment
QA	quality assurance
QC	quality control
RAWP	Removal Action Work Plan
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RSE	Removal Site Evaluation
SACD	Stipulated Amendment to the Consent Decree
SAP	Sampling and Analysis Plan
SCQ	Site-wide CERCLA Quality Assurance Project Plan
SOP	Standard Operating Procedure
TCLP	Toxicity Characteristic Leaching Procedure
TLV	Threshold Limit Value
TSD	Treatment, Storage and Disposal
UNH	uranyl nitrate hexahydrate
USEPA	U.S. Environmental Protection Agency
U.S.C.	United States Code
WEMCO	Westinghouse Environmental Management Company of Ohio

EXECUTIVE SUMMARY

The Nitric Acid Tank Car (Tank Car) and Area Removal Action Work Plan (RAWP)/Closure Plan Information and Data (CPID) described actions encompassing removal and disposition of Tank Car contents, decontamination and disposition of the Tank Car, and excavation and interim management of contaminated surface soils within the Tank Car and Area Hazardous Waste Management Unit (HWMU). Field operations began in July 1993, and were completed in October 1993. All wastes resulting from this action have been properly dispositioned, as described in the sections that follow.

ES.1 BACKGROUND

In June 1991, the Nitric Acid Tank Car and Area was declared a hazardous waste management unit (HWMU) since the discarded nitric acid was stored in excess of 90 days and has the hazardous characteristic of corrosivity (U.S. Environmental Protection Agency [USEPA] Hazardous Waste No. D002). The Tank Car and Area is therefore included in the list of HWMUs in the latest Resource Conservation and Recovery Act (RCRA) Part A and Part B Permit Applications submitted to the Ohio Environmental Protection Agency (OEPA). The Tank Car and its contents was also identified as a removal action in the U.S. Department of Energy (DOE) letter DOE-667-92, "Proposed Phase III Removal Actions" (dated January 14, 1992) submitted to the USEPA pursuant to the Amended Consent Agreement (USEPA 1991).

Visual inspections of the Tank Car indicated that there was a relatively small amount of liquid remaining in the tank, estimated at between 50 to 100 gallons. Laboratory analysis of initial characterization samples indicated the liquid was approximately 3N HNO_3 with a pH less than 1, and contained approximately 2 mg/L uranium and 1,600 mg/L chromium (TCLP and total). As a result of the low pH and chromium concentration, the tank contents are considered a RCRA hazardous waste due to the characteristics of corrosivity and toxicity (D002 and D007).

ES.2 SUMMARY OF FIELD ACTIONS

The Tank Car contents were confirmed, through sampling and analysis conducted as part of the field actions, to consist of 100 gal of waste nitric acid (pH 0.1) containing approximately 2,000 mg/L chromium and 0.201 mg/L uranium. These results confirm the initial characterization described in the preceding section. The Tank Car contents were pumped into portable tanks, along with rinseate from a total of five rinses, and transferred to Tank F1-24 of the Nitric Acid Recovery (NAR) System for ultimate disposition via the Uranyl Nitrate (UNH) System. The fifth and final rinse indicated a pH of 8 by field electrode, and 6 by subsequent laboratory analysis; and a nitrate concentration of 1.6 mg/L by field electrode, and concentrations by subsequent laboratory analysis of 3.47 and 0.68 mg/L. Chromium was not tested in the fifth rinse because the concentrations present within the fourth rinse (0.543 and 0.718 mg/L) were below the decontamination action level (0.75 mg/L). The laboratory results are summarized in Table ES-1.

A radiological contamination survey of the Tank Car, conducted in accordance with Fernald Environmental Management Project (FEMP) standard operating procedures, determined that the car was free of significant external radiological contamination. Following completion of final rinseate testing, the Safe Shutdown Program separated the stainless steel tank from the rail car undercarriage, cut the tank open to prevent its reuse, and transferred these components to the scrap metal holding areas.

The surface soils within the Tank Car and Area HWMU, and one location outside the HWMU, were sampled and analyzed for chromium, pH, nitrates, and uranium (total and isotopic). Seven additional metals were addressed in the analysis of soil samples for the purpose of providing supplemental data to the Comprehensive Environmental Response Compensation, and Liability Act (CERCLA) Remedial Investigation/Feasibility Study (RI/FS) characterization program, but were not included in evaluations of the Tank Car closure. The analytical results indicated that the surface soils in this area contain generally uniform concentrations of lead, mercury, cadmium, barium and chromium that are slightly greater than the mean background concentrations plus two standard deviations, as determined by the *FEMP Soil Background Study* (FERMCO 1993). As stated in Section 4.1.1 of the Tank Car RAWP/CPID, the mean background concentration plus two standard deviations for chromium (16.3 mg/Kg) will be the standard of clean for soils, in accordance with the OEPA Closure Plan Review Guidance Document (OEPA 1991).

It has been concluded that the measured surface soil concentrations are not likely to be the result of releases from the Tank Car because:

Table ES-1. Summary of Tank Decontamination and Excavation Verification.

Analytes	Total Chromium	pH	Nitrates (NO2/NO3-N)
Tank Decontamination:			
Tank Contents	2,030 mg/L	0.14	47,300 mg/L
4th Rinseate	0.63 J mg/L	3.22	146 mg/L
5th Rinseate	NA	6.00	2 mg/L
Soil Verification:			
Background (Mean + 2xSD)	16.3 mg/Kg	NA	NA
Soil 1c	16.02 mg/Kg	NA	NA
Soil 2c	10.8 mg/Kg	NA	NA
Soil 3c	12.6 mg/Kg	NA	NA
Soil 4b	11.73 mg/Kg	NA	NA
Soil 5b	12.53 mg/Kg	NA	NA

Laboratory Data Qualifiers:

U = The analyte concentration was not greater than the minimum detectable concentration (MDC) reported for the method

UJ = The analyte concentration was not greater than the MDC but deficiencies in data quality make the nondetect estimated

J = The analyte concentration was detected at a level greater than the MDC but deficiencies in data quality make the detection estimated

R = Deficiencies in data qulaity make the results unusable

N = Presumptive evidence exists for the presence of the analyte but the concentration cannot be quantified due to deficiencies in data quality

NV = The analytical result was not validated

Notes:

NA = Not analyzed

- Daily monitoring of the Tank Car has been conducted since 1991. This monitoring verifies that no leaks have occurred during that time. While the rails exhibit normal rust and staining, there is no visual evidence on the tank, tracks, or ground of past spills from the Tank Car.

- Process knowledge indicates there were no material transfers to/from the tank at this location. Material transfers took place elsewhere, and the Tank Car was moved to the HWMU location for storage only.

- The measured concentrations of metals in surface soil are fairly uniform throughout the area sampled, indicating an area-wide source rather than a point source. In the event of a point-source discharge from the Tank Car, resulting soil contamination would be expected to remain localized, and not produce uniformly distributed concentrations.

- Metal concentrations exceeded the mean soil background concentration plus two standard deviations for five of the eight metals analyzed; however, chromium was the only metal detected at an elevated concentration in the Tank Car contents. Further, the relative concentrations of the five metals are reasonably constant across all sampling locations, potentially indicating a common non-point source.

Although these detected metals concentrations are believed to be attributable to sources other than the Tank Car, surface soil within the Tank Car HWMU was removed until concentrations of chromium in remaining soil were below the standard of clean (16.3 mg/Kg). Twelve inches of surface soil were excavated across the full area. Verification samples collected from the base of the excavation indicated residual levels of chromium ranging from 10.8 to 16.0 mg/Kg, and are shown in Table ES-1. Soil beyond the HWMU boundaries was not removed. Additional sampling is being conducted outside the HWMU to further investigate the extent of soil contamination for future activities.

Supplemental TCLP analyses were performed on two of the surface soil samples where the total concentration of lead for one, and mercury for the other, were more than 20 times the TCLP regulatory levels, an indication that concentrations in leachate could exceed the regulatory levels (the elevated mercury result was subsequently determined to be in error, the sample was reanalyzed, and the new result was below 20 times the regulatory level). Lead was detected in only one of the two TCLP leachates, at a concentration of 0.047 mg/L, which is well below the TCLP regulatory level of 5 mg/L. Total chromium concentrations did not exceed 20 times the TCLP regulatory level in any of the samples. The analytical results indicate that excavated soils are non-hazardous, and their levels of radiological contamination are less than the Removal Action No. 17, Improved Storage of Soil and Debris, interim management guidelines (FEMP 1993). Excavated soils that were not used in backfilling the Pilot Plant Sump excavation, in accordance with Removal Action No. 17, were placed into stockpiles for interim management in accordance with Removal Action No. 17.

ES.3 CONCLUSIONS

The Tank Car and Area Removal Action/Closure encompassed removal and disposition of Tank Car contents, decontamination and disposition of the Tank Car, and excavation and interim management of contaminated surface soils within the Tank Car and Area HWMU. The primary objectives of the Tank Car action were:

- To ensure that the Tank Car contents and all rinseate water were properly stored, labeled, characterized, and dispositioned;
- To ensure that the Tank Car was properly cleaned and decontaminated; and
- To ensure that contaminated soil was removed to achieve clean closure and managed in accordance with Removal Action No. 17.

As detailed in this report, and summarized below, all objectives of the Tank Car Removal Action/Closure have been met.

The Tank Car contents and rinseates were pumped into portable tanks, and properly dispositioned via transfer into the NAR System for ultimate treatment through the UNH System.

A radiological contamination survey of the Tank Car determined that the car was free of significant external radiological contamination. Rinseate testing indicated that the tank was successfully decontaminated as summarized below:

1. Chromium concentrations of 0.543 and 0.718 mg/L in the 4th rinse, relative to the Decontamination Action Level of 0.75 mg/L,

2. A pH of 6 and 6.09 in the 5th rinse, relative to the Decontamination Action Level range of 6 to 9, and

3. Nitrate concentrations (as N) of 3.47 and 0.68 mg/L in the 5th rinse, relative to the Maximum Contaminant Level (MCL) of 10 mg/L.

Following completion of final rinseate testing, the Safe Shutdown Program separated the stainless steel tank from the rail car undercarriage, cut the tank open to prevent its reuse, and transferred these components to the scrap metal holding areas.

Verification soil samples collected from the base of the HWMU excavation indicated residual levels of chromium ranging from 10.8 to 16.02 mg/Kg, which satisfied the standard of clean (16.3 mg/Kg). Based on data indicating that excavated soils were non-hazardous, and the levels of radiological contamination were less than the Removal Action No. 17 interim management guidelines, the soils were used as backfill for the Pilot Plant Sump excavation, with the remainder placed into stockpiles for interim management in accordance with Removal Action No. 17.

1.0 INTRODUCTION

The Nitric Acid Tank Car (Tank Car), identified as the Nitric Acid Tank Car and Area, was declared a hazardous waste management unit (HWMU) in June 1991 since the discarded nitric acid was stored in excess of 90 days and has the hazardous characteristic of corrosivity (EPA Hazardous Waste No. D002). The Tank Car contents were subsequently determined to contain concentrations of chromium in excess of the regulatory limit and were, therefore, toxic (EPA Hazardous Waste No. D007). The Tank Car and Area is included in the list of HWMUs in the latest Resource Conservation and Recovery Act (RCRA) Part A and Part B Permit Applications submitted to the Ohio Environmental Protection Agency (OEPA).

The Tank Car and its contents was also identified as a removal action in the DOE letter DOE-667-92, "Proposed Phase III Removal Actions" (dated January 14, 1992) submitted to the U.S. Environmental Protection Agency (USEPA) pursuant to the Amended Consent Agreement (USEPA 1991).

The Tank Car and Area Removal Action Work Plan (RAWP)/Closure Plan Information and Data (CPID) described actions encompassing removal and disposition of Tank Car contents, decontamination and disposition of the Tank Car, and excavation and interim management of contaminated surface soils within the Tank Car and Area HWMU (FERMCO 1993). The Tank Car action was conducted in accordance with performance standards in Ohio Administrative Code (O.A.C.) 3745-66-11 (40 Code of Federal Regulations [C.F.R.] § 265.111). Applicable parts of these standards include:

1. Minimize the need for further maintenance (or inspection). Post-closure maintenance is not required where no hazardous wastes or unacceptable levels of contamination remain after closure (i.e., clean closure).

2. Controlling, minimizing, or eliminating, to the extent necessary to protect human health and the environment, the escape of hazardous waste or hazardous waste constituents.

3. Conducting closure actions in accordance with the provisions of an approved Plan.

The Tank Car field activities included those steps necessary to remove the Tank Car, its contents, and underlying soils as necessary to achieve clean closure in a manner that meets applicable regulatory criteria and minimizes the risk to human health and safety and the environment. The primary objectives of the Tank Car action were:

- To ensure that the Tank Car contents and all rinsate water were properly stored, labeled, characterized, and dispositioned;

- To ensure that the Tank Car was properly cleaned and decontaminated; and

- To ensure that contaminated soils were removed to achieve clean closure and managed in accordance with Removal Action No. 17 (FEMP 1993).

This document provides a summary of the activities conducted during the course of the Tank Car removal action and closure. Section 2.0 describes the unit's physical and contaminant characteristics. Section 3.0 summarizes the field activities, while Section 4.0 discusses the disposition of Tank Car hardware and contents, and excavated soils. Section 5.0 discusses the results of sampling and analysis, including validation of the analytical data. Section 6.0 summarizes the health and safety controls instituted during the field actions, and Section 7.0 contains references.

2.0 NITRIC ACID TANK CAR BACKGROUND INFORMATION

Nitric acid (HNO_3) was an important process chemical when the Feed Materials Production Center (FMPC [now Fernald Environmental Management Project, FEMP]) was producing uranium metal. Nitric acid was a primary chemical used in the formation of uranyl nitrate hexahydrate (UNH) solution, subsequently chemically transformed into uranium tetrafluoride. Nitric acid was also used throughout the FMPC production area for acid cleaning and metal pickling operations. From 1975 until 1981 more than 56 million pounds of concentrated (55 to 60 percent) nitric acid was purchased.

During peak production, Tank Car DODX17135 was used as an efficient means of temporary HNO_3 storage, providing 100,000 pounds of mobile storage capacity. The car was normally kept on a rail siding until either its contents or storage capacity were needed elsewhere on site. Following acid transfers, the car was returned to the siding. The Tank Car had been in its present location, unused, for approximately 6 years.

2.1 UNIT DESCRIPTION

The Tank Car had been located on a railway siding in the northeast corner of OU-3 (Figure 2-1). The Tank Car and that portion of the FEMP site interior track system on which the car resided (Figure 2-2) constitute the HWMU. The boundary of the HWMU is 40 feet long by 14 feet wide, encompassing a total area of 560 square feet. The HWMU is level and easily accessed via an adjacent roadway. Rail tracks and bare ground extend beyond the boundary of the HWMU.

The Tank Car was approximately 36 feet long and consisted of a 100,000 pound capacity stainless steel tank mounted on a railway carriage. The tank was about 6 feet in diameter and was accessed by a 3 feet diameter manway located at the tank's midpoint. The manway was covered with a metal plate that was attached to the tank with bolts around its circumference. During operations, the tank contents were removed via a pipe in the metal plate by adding air pressure to the tank (also through a pipe penetrating the plate). A pressure relief valve was installed in the tank through the manway cover. There were no visible signs of deterioration of the tank or carriage, but wooden blocks on which the tank was resting were noticeably degraded. Daily

48 54

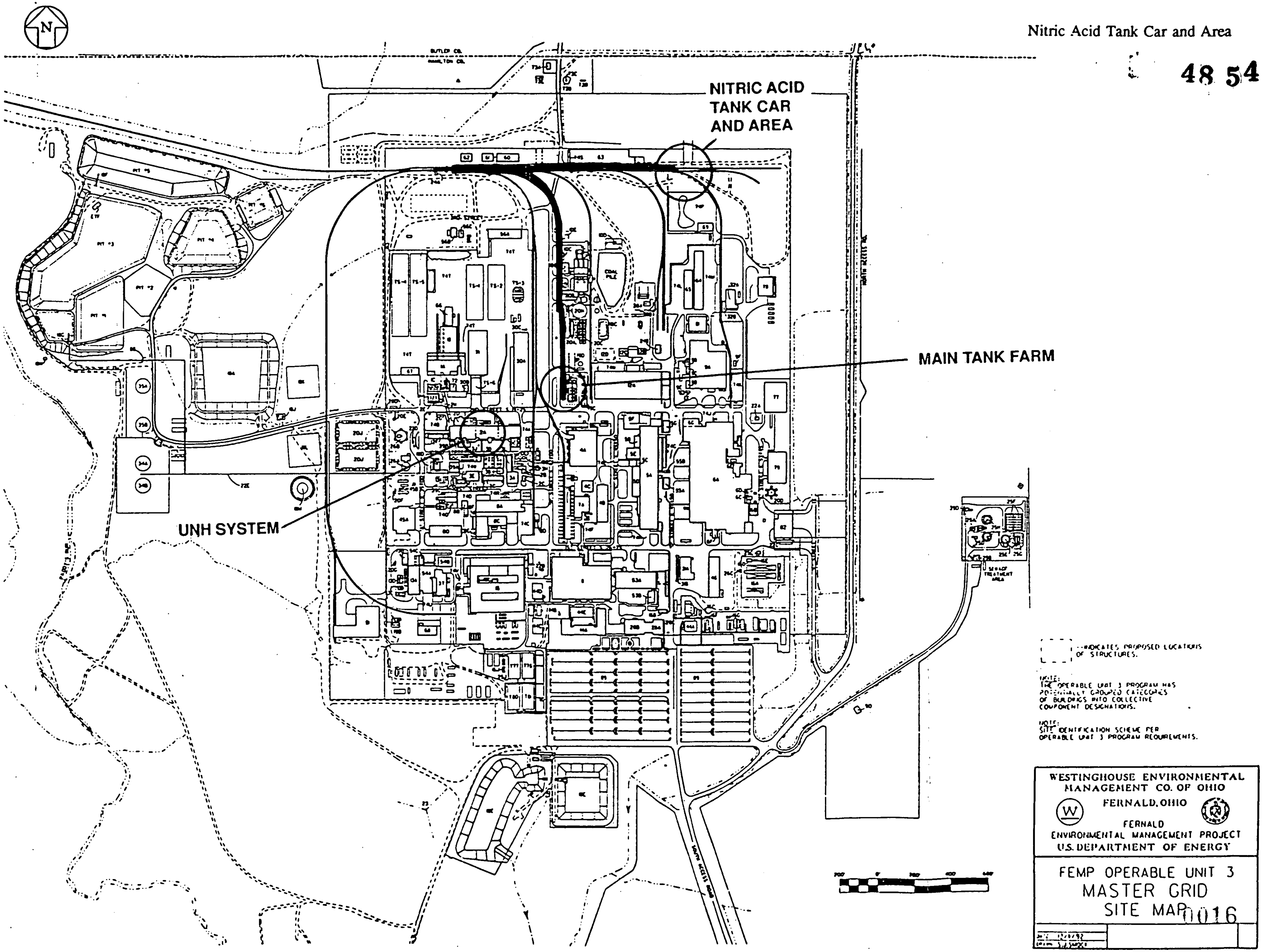

Figure 2-1. Master Grid Site Map.

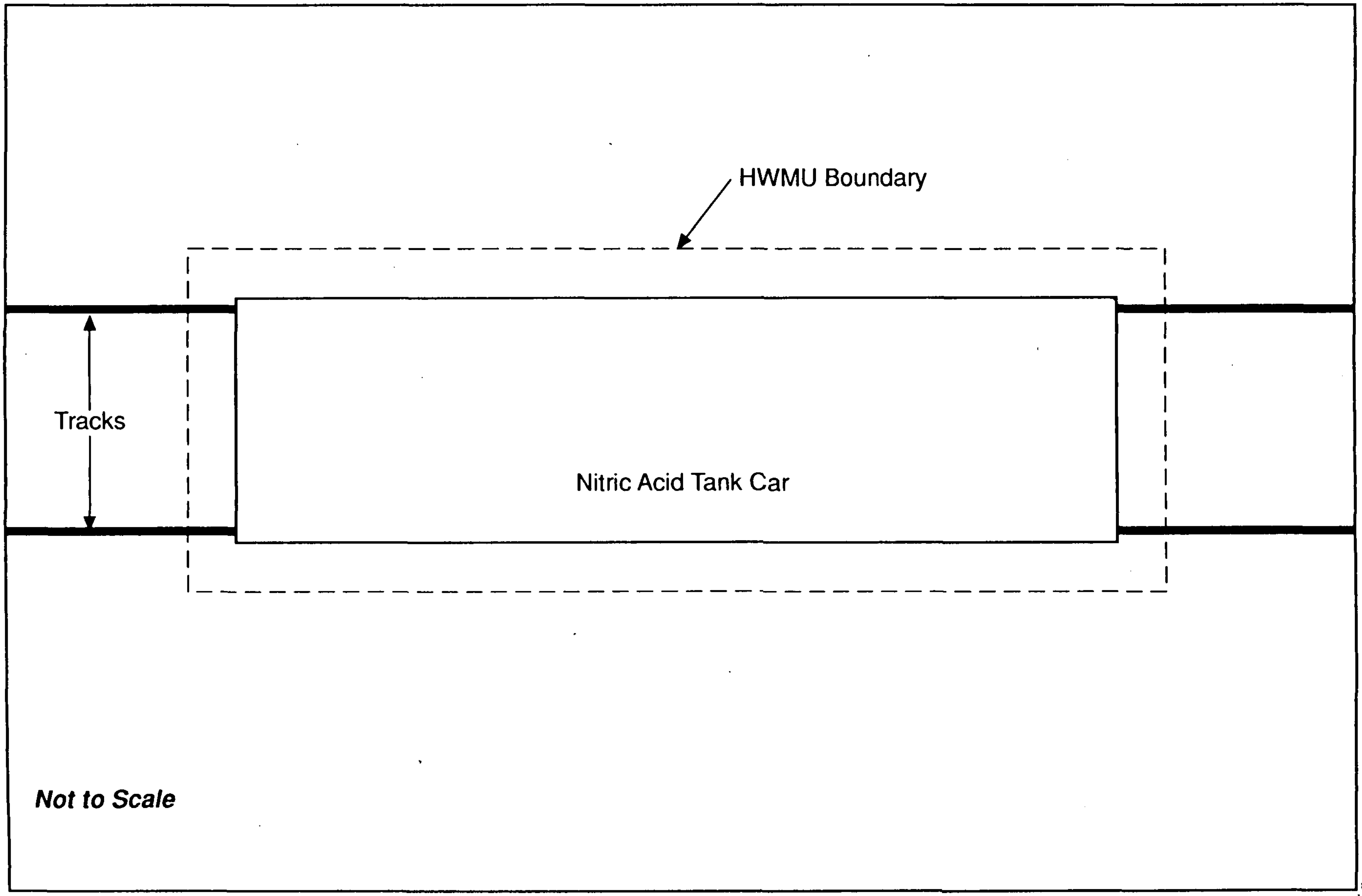

Figure 2-2. Nitric Acid Tank Car and Area HWMU.

inspections of the Tank Car and Area, in accordance with 40 C.F.R. § 265.195, did not reveal evidence of waste material leaking from the tank.

2.2 WASTE CHARACTERIZATION AND INVENTORY

Visual inspections of the Tank Car indicated that there was a relatively small amount of liquid remaining in the tank, estimated at between 50 to 100 gallons. Though small, the volume was sufficient to preclude exemption from the hazardous waste classification under the "empty container rule" (40 C.F.R. § 261.7 and O.A.C. 3745-51-07), which states that a container of greater than 110 gallons can contain no more than 0.3 percent by weight of its capacity and still be considered "empty." After production ceased in 1989, the material in the Tank Car was not considered unused acid, nor was it intended for future use.

The Tank Car and surrounding area have been inspected daily in compliance with inspection requirements for hazardous waste storage tanks (40 C.F.R. § 265.195). In addition, the contents have been sampled and analyzed for Toxicity Characteristic Leaching Procedure (TCLP) metals, total uranium, and acid normality. These analyses revealed that the liquid was approximately 3N HNO_3 with a pH less than 1, and contained approximately 2 mg/L uranium and 1,600 mg/L chromium (total and TCLP). The uranium concentration was very low, on the order of 1,400 pCi/L on a specific activity basis assuming natural uranium. As a result of the low pH and high chromium concentration, the tank contents were considered a RCRA hazardous waste due to the characteristics of corrosivity and toxicity. The normality of the liquid differed substantially from that of the concentrated reagent used during production (12N). No information was available to explain this difference, although two possible explanations were that: 1) the liquid is a rinseate left after a limited decontamination effort, or 2) the acid contents may have been partially neutralized prior to moving the car to the HWMU location.

3.0 DESCRIPTION OF THE TANK CAR ACTION

The goal of this combined removal action and closure was to remove the Tank Car contents; decontaminate and dispose of the Tank Car; characterize the contamination status of the soil underlying the Tank Car within the bounds of the Tank Car and Area; and remove soil as necessary to achieve clean closure. The following procedure was conducted to accomplish the work while maintaining worker exposure to chemical and radiological hazards as low as reasonably achievable (ALARA):

1) Survey HWMU boundaries
2) Transport Tank Car to Main Tank Farm
3) Remove and sample Tank Car contents
4) Collect and analyze soil samples
5) Decontaminate and dispose of Tank Car
6) Evaluate the feasibility of achieving clean closure
7) Remove soil as necessary to achieve clean closure.

A radiological survey for alpha and beta-gamma surface contamination was performed on March 29, 1993 to determine the radiological status of the Tank Car and work area prior to the start of field activities. With few exceptions, the survey determined the site to be free of measurable surface contamination or radiation dose rates. Removable alpha activity was observed to be below minimum detectable activity (MDA) for all locations. The four wheels of the Tank Car yielded beta-gamma activity of 2,000 to 5,000 dpm total contamination (fixed plus removable), but with removable activities of less than the MDA for beta-gamma. The top of the tank included a location with total beta-gamma activity of 2,000 dpm. One point at an end of the tank was below the MDA (1,000 dpm) for total beta-gamma contamination, although yielded removable beta-gamma activity of 33 dpm. Lastly, one rail tie within the HWMU exhibited the MDA of 1,000 dpm total contamination, with a removable level below the MDA. These values all are below the release criteria contained in DOE Order 5400.5 and are therefore determined to be insignificant.

Field work activities began in July 1993 and were completed in October 1993. Activities followed appropriate FEMP Standard Operating Procedures (SOPs) and the SCQ (FEMP 1992) to provide consistency with other FEMP actions. Changes to the

SCQ that occurred subsequent to finalization of the RAWP/CPID were followed in conducting the activities. All sampling events included the full implementation of Quality Assurance/Quality Control (QA/QC) procedures to ensure that high quality data were collected.

During the execution of this action, it was necessary to comply with industrial health and safety requirements. All field work activities were conducted in accordance with a site work permit and chemical hazardous material work permit (#24413), and radiation work permit (#9355-021).

The field procedures for this activity followed the Removal Action Work Plan/Closure Plan Information and Data (RAWP/CPID) to the extent practical, with minor changes made in adjustment to actual site working conditions or to expedite analyses. For the most part, these changes represented enhancements to the planned procedures and allowed for smoother conduct of the necessary tasks. Minor deviations from the plans are noted where appropriate throughout the text. No major deviations from the RAWP/CPID occurred.

3.1 SURVEY HWMU BOUNDARIES

A survey crew established the boundaries of the HWMU area on March 29, 1993 by surveying the four corners of the area relative to the southeast corner of the KC2 Warehouse. Control points determined for the four HWMU corners were then tied to established FEMP Site benchmarks based on the known reference point. Corners of the HWMU are shown below based on the Ohio State Planar Coordinates (1983).

HWMU Corner	Northing	Easting
Northwest	482,095.35	1,349,611.089
Northeast	482,095.35	1,349,651.089
Southwest	482,083.35	1,349,611.089
Southeast	482,083.35	1,349,651.089

These formally documented boundaries will allow recovery of the physical identity of the HWMU now that the Tank Car and underlying soil have been moved. Permanent survey monuments, as called for in the RAWP/CPID, were determined to be unnecessary to preserve the identity of this location.

3.2 TRANSPORT TANK CAR

The rail car track mover was used on August 26 to tow the Tank Car over existing on-site tracks to the Main Tank Farm. Prior to moving the Tank Car, its undercarriage was inspected and lubricated. The Tank Car was positioned over the tank farm dike pit, which contains a low-permability concrete liner, to provide a stable working surface, access for the crane needed to remove the access plate on the top of the Tank Car, and a barrier between potential spills and the environment. In this location, the Tank Car was within convenient working distance of tank farm utilities. These locations and the transport route are shown in Figure 2-1. The tank farm dike pit is a concrete sump designed to collect liquid wastes that might spill during transfer operations. Equipment lay down and work areas were prepared by spreading acid resistant ground coverings.

3.3 TANK CONTENTS REMOVAL

After the tank car was moved to the Main Tank Farm, the tank was opened and monitored, then its contents were sampled and transferred to a temporary portable holding tank (dumpster tank).

3.3.1 Removal of Access Plate/Piping and Sample Contents

A crane was used on August 26 to lift the access plate, along with attached piping. The dip tube was removed from the access plate and handled separately. All workers handling the access plate and piping wore saranex suits, airline respirators, and acid resistant gloves. The worker breathing zone and general area were monitored periodically during the work process.

Visual inspections of the tank interior and tank contents were performed from outside the tank via the access opening. Personnel did not enter the tank, and close inspections around the opening were conducted in accordance with requirements of the Health and

Safety Plan (HASP). Approximately 3 inches of liquid were observed on the bottom of the tank. Sampling was conducted on August 26 as described in Section 3.5.

3.3.2 Transfer of Contents

The Tank Car contents were transferred to a mobile stainless steel "dumpster" tank using SOP 20-C-014, Wet or Dry System Cleanout, on August 27. The transfer yielded 100 gallons of nitric acid from the tank. The dumpster tank remained near the Tank Car to receive initial rinse waters, as described in Section 3.4, before being transported to Tank F1-24 in the NAR System, for eventual disposition via the UNH System. The contaminant and pH characteristics of the NAR System are very similar to the Tank Car contents, and it was determined that the NAR System provided a more effective point of introduction to the UNH System. SOP 20-C-014 was again used to transfer the dumpster contents into Tank F1-24 from which it will ultimately be introduced to the UNH processing system.

3.4 TANK CAR DECONTAMINATION AND DISPOSAL

Following initial removal of the Tank Car contents, the Tank Car's internal surfaces were flushed with water sprays to remove residual traces of the nitric acid and its contaminants. Samples of the rinseates also were collected for analysis. The rinseates were transferred to portable tanks as discussed below. Tank Car decontamination was performed using SOP 20-C-916, Cleaning Sump Systems.

Decontamination Action Levels (DALs) were established in the RAWP/CPID (Section 4.0) based upon OEPA guidance (OEPA 1991). Decontamination was to be determined complete when the final rinseate samples contained concentrations of analytes at levels below the DALs. Uranium action levels were based on the limits in 10 C.F.R. § 20.2003 and DOE Order 5400.5.

The DALs were based on OEPA guidance contained in *Closure Plan Review Guidance* (OEPA 1991). That guidance indicates that decontamination rinseates must meet the following levels:

(1) Fifteen times the public drinking water maximum contaminant level for hazardous waste constituents as promulgated in 40 C.F.R. § 141.11 and O.A.C. 3745-81-11 for inorganics;

(2) If an MCL is not available for a particular contaminant, then fifteen times the Maximum Contaminant Level Goal (MCLG) as promulgated in 40 C.F.R. § 141.50; or

(3) If the product of fifteen times the MCL or MCLG exceeds 1 mg/l or if neither an MCL nor an MCLG is available for a particular contaminant, then 1 mg/L shall be the standard.

The DAL presented in the RAWP/CPID for nitrate was 1 mg/L, calculated in accordance paragraph (3) above. However, the MCL value for nitrate (as N) is 10 mg/L, creating the potential for tap water, used to rinse the Tank Car, to exceed the DAL. The Ohio EPA, Hazardous Waste Division (Columbus Office) was contacted on September 22, 1993, for additional guidance in the development and application of a DAL for nitrates. OEPA staff indicated that OEPA does not consider nitrates to be a hazardous waste in the context of HWMU closures, and that not all MCLs or MCLGs are necessarily to be considered when determining Decontamination Action Level requirements. As a result, the 1 mg/L nitrate DAL presented in the RAWP/CPID was in error.

While it was not the intent of OEPA that a DAL be established for nitrate, because it is not a hazardous waste constituent, nitrate is a contaminant of concern for the Tank Car. Therefore, for the purpose of the Tank Car closure, and consistent with the additional guidance provided by OEPA, nitrate concentrations in rinseate samples were evaluated relative to the MCL of 10 mg/L as the DAL. The complete DALs applied during the Tank Car decontamination efforts are presented in Table 3-1. Decontamination Action Levels were included for other inorganics, in addition to chromium, pending complete characterization of the Tank Car contents.

3.4.1 Tank Rinses

Flushing the Tank Car was conducted in three stages, involving a total of five rinses to remove residual acid and any solids that were present. Each rinse consisted of 100 gallons of water from a known source that has an approximate pH of 8.98 and nitrates as nitrogen of 0.5 mg/L. In the first stage, three separate rinses were performed and the total rinseate (approximately 300 gallons) was combined with the Tank Car contents in the dumpster tank. The first rinse was conducted on August 27, with the second and

Table 3-1. Decontamination Action Levels.

Analyte	MCL/MCLG (mg/L)[1/]	Decontamination Action Levels (mg/L)[2/]
CONTAMINANTS OF CONCERN		
Chromium	0.05	0.75
Nitrate	10	10
pH	-	6 to 9
OTHER INORGANICS[3/]		
Arsenic	0.05	0.75
Barium	1.0	1.0
Cadmium	0.01	0.15
Lead	0.05	0.75
Mercury	0.002	0.03
Nickel	0.1	1.0
Selenium	0.01	0.15
Silver	0.05	0.75

1/ Maximum Contaminant Levels or Maximum Contaminant Level Goals as listed in 40 C.F.R. Parts 141 and 142, and O.A.C. 3745-81-11.
2/ pH range is not characteristic of corrosivity.
3/ Decontamination Action Levels were included for other inorganics pending complete characterization of the Tank Car Contents

third rinses on August 28. The rinseate from each of these rinses was tested in the field for pH.

In the second stage, a fourth rinse was performed on August 28 to confirm that sufficient rinsing of the tank had occurred. Samples of the rinseate (approximately 100 gallons) were collected and submitted for laboratory analysis prior to transfer of the fluid to a separate dumpster tank. Based on results of those analyses, a third stage was added to conduct a final fifth rinse. Rinseate from the fifth rinse conducted on September 23 was sampled for analysis and then transferred to two 55-gal. drums for temporary storage. Sampling and analysis is described in Section 3.5.

The Tank Car's external surfaces had already been confirmed to be free from significant radiological contamination. Following evaluation of final rinseate analytical results, the Tank and rail car undercarriage were separated, the tank was cut open to prevent its reuse, and both components were transferred to the scrap metal holding area. These disassembly activities were conducted during the week of October 4.

3.4.2 Transfer of Rinseate for Treatment and Disposal

Following evaluation of the final analytical results, the rinseates (along with the Tank Car contents) were transported to Tank F1-24 in the NAR System. Transfer occurred during the week of October 11. SOP 20-C-014 was used to transfer the dumpster contents into Tank F1-24 from which it will ultimately be introduced to the UNH processing system. Although the RAWP/CPID indicated that the final rinseate would be transferred to the Plant 8 waste water treatment system, because of its small volume and the unavailability of the Plant 8 system, it was instead combined with the first four rinseates and transferred to the NAR System.

3.5 SAMPLE COLLECTION

Samples of both liquids and soil were collected for submittal to laboratories for analysis. Liquids sampling included the tank contents and tank rinseates. Soil sampling included initial sampling of gravel and soil, as well as confirmation sampling following soil removal. QA/QC samples and procedures (described in Section 3.5.3) accompanied all liquids and soil sampling events, with each sample set including a field blank, rinseate blank, and sample duplicate. Table 3-2 for liquids and Table 3-3 for soil present the date, identification, and analyses requested for all samples collected.

Two differences in analyses identified in the RAWP/CPID occurred. Analytical Support Levels (ASLs) for soil were indicated as ASL C and ASL D. This was done as specified for the soil characterization samples. Soil confirmation samples, although not directly specified in the RAWP/CPID, were conducted as ASL B to allow a more rapid turnaround of analytical results than would have been provided under ASL C and D. Also, gamma spectroscopy for liquid samples was specified in the RAWP/CPID but was not requested based on the performance of uranium isotopic analyses. Gross alpha and beta analyses were requested and performed, however, because the gross alpha and beta results were not critical to this action, they are not presented herein. Complete data

Table 3-2. Liquid Samples and Analyses.

Location Identification	Sample Number	Analis Number	Sample PT No.	ASL Level	Date Collected	Analyses Requested
Field blank	93-401-8656	930826-039	SP-FB	D	26-Aug-93	pH, Total TCLP-list Metals, Nitrates, Total and Isotopic Uranium, Gross Alpha/Beta
Rinse blank	93-401-8657	930826-040	SP-RB	D	26-Aug-93	pH, Total TCLP-list Metals, Nitrates, Total and Isotopic Uranium, Gross Alpha/Beta
Tank contents	93-401-8658	930826-041	SP-1	D	26-Aug-93	pH, Total TCLP-list Metals, Nitrates, Total and Isotopic Uranium, Gross Alpha/Beta
4th rinseate	93-401-8659	930830-049	SP-2	D	28-Aug-93	pH, Total TCLP-list Metals, Nitrates, Total and Isotopic Uranium, Gross Alpha/Beta
Duplicate (SP-2)	93-401-8660	930830-050	SP-3	D	28-Aug-93	pH, Total TCLP-list Metals, Nitrates, Total and Isotopic Uranium, Gross Alpha/Beta
1st rinseate	93-401-8661	n/a	SP-A	A	27-Aug-93	Field pH
2nd rinseate	93-401-8662	n/a	SP-B	A	28-Aug-93	Field pH
3rd rinseate	93-401-8663	n/a	SP-C	A	28-Aug-93	Field pH
Rinse blank	93-401-8771	930923-070	SP-RB	D	23-Sep-93	pH, Nitrates Gross Alpha/Beta
Field blank	93-401-8772	930923-071	SP-FB	D	23-Sep-93	pH, Nitrates Gross Alpha/Beta
5th rinseate-field	93-401-8773	n/a	SP-A	A	23-Sep-93	Field pH and Nitrate
Tap water - field	93-401-8777	n/a	SP-E	A	23-Sep-93	Field pH and Nitrate
5th rinseate-lab	93-401-8778	930923-072	SP-1	D	23-Sep-93	pH, Nitrates, Gross Alpha/Beta
Duplicate (SP-1)	93-401-8779	930923-073	SP-2	D	23-Sep-93	pH, Nitrates, Gross Alpha/Beta
Tap water - lab	93-401-8780	930923-074	SP-F	D	23-Sep-93	pH, Nitrates, Gross Alpha/Beta

n/a = Not applicable for field analyses

Table 3-3. Soil Samples and Analyses.

Location Identification	Sample Number	Analis Number	Sample PT No	ASL Level	Date Collected	Analyses Requested
Initial Soil Samples:						
Field blank	93-401-7995	930802-045	FB	D	30-Jul-93	pH, Total TCLP-list Metals, Nitrates, Total and Isotopic Uranium, Gross Alpha/Beta
Rinse blank	93-401-7996	930802-046	RB	D	30-Jul-93	pH, Total TCLP-list Metals, Nitrates, Total and Isotopic Uranium, Gross Alpha/Beta
Soil 1b	93-401-7997	930802-047	SP-1	D	30-Jul-93	pH, Total TCLP-list Metals, Nitrates, Total and Isotopic Uranium, Gross Alpha/Beta
Soil 2b	93-401-7998	930802-048	SP-2	C	30-Jul-93	pH, Total TCLP-list Metals, Nitrates, Total and Isotopic Uranium, Gross Alpha/Beta
Soil 3b	93-401-7999	930802-049	SP-3	C	30-Jul-93	pH, Total TCLP-list Metals, Nitrates, Total and Isotopic Uranium, Gross Alpha/Beta
Soil 4	93-401-8000	930802-050	SP-4	C	30-Jul-93	pH, Total TCLP-list Metals, Nitrates, Total and Isotopic Uranium, Gross Alpha/Beta
Soil 5	93-401-8001	930802-051	SP-5	C	30-Jul-93	pH, Total TCLP-list Metals, Nitrates, Total and Isotopic Uranium, Gross Alpha/Beta
Soil 6	93-401-8002	930802-052	SP-6	C	30-Jul-93	pH, Total TCLP-list Metals, Nitrates, Total and Isotopic Uranium, Gross Alpha/Beta
Soil 1a	93-401-8003	930802-053	SP-7	D	30-Jul-93	pH, Total TCLP-list Metals, Nitrates, Total and Isotopic Uranium, Gross Alpha/Beta
Soil 2a	93-401-8004	930802-054	SP-8	C	30-Jul-93	pH, Total TCLP-list Metals, Nitrates, Total and Isotopic Uranium, Gross Alpha/Beta
Soil 3a	93-401-8005	930802-055	SP-9	C	30-Jul-93	pH, Total TCLP-list Metals, Nitrates, Total and Isotopic Uranium, Gross Alpha/Beta
Duplicate (Soil 1b)	93-401-8006	930802-056	SP-10	D	30-Jul-93	pH, Total TCLP-list Metals, Nitrates, Total and Isotopic Uranium, Gross Alpha/Beta
Post Excavation Verification Soil Samples:						
Field blank	93-401-8664	200013207	FB	B	08-Sep-93	Total chromium, TCLP Chromium
Rinse blank	93-401-8665	200013208	RB	B	08-Sep-93	Total chromium, TCLP Chromium
Soil 4b	93-401-8666	200013209	SP-4	B	08-Sep-93	Total chromium, TCLP Chromium
Soil 5b	93-401-8667	200013210	SP-5	B	08-Sep-93	Total chromium, TCLP Chromium
Duplicate (Soil 5b)	93-401-8668	200013211	SP-5A	B	08-Sep-93	Total chromium, TCLP Chromium
Field blank	93-401-5396	200016730	FB	B	04-Oct-93	Total chromium
Rinse blank	93-401-5397	200016736	RB	B	04-Oct-93	Total chromium
Soil 1c	93-401-5398	200016737	SP-1	B	04-Oct-93	Total chromium
Soil 2c	93-401-5399	200016738	SP-2	B	04-Oct-93	Total chromium
Soil 3c	93-401-5400	200016739	SP-3	B	04-Oct-93	Total chromium
Duplicate (Soil 1c)	93-401-5401	200016740	SP-1A	B	04-Oct-93	Total chromium

results were not critical to this action, they are not presented herein. Complete data packages including laboratory QC results are maintained in the CRU-3 project files.

3.5.1 Collection and Analysis of Tank Contents and Rinseate Samples

Samples were collected from the Tank Car for tank contents and subsequent rinseates by use of a stainless steel ladle attached to an extension rod. Tank Car contents were sampled on August 26. Fourth rinseate samples were collected on August 28, with fifth rinseate samples collected on September 23. Contents were poured directly into sample containers. Field blanks, rinseate blanks, and duplicates also were submitted for each day that sampling occurred. Results of these analyses are discussed in Section 5.0 of this report.

Samples of the tank contents were submitted to laboratories for analysis of pH, nitrates (nitrate and nitrite as nitrogen), total TCLP-list metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver), and total and isotopic uranium (Table 3-2). Samples of rinseates for rinses one through three were analyzed in the field for field pH. The rinseate of the fourth rinse was sampled and analyzed for the same analytes as the tank contents. The rinseate for the fifth rinse, which was conducted because the pH and nitrate concentration of the fourth rinse were out of the target range, was analyzed for only pH and nitrates. Field pH values for the tank contents and rinseates for tank rinses one through the four were determined using litmus paper. Field probes for pH and nitrates were used for the fifth rinse.

The results of the total metals analyses of the rinseates indicated that TCLP limits would not be exceeded. Therefore, TCLP extractions were not performed. As discussed in Section 4.1, the rinseates were transferred, along with the Tank Car contents, to Tank F1-24 in the NAR System.

3.5.2 Collection and Analysis of Soil Samples

Soil within the HWMU area was sampled and analyzed for the presence of chromium, uranium, and nitrates, as well as to characterize the concentrations of seven other metals and total and isotopic uranium (Table 3-3). Sampling was conducted on July 30 and followed Section 3.3 of the RAWP/CPID. SCQ analytical procedures referenced in RAWP/CPID Tables 3-2 and 3-3 were converted to analytical standards in Appendix G in the most recent SCQ edition, which were followed in the conduct of these activities. Sample collection was conducted using a clean stainless-steel scoop. The scoop was used to loosen soil at sample locations for the interval of 0 to 6 inches. The loosened soil was then placed into containers using the scoop. QA/QC samples collected for all soil samples included field blanks, rinseate blanks, and duplicates, as described in Section 3.5.3.

Sample locations are indicated on Figure 3-1. Initial samples for soil characterization were collected and included nine samples at six locations. Three samples were collected of the gravel forming the track ballast at locations Soil 1 through Soil 3 (Soil 1a through Soil 3a). Soil samples were collected from 6 locations, Soil 1 through Soil 6, for which a shovel was used to remove gravel overlying the sample intervals. Because no sludge was present in the Tank Car, the sludge sample indicated in the RAWP/CPID was not collected.

Analysis of initial characterization samples was conducted for pH, total TCLP-list metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver), nitrates (nitrate and nitrite as nitrogen), and uranium (total and isotopic uranium). Analysis for the gravel samples varied from the RAWP/CPID in that the plan called for a TCLP-type extraction for metals analysis and the analysis actually performed was conducted for total metals without TCLP extraction to permit direct comparison to soil background levels. The results of total metals analyses for all samples were reviewed for the purpose of waste characterization to identify any sample for which TCLP criteria for metals potentially could be exceeded. Based on this screening, TCLP analysis was conducted for lead and mercury for Soil 1b due to initial laboratory reports of elevated concentrations (since amended in the final laboratory report to lower concentrations) and for Soil 4 because of an elevated lead concentration. No other samples indicated the potential to exceed TCLP criteria, thus no other TCLP analyses were conducted for the initial samples.

Soil removal to a 1-foot depth was conducted for the HWMU in response to detection of elevated chromium. Soil first was removed underlying the areas of samples Soil 4 and Soil 5 on September 8 based on preliminary laboratory results, and then for the entire HWMU on October 1 once final laboratory results were received. Subsequent to soil removal, sampling was again conducted for the five sample locations within the HWMU (Soil 1 through Soil 5). Samples at Soil 4 and Soil 5 were collected on September 8.

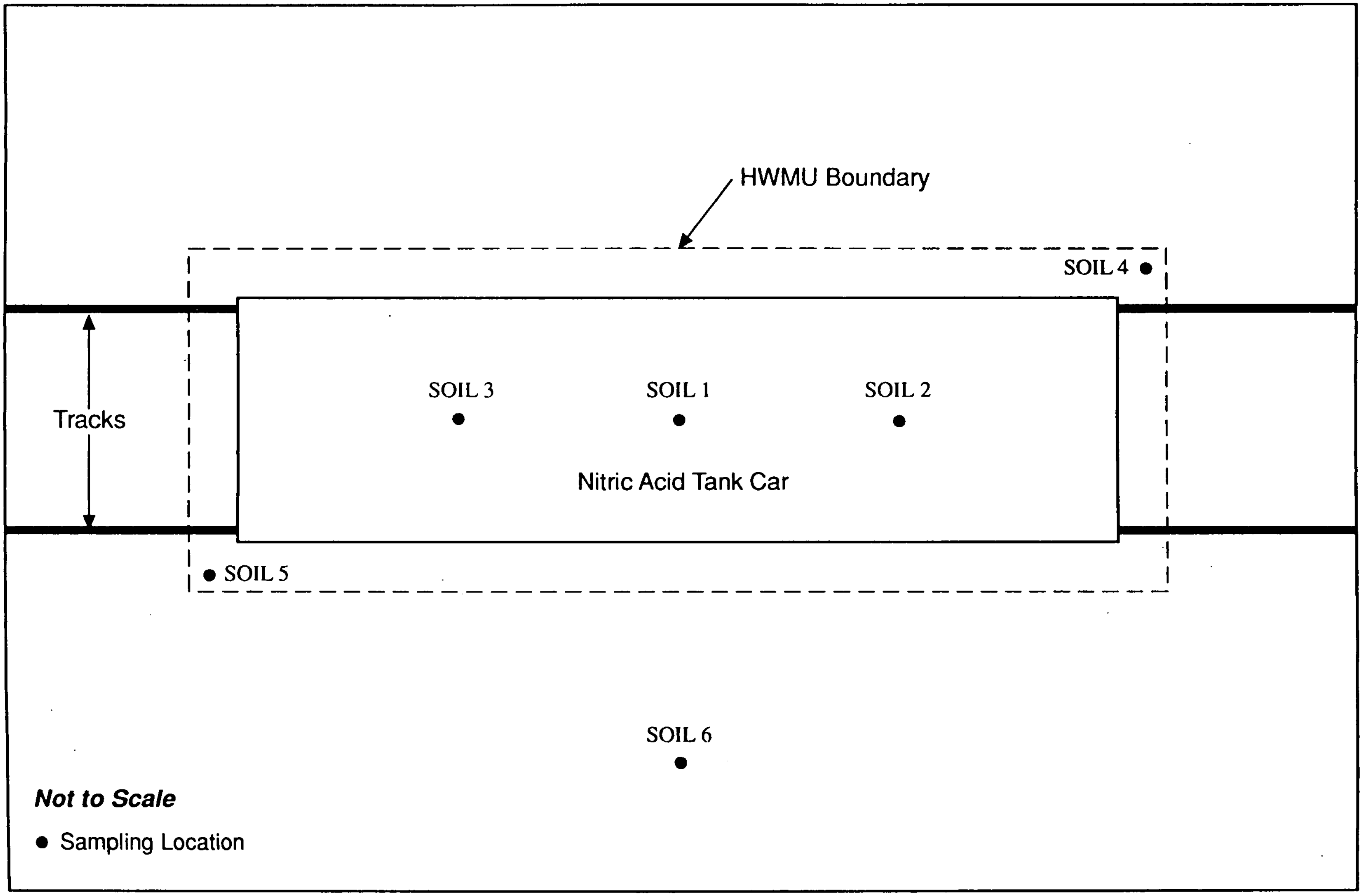

Figure 3-1. Soil sampling locations.

Samples at Soil 1, Soil 2, and Soil 3 were collected on October 4. Analyses of these samples for the 12- to 18-inch interval (0 to 6 inches below the base of the excavation) were for total chromium. In addition, chromium by TCLP was requested for the samples Soil 4b and Soil 5b (and supportive QA/QC samples) in order to meet the project time constraints in case these analyses were required.

3.5.3 QA/QC Samples

QA/QC samples followed specifications presented in the RAWP/CPID and are indicated on Tables 3-2 and 3-3. QA/QC samples comprised field blanks, rinseate blanks, and duplicate samples for all sampling activities conducted, including a complete set of QA/QC samples for each day that sampling occurred. QA/QC samples were analyzed for the same analytes as the environmental samples. Field blanks were collected by filling sample containers directly with laboratory-grade de-ionized (DI) water prior to the collection of environmental samples. Rinseate blanks for the tank samples were collected by pouring laboratory-grade DI water into the clean ladle and filling containers. Rinseate blanks for soil samples were collected by pouring DI water over the scoop into the containers. Duplicate liquid samples were collected by filling additional containers with the ladle at the same time as the environmental sample. Duplicate soil samples were collected along with environmental samples by filling containers with loosened soil from the same sample location.

3.5.4 Decontamination of Sampling Equipment

Sampling equipment was decontaminated prior to use and following sample collection by washing and rinsing. The procedure involved three buckets in which the first two were washes and the third a rinse. Wash buckets contained tap water with a laboratory-grade detergent. The rinse bucket contained laboratory-grade DI water.

3.6 SOIL REMOVAL

As identified in the RAWP/CPID, potential source contaminants from the Tank Car, based on its contents, are chromium, uranium, and nitrate. Analysis for these compounds in soil was requested for these constituents, along with analysis of seven other metals for the purpose of characterization. Analyses were also performed for pH, based on the presence of nitric acid. Characterization of the seven additional metals also supported the selection of interim management options, if necessary, for any excavated soil. Soil removal from the HWMU was guided by the collection of soil samples, with the extent and confirmation of the removal based on analytical results (presented in Section 5.0). As stated in Section 4.1.1 of the Tank Car RAWP/CPID, soil would be considered clean if none of the samples exceeded the mean background concentration plus two standard deviations for chromium. This value for chromium is 16.3 mg/Kg, as reported in the *FEMP Soil Background Study* (FERMCO 1993).

The surface soils within the Tank Car and Area HWMU, and one location outside the HWMU, were sampled and analyzed for a list of eight metals, pH, nitrates, and uranium (total and isotopic). The analytical results indicated that the surface soils in this area contain elevated concentrations of lead, mercury, cadmium, barium, and chromium for which at least one sample each was slightly greater than background concentrations determined by the *FEMP Soil Background Study* (FERMCO 1993). Nitrates, pH, and uranium appear to be within normal ranges. Because the chromium value is identified as the standard of clean, the elevated concentration of chromium relative to background for the HWMU was a significant finding and led to a limited soil removal.

It has been concluded that the measured surface soil concentrations of metals are not likely to be the result of releases from the Tank Car because:

- Daily monitoring of the Tank Car, conducted since 1991, has verified that no leaks have occurred. While the rails exhibit normal rust and staining, there is no visual evidence on the tank, tracks, or ground of past spills from the Tank Car.

- Process knowledge indicates there were no material transfers to/from the tank at this location. Material transfers took place elsewhere, and the Tank Car was moved to the HWMU location for storage only.

Although these detected metals concentrations are believed to be attributable to sources other than the Tank Car, surface soil within the Tank Car HWMU was removed until residual concentrations of chromium were below the mean background concentration plus two standard deviations, which is the standard of clean for soil. This approach is consistent with OEPA closure plan review guidance (OEPA 1991).

The background mean value plus two standard deviations for chromium is 16.3 mg/kg (FERMCO 1993). (The RAWP/CPID incorrectly identified the upper tolerance level, or UTL, value of 17.8 mg/kg as the standard of clean). Twelve inches of surface soil were excavated across the full area in two stages. Preliminary laboratory data indicated that elevated chromium with respect to background was identified for two sample locations (Soil 4 and Soil 5; see Section 5.0). Limited soil excavation was conducted on September 8 in the area of those two samples. Subsequent receipt of final laboratory results indicated elevated levels of chromium for all five sample locations, and additional excavation was conducted on October 1 to remove the top 12 inches of soil from the entire HWMU.

Supplemental TCLP analyses were performed on two of the surface soil samples where total concentrations in soil of lead for one, and mercury for the other, were more than 20 times the TCLP regulatory levels for TCLP leachate, indicating that the concentration in leachate could exceed the regulatory levels (the elevated mercury result was subsequently determined to be in error, the sample reanalyzed, and the new result was below 20 times the regulatory level). TCLP analyses were not performed for chromium because total chromium concentrations did not exceed 20 times the TCLP regulatory level in any of the samples. Analysis of the two TCLP leachates detected lead in only one sample, at a concentration of 0.047 mg/L, which is well below the 5 mg/L regulatory level. All other metals concentrations were below the screening level of 20 times the TCLP leachate criteria, so no other TCLP analyses were conducted.

Verification samples were collected as described in Section 3.5.2 to demonstrate sufficient soil removal to reduce chromium concentrations in soil remaining within the HWMU to below the standard of clean. No further soil removal was conducted following collection and analysis of the verification samples from the base of the excavation which indicated residual levels of chromium ranging from 10.8 to 16.02.

3.7 CERTIFICATION INSPECTIONS

Certification inspections were conducted by an independent registered professional engineer licensed in Ohio, to ensure that the Nitric Acid Tank Car and Area HWMU is closed in accordance with the RAWP/CPID. The major emphasis of the closure inspection was:

- To ensure that the sample collection techniques described in Section 3.3 of the RAWP/CPID were used;

- To ensure that the Nitric Acid Tank Car was properly cleaned and decontaminated;

- To ensure that all rinseate water was properly stored, labeled, and characterized; and

- To ensure that contaminated soils were removed to achieve clean closure and managed in accordance with Removal Action No. 17.

4.0 WASTE MANAGEMENT AND DISPOSITION

Several work activities associated with this removal/closure action produced waste. Management of the wastes followed the guidance of existing FEMP waste minimization and management programs. Types of wastes produced include the following:

- Tank contents
- Tank rinseates
- Tank Car hardware
- Railway materials
- Excavated soil
- Sampling waste
- Personal Protective Equipment.

The wide range of waste materials required that different disposal/treatment procedures be applied to the waste categories. The approach selected for each category is presented below.

4.1 TANK CONTENTS AND RINSEATES

The tank contents (100 gallons) and the first through third rinseates (300 gallons) were placed in a 500 gallon dumpster tank. The fourth rinseate (100 gallons) was placed in a separate dumpster tank, to which the fifth rinseate (100 gallons) later was added after initial storage in two 55-gallon drums. The liquid wastes were transferred from the dumpsters into the NAR System Tank F1-24. This is a slight deviation from the Work Plan specification of placing these wastes into the UNH System. It is believed that disposal for treatment through the NAR System tank is a more compatible disposal option for the waste because the tank contains acid that is used to flush the UNH system, after which it receives the same treatment. Also, the RAWP/CPID called for disposing of the final rinse to Tank 17, but the fifth rinse was included with the other rinse water as Tank F1-24 offered the best treatment option.

4.2 TANK CAR HARDWARE

The tank car was screened and cleared by a radiological survey. After rinsing was complete, a hole was cut to disable the tank and the tie bands were cut to separate the tank from the flat railcar. The metal was delivered to the scrap metal pile, with the tank delivered to the stainless steel pile and the car to the carbon steel pile.

4.3 RAILWAY MATERIALS

Railway materials consisted of steel rails and wooden ties that were removed to allow excavation of the underlying soil. Rails were cut at the edge of the HWMU. Rails and ties were then picked up as a single unit and placed onto plastic next to the site for temporary storage pending future reuse/recycling.

4.4 EXCAVATED SOIL

The excavation of surface soil within the HWMU yielded both soil and gravel. The initial soil excavation for areas underlying Soil 4 and Soil 5 placed soil for temporary storage into fifteen 55-gal. drums to await analytical results. Once the soil analyses were complete and demonstrated that no hazardous, low-level, or mixed waste was present, the drummed soil and subsequent excavation spoils for the entire HWMU were used as backfill for the Pilot Plant Sump excavation with the remainder transferred to stockpiles for interim management in accordance with Removal Action 17. The soil removal yielded approximately 40 yards of soil placed in a separate stockpile.

4.5 SAMPLING WASTE

Sampling wastes included wash and rinse waters from decontamination activities and samples returned by the laboratories following the analyses. Decontamination water and returned sample water was combined with the tank contents and rinseates water in the storage container and processed along with those wastes. Samples returned following disposition of the other liquid wastes were disposed of separately but in the same fashion. Soil samples returned from the laboratory were added to the excavated soil stockpile.

4.6 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) was worn during field activities. Two categories of protective clothing wastes were generated: disposable and reusable. Examples of disposable protective clothing were surgeon's gloves, and examples of clothing that could be decontaminated and reused were booties and respirators. The small quantities of PPE wastes generated by the activities were disposed of, or cleaned and reused, in accordance with existing SOPs (FMPC-0515, FMPC-2128, RM-0009I, FMPC-2152).

5.0 ANALYTICAL RESULTS

5.1 DATA VALIDATION

Analytical results from samples taken in connection with the Tank Car removal/closure action were validated to establish their usefulness and defensibility for assuring that site closure criteria are met. Results for pH, nitrate/nitrogen, total metals, and TCLP metals were validated according to the criteria contained in Section D of the *FEMP Sitewide CERCLA Quality Assurance Project Plan* (SCQ [FD-1000, 7/15/92]). Results from total uranium and isotopic uranium analyses were validated according to according to *Guidelines for ASL C (and D) Validation of TCT/CORE Laboratory Radiological Data Packages* developed for FEMP data validation efforts by Ebasco Environmental. Although the RAWP/CPID specified ASL D for specific nitrate and pH analyses, the highest level that these conventional parameters could be validated to was ASL C, which is consistent with requirements of the SCQ.

A summary of the data qualifiers assigned to each sample result is presented in Attachment A. Although a substantial number of analytical results were qualified as estimated due to various minor deficiencies, none of the data deemed critical to the Tank Car action (chromium, nitrate, pH) were qualified as unusable (R qualifier). The overall data quality is sufficient for use to verify closure criteria. Complete data packages, including laboratory QC results, are maintained in the CRU-3 project files.

5.2 ANALYTICAL RESULTS FOR LIQUID SAMPLES

Results for the tank contents and tank rinseates are shown in Table 5-1. Results for the tank contents confirm the results of previous sampling and analyses (Section 2.0). Besides the presence of nitric acid (indicated by pH 0.14), significant detections occurred for chromium at 2,030 mg/L and nitrite/nitrate (as nitrogen) at 47,300 mg/L. The concentration of total uranium was 0.201 mg/L. Other metals were detected at minor concentrations (Table 5-1). Results of rinseate samples show that the final rinseate satisfies all DALs.

Field pH values for the first through third rinseates demonstrate a steady progression in flushing of the acid from the tank. Although the pH determination for the fourth rinseate indicates a lower value than for the third, the methods for the determinations (litmus paper versus laboratory probe) are not readily comparable. The pH for the fifth

Table 5-1. Liquid Analytical Results.

Analytes	Sample Identification					
	Tank Contents	1st Rinseate	2nd Rinseate	3rd Rinseate	4th Rinseate	5th Rinseate
Total Chromium (mg/L):	2,030	NA	NA	NA	0.542 J	NA
Other Metals (mg/L):						
Arsenic	0.27 J	NA	NA	NA	0.0047 J	NA
Barium	1.47 J	NA	NA	NA	0.0041 UJ	NA
Cadmium	0.271 J	NA	NA	NA	0.005 UJ	NA
Lead	0.199 J	NA	NA	NA	0.001 UJ	NA
Mercury	0.00057	NA	NA	NA	0.0001 UJ	NA
Selenium	0.002 R	NA	NA	NA	0.002 .R	NA
Silver	0.0175	NA	NA	NA	0.001 UJ	NA
pH:	0.14	1	3	4	3.22	6.00
NO2/NO3-N (mg/L):	47,300	NA	NA	NA	146	3.47
Radionuclides:						
Total Uranium (mg/L)	0.201 J	NA	NA	NA	0.0002 J	NA
U-234 (pCi/L)	NA	NA	NA	NA	0.2 U	NA
U-235 (pCi/L)	NA	NA	NA	NA	0.1 U	NA
U-238 (pCi/L)	NA	NA	NA	NA	0.2 U	NA

Laboratory Data Qualifiers:
U = The analyte concentration was not greater than the minimum detectable concentration (MDC) reported for the method
UJ = The analyte concentration was not greater than the MDC but deficiencies in data quality make the nondetect estimated
J = The analyte concentration was detected at a level greater than the MDC but deficiencies in data quality make the detection estimated
R = Deficiencies in data qulaity make the results unusable
N = Presumptive evidence exists for the presence of the analyte but the concentration cannot be quantified due to deficiencies in data quality
NV = The analytical result was not validated
Notes:
NA = Not analyzed

rinseate indicates a continuation in the movement of the pH into the decontamination target range. The pH value of 6.00 and 6.09 (duplicate sample) for the fifth rinsate satisfy the DAL of a pH between 6 and 9.

Total metals analyses of the fourth rinseate indicated very low levels for all metals. Chromium was measured at 0.542 mg/L and 0.718 mg/L (duplicate sample) in the fourth rinseate, which is below the decontamination action level of 0.75 mg/L. Chromium was not analyzed for the fifth rinseate because compliance with the decontamination action level was demonstrated by the fourth rinseate.

Nitrates (as N) were determined for the fourth and fifth rinses. The fourth rinse had a value of 146 mg/L. A fifth rinse was conducted to lower the rinsate value below the DAL of 10 mg/L. The fifth rinseate yielded values of 3.47 mg/L and 0.68 mg/L (duplicate sample), which satisfies the DAL.

Total uranium and isotopic uranium were analyzed for the fourth rinseate. The analysis indicated that total uranium had been reduced to 0.0002 mg/L, compared to 0.2 mg/L in the tank contents. Isotopic uranium values were reported below the detection limit (Table 5-1). Due to the very low values, uranium analysis was not requested for the fifth rinseate.

5.3 ANALYTICAL RESULTS FOR SOIL SAMPLES

Soil samples were analyzed both for soil characterization activities and for removal verification.

5.3.1 Soil Characterization Results

Results for soil characterization samples are summarized in Table 5-2. Total metals analyses for the initial gravel and soil samples resulted in detections for barium, cadmium, chromium, lead, and mercury. Results for all of these detections in at least one sample each exceeded the background mean values plus two standard deviations (Table 5-2). The detections of these metals demonstrate a relatively even distribution across the HWMU. Only lead for Soil 4, which was detected at 6 times the next highest value, indicates a slightly anomalous value.

Table 5-2. Soil Characterization Analytical Results.

Analytes	Sample Identification											
	Background (Mean + 2xSD)	Soil 1a[a/]	Soil 1b	Soil 2a[a/]	Soil 2b	Soil 3a[a/]	Soil 3b	Soil 4	Soil 5	Soil 6[b/]	Geometric Mean[c/]	Standard Deviation[c/]
Total Chromium (mg/kg):	16.3	3.9	18.8	4.3	17.8	4.2	19.2	22.2	22.6	22.3	20.39	2.12
Other Metals (mg/kg):												
Arsenic	8.6	20.2 UJ	20.4 UJ	20.1 UJ	23.1 UJ	20.1 UJ	21.4 UJ	18.7 UJ	21.2 UJ	24.5 UJ	ND	ND
Barium	174.5	269 J	93.3 J	15.1 J	98.4 J	11.4 J	154 J	151 J	134 J	156 J	128.31	28.45
Cadmium	0.78	1.2 UJ	1.9 J	1.2 UJ	1.3 UJ	1.2 UJ	1.8 J	1.1 UJ	1.2 UJ	1.4 UJ	1.85	0.07
Lead	27.3	14.6 UJ	19.3 J	16.7 J	24.6 J	31.2 J	32 J	196	22.4 J	27.9 J	35.07	69.85
Mercury	0.16	0.06 U	0.06 UJ	0.18 U	0.11 U	0.09 U	0.65 J	0.14 U	0.36 U	0.96 J	0.79	0.22
Selenium	0.55	6.4 UJ	6.4 UJ	6.3 UJ	7.3 UJ	6.3 UJ	6.7 UJ	5.9 UJ	6.6 UJ	7.7 UJ	ND	ND
Silver	1.4	3.1 U	3.1 U	3 U	3.5 U	3 U	3.2 U	2.8 U	3.2 U	3.7 U	ND	ND
TCLP Metals (mg/L):												
Lead	--	NA	0.039 UJ	NA	NA	NA	NA	0.047 J	NA	NA	0.05	ND
Mercury	--	NA	0.0001 U	NA	NA	NA	NA	NA	NA	NA	ND	ND
pH:	--	7.89	7.92	7.71	8.09	8.22	7.86	7.9	7.18	7.97	7.81	0.32
NO2/NO3-N (mg/Kg):	--	NA	1.68	NA	2.02	NA	1.2	1.72	10.2	1.31	2.13	3.53

Table 5-2. Soil Characterization Analytical Results.

Analytes	Background (Mean + 2xSD)	Soil 1a[a]	Soil 1b	Soil 2a[a]	Soil 2b	Soil 3a[a]	Soil 3b	Soil 4	Soil 5	Soil 6[b]	Geometric Mean[c]	Standard Deviation[c]
Radionuclides:												
Total Uranium (mg/kg)	--	5.1 J	19.5	9.9 J	7.2	14.6 J	5.1	80.4	4.2	30.8 J	13.97	26.70
U-234 (pCi/g)	--	2.6	3.2	2.5	2.3	3.9	2.0	26.6	1.5	3.9	3.63	8.99
U-235 (pCi/g)	--	0.2	0.3	0.2	0.2	0.2	0.1	1.5	0.1	0.2	0.24	0.50
U-238 (pCi/g)	--	2.6	4.2	2.8	2.0	4.5	2.2	30.8	1.8	4.0	4.00	10.46

Laboratory Data Qualifiers:
U = The analyte concentration was not greater than the minimum detectable concentration (MDC) reported for the method
UJ = The analyte concentration was not greater than the MDC but deficiencies in data quality make the nondetect estimated
J = The analyte concentration was detected at a level greater than the MDC but deficiencies in data quality make the detection estimated
R = Deficiencies in data qulaity make the results unusable
N = Presumptive evidence exists for the presence of the analyte but the concentration cannot be quantified due to deficiencies in data quality
NV = The analytical result was not validated
Notes:
NA = Not analyzed
ND = Not detected
a/ = Track ballast sample consisting of gravel
b/ = Sample location is outside of HWMU
c/ = Calculated for detections only in soil samples; excludes track ballast samples Soil 1a, Soil 2a, and Soil 3a.

0042

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Total metal concentrations were compared to the TCLP leachate criteria for the purpose of waste characterization. TCLP analyses were performed on two of the surface soil samples where the total concentration of lead for one (Soil 4), and mercury and lead for the other (Soil 1b), were more than 20 times the TCLP leachate regulatory levels. The preliminary elevated mercury and lead results for Soil 1b were subsequently determined to be in error and revised to lower values in the laboratory report. In any event, lead was detected in only one of the two TCLP leachates, at a concentration of 0.047 mg/L, which is well below the TCLP regulatory level of 5 mg/L.

Analytical results for other parameters also are summarized in Table 5-2. The results for pH of soil and gravel indicates a very narrow range from 7.18 to 8.22, which are near neutral. Nitrate values range from 1.2 to 10.2 mg/Kg, with no notably high concentrations. Total uranium values fall within the range of 4.2 to 50.4 mg/Kg. None of the total uranium values nor the associated isotopic values are notably high, although concentrations for Soil 4 and Soil 6 (outside of the HWMU) are somewhat higher with respect to the other samples.

5.3.2 Verification Results

Soil excavation verification results are presented in Table 5-3. Soil samples from the base of the excavation at location Soil 1 to Soil 6 (Figure 3-1) indicate a range in total chromium from 10.8 to 16.02 mg/Kg. All results are below the soil clean standard of 16.3 mg/Kg (background mean plus two standard deviations). Two samples were analyzed for chromium by TCLP that yielded values below detection limits and well below the TCLP leachate criterium. The verification results confirm that sufficient soil was removed from the HWMU to reduce the total chromium value below the standard of clean.

Table 5-3. Soil Excavation Verification Results.

Analytes	Background (Mean + 2xSD)	Soil 1c	Soil 2c	Soil 3c	Soil 4b	Soil 5b
Total Chromium (mg/kg):	16.3	16.02	10.8	12.6	11.73	12.53
TCLP Chromium (mg/L):	--	NA	NA	NA	0.01 U	0.01 U

Laboratory Data Qualifiers:
U = The analyte concentration was not greater than the minimum detectable concentration (MDC) reported for the method
UJ = The analyte concentration was not greater than the MDC but deficiencies in data quality make the nondetect estimated
J = The analyte concentration was detected at a level greater than the MDC but deficiencies in data quality make the detection estimated
R = Deficiencies in data qulaity make the results unusable
N = Presumptive evidence exists for the presence of the analyte but the concentration cannot be quantified due to deficiencies in data quality
NV = The analytical result was not validated
Notes:
NA = Not analyzed

6.0 HEALTH AND SAFETY CONTROLS

Health and Safety controls and monitoring were conducted in accordance with the Work Plan. Monitoring of materials, work spaces, and personnel was conducted as specified in Table 3-1 of the RAWP/CPID, and no action levels were exceeded.

7.0 REFERENCES

Ebasco Environmental. *Guidelines for ASL C (and D) Validation of TCT/CORE Laboratory Radiological Data Packages.*

FEMP. 1992. *FEMP Sitewide CERCLA Quality Assurance Project Plan.*

FEMP (Fernald Environmental Management Project). 1993. *Improved Storage of Soil and Debris Removal Action 17 Work Plan.* Westinghouse Environmental Management Company of Ohio, Fernald, Ohio.

FERMCO (Fernald Environmental Restoration Management Corporation). 1993. *FEMP Soil Background Study.*

OEPA (Ohio Environmental Protection Agency). 1991. *Closure Plan Review Guidance.*

USEPA (U.S. Environmental Protection Agency). 1991. Amended Consent Agreement.

ATTACHMENT A

ANALYTICAL DATA VALIDATION

ATTACHMENT A

ANALYTICAL DATA VALIDATION

Analytical results from samples taken in connection with the Tank Car removal/closure action were validated to establish their usefulness and defensibility for assuring that site closure criteria are met. Results for pH, nitrate/nitrogen, total metals, and TCLP metals were validated according to the criteria contained in Section D of the FEMP Sitewide CERCLA Quality Assurance Project Plan (SCQ [FD-1000, 7/15/92]). Results from total uranium and isotopic uranium analyses were validated according to Guidelines for ASL C (and D) Validation of TCT/CORE Laboratory Radiological Data Packages developed for FEMP data validation efforts by Ebasco Environmental. Gross alpha and gross beta results are reported but were not validated due to the semiquantitative nature of these data. Data validation of included a review of the following information:

- Instrument initial and continuing calibration
- Duplicate sample results
- Laboratory control sample results
- Matrix spike and matrix spike duplicate results
- Method blank sample results
- Instrument background (radiochemical analyses)
- Chemical and radiometric recovery
- Reported vs raw data results

A summary of the data qualifiers assigned to each sample result is presented in Tables A.1 through A.25 along with the analytical result and analytical support level (ASL) to which the data was validated. The data validation qualifiers and codes are defined as follows:

Qualifier	Definition
U	The analyte concentration was not greater than the minimum detectable concentration (MDC) reported for the method.
UJ	The analyte concentration was not greater than the MDC but deficiencies in data quality make the nondetect estimated.

J The analyte concentration was detected at a level greater than the MDC but deficiencies in data quality make the detection estimated.

R Deficiencies in data quality make the results unusable.

N Presumptive evidence exists for the presence of the analyte but the concentration cannot be quantified due to deficiencies in data quality.

NV The analytical result was not validated

A.1 Minor Deficiencies

Low method precision was observed for barium analysis on soil samples (Laboratory Release Number (#) 4968) and arsenic and lead analyses for tank contents samples (#5299 and #5315). All associated results are qualified as either estimated detects (J) or nondetects (UJ).

Problems with achieving the required detection limit resulted in the arsenic, lead, selenium, and TCLP lead and mercury results from #4968 soil samples being qualified as estimated.

Deficiencies in method accuracy resulted in soil cadmium results and field blank results for arsenic and chromium in #4968 being qualified as estimated. Two chromium results from #5299 are estimated for the same reason.

The total uranium results for the field blank, rinse blanks, and 4 samples from #4968 were qualified as estimated because the indicated correlation (R^2) between phosphorescence intensity and lifetime was less than 0.95. All total uranium results for #5315 and 5299 are estimated because one replicate of the duplicate samples exhibited an $R^2 < 0.95$.

The nitrate/nitrogen results for #5546 were qualified as nondetects since all results were much less than the field blank results of 284000 μg/L.

Other package deficiencies include:

- All total metals results for the samples included in #5315 are qualified estimated since the sample was not preserved correctly (pH > 2.0).

- Two mercury results for #4968 are qualified estimated due to low spike recovery.

- Seven mercury results are coded as nondetects (not qualified) due to contamination of the rinseate blank sample.

- The barium and cadmium results from analysis number 930826-041 are qualified as estimated because sample serial dilution results were out of range.

- No weekly background count data was provided for alpha spectrometry detector number 1 or those numbered greater than 32. An inspection of the background counts reported in the sample raw data indicated background for these detectors is consistent with weekly counts reported. No data was qualified.

- The field and rinse blank results reported for the #4968 pH analysis were 1.79 and 1.71, respectively. This low pH resulted from addition of nitric acid as a preservative to the sample containers (per procedure since these samples are also the field and rinse blank for the metals and inorganic analyses). Since field and rinse blank samples are not typically required for pH samples, the data are not qualified.

- Isotopic uranium results were not reported for sample #930830-049 of release #5299. The laboratory experienced difficulties with the analytical method as a result of matrix interferences. Results will be forthcoming after these interferences are resolved. In any event, these results are not critical to completion of the Tank Car action.

A.2 Major Deficiencies

Selenium results from all 5 tank contents samples (Laboratory Release Numbers 5299 and 5315) are qualified as unusable (R) due to a matrix spike sample recovery of less than 30%. Matrix spike samples are analyzed to assess possible interference of the sample matrix on the analytical results. The very low recovery for selenium could indicate severe matrix interference.

Table A.1 pH (pH UNITS)

RELEASE NO. 4968, SOIL SAMPLES				
ANAL. NO.	ASL	RESULT	QUALIFIER	COMMENT
930802-045	D	1.79		FIELD BLANK FOR METALS/INORGANICS
930802-046	D	1.71		RINSE BLANK FOR METALS/INORGANICS
930802-047	D	7.92		
930802-048	C	8.09		
930802-049	C	7.86		
930802-050	C	7.90		
930802-051	C	7.18		
930802-052	C	7.91		
930802	D	7.89		
930802-054	C	7.71		
930802-055	C	8.22		
930802-056	D	8.06		
RELEASE NO.s 5299 AND 5315, TANK SAMPLES				
930826-039	D	5.78		FIELD BLANK
930826-040	D	5.77		RINSE BLANK
930826-041	D	0.14		
930830-049	D	3.22		
930830-050	D	2.97		
RELEASE #5546, TANK SAMPLES (FIFTH RINSE)				
930923-070	D	5.97		RINSE BLANK
930923-071	D	5.24		FIELD BLANK
930923-072	D	6.00		
930923-073	D	6.09		
930923-074	D	8.14		

Table A.2 NITRATE/NITRITE (AS NITROGEN)

RELEASE NO. 4968, SOIL SAMPLES (MG/KG)				
ANAL. NO.	ASL	RESULT	QUALIFIER	COMMENT
930802-045	D	97.3 MG/L		FIELD BLANK
930802-046	D	0.1 MG/L		RINSE BLANK
930802-047	D	1.68		
930802-048	C	2.02		
930802-049	C	1.20		
930802-050	C	1.72		
930802-051	C	10.2		
930802-052	C	1.31		
930802-056	D	1.70		
RELEASE NO.s 5299 AND 5315, TANK SAMPLES (MG/L)				
930826-039	D	0.03		FIELD BLANK
930826-040	D	0.06		RINSE BLANK
930826-041	D	0.14		
930830-049	D	146		
930830-050	D	198		
RELEASE #5546, TANK SAMPLES (FIFTH RINSE) (MG/L)				
930923-070	D	0.0423		RINSE BLANK
930923-071	D	284	R	FIELD BLANK; APPARENT CROSS CONTAMINATION
930923-072	D	3.47		
930923-073	D	0.88		
930923-074	D	0.147	U	

RDL - REQUIRED DETECTION LIMIT
IDL - INSTRUMENT DETECTION LIMIT
N/A - NOT ANALYZED

Table A.3 TOTAL METALS, SOIL SAMPLES, RELEASE NO. 4968

SAMPLE NO. 930802-045 (FIELD BLANK) ASL: D UNITS: µG/L			
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC	2.0	UJ	RDL 50%-80%
BARIUM	5.0	U	
CADMIUM	5.0	U	
CHROMIUM	6.0	UJ	RDL 50%-80%
LEAD	62.0	U	
MERCURY	0.2		
SELENIUM	1.1		
SILVER	1.0	U	

Table A.4 TOTAL METALS, SOIL SAMPLES, RELEASE NO. 4968

SAMPLE NO. 930802-046 (RINSE BLANK) ASL: D UNITS: µG/L			
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC	2.0	UJ	RDL 50%-80%
BARIUM	5.0	U	
CADMIUM	5.0	U	
CHROMIUM	6.0	UJ	RDL 50%-80%
LEAD	62.0	U	
MERCURY	0.1	U	
SELENIUM	1.0	U	
SILVER	1.0	U	

RDL - REQUIRED DETECTION LIMIT
IDL - INSTRUMENT DETECTION LIMIT
N/A - NOT ANALYZED

Table A.5 TOTAL METALS, SOIL SAMPLES, RELEASE NO. 4968

SAMPLE NO. 930802-047 ASL: D UNITS: MG/KG			
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC	20.4	UJ	IDL > RDL
BARIUM	93.3	J	DUPLICATE RPD OUT OF RANGE
CADMIUM	1.9	J	RDL 50%-80%
CHROMIUM	18.8		
LEAD	19.3	J	IDL > RDL
MERCURY	0.06	UJ	HOLDING TIME EXCEEDED
SELENIUM	6.4	UJ	IDL > RDL
SILVER	3.1	U	

Table A.6 TOTAL METALS, SOIL SAMPLES, RELEASE NO. 4968

SAMPLE NO. 930802-048 ASL: C UNITS: MG/KG			
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC	23.1	UJ	IDL > RDL
BARIUM	98.4	J	DUPLICATE RPD OUT OF RANGE
CADMIUM	1.3	UJ	RDL 50%-80%
CHROMIUM	17.8		
LEAD	24.6	J	IDL > RDL
MERCURY	0.11	U	RINSATE BLANK CONTAMINATION
SELENIUM	7.3	UJ	IDL > RDL
SILVER	3.5	U	

RDL - REQUIRED DETECTION LIMIT
IDL - INSTRUMENT DETECTION LIMIT
N/A - NOT ANALYZED

Table A.7 TOTAL METALS, SOIL SAMPLES, RELEASE NO. 4968

SAMPLE NO. 930802-049	ASL: C	UNITS: MG/KG	
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC	21.4	UJ	IDL > RDL
BARIUM	154	J	DUPLICATE RPD OUT OF RANGE
CADMIUM	1.8	J	RDL 50%-80%
CHROMIUM	19.2		
LEAD	32.0	J	IDL > RDL
MERCURY	0.65	J	SPIKE > 125%
SELENIUM	6.7	UJ	IDL >RDL
SILVER	3.2	U	

Table A.8 TOTAL METALS, SOIL SAMPLES, RELEASE NO. 4968

SAMPLE NO. 930802-050	ASL: C	UNITS: MG/KG	
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC	18.7	UJ	IDL >RDL
BARIUM	151	J	DUPLICATE RPD OUT OF RANGE
CADMIUM	1.1	UJ	RDL 50%-80%
CHROMIUM	22.2		
LEAD	196		
MERCURY	0.14	U	RINSATE BLANK CONTAMINATION
SELENIUM	5.9	UJ	IDL >RDL
SILVER	2.8	U	

RDL - REQUIRED DETECTION LIMIT
IDL - INSTRUMENT DETECTION LIMIT
N/A - NOT ANALYZED

Table A.9 TOTAL METALS, SOIL SAMPLES, RELEASE NO. 4968

SAMPLE NO. 930802-051	ASL: C	UNITS: MG/KG	
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC	21.2	UJ	IDL > RDL
BARIUM	134	J	DUPLICATE RPD OUT OF RANGE
CADMIUM	1.2	UJ	RDL > 50%-80%
CHROMIUM	22.6		
LEAD	22.4	J	IDL > RDL
MERCURY	0.36	U	RINSATE BLANK CONTAMINATION
SELENIUM	6.6	UJ	IDL > RDL
SILVER	3.2	U	

Table A.10 TOTAL METALS, SOIL SAMPLES, RELEASE NO. 4968

SAMPLE NO. 930802-052	ASL: C	UNITS: MG/KG	
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC	24.5	UJ	IDL > RDL
BARIUM	156	J	DUPLICATE RPD OUT OF RANGE
CADMIUM	1.4	UJ	RDL 50%-80%
CHROMIUM	22.3		
LEAD	27.9	J	IDL > RDL
MERCURY	0.96	J	SPIKE > 125%
SELENIUM	7.7	UJ	IDL > RDL
SILVER	3.7	U	

RDL - REQUIRED DETECTION LIMIT
IDL - INSTRUMENT DETECTION LIMIT
N/A - NOT ANALYZED

Table A.11 TOTAL METALS, SOIL SAMPLES, RELEASE NO. 4968

SAMPLE NO. 930802-053	ASL: D	UNITS: MG/KG	
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC	20.2	UJ	IDL > RDL
BARIUM	269	J	DUPLICATE RPD OUT OF RANGE
CADMIUM	1.2	UJ	RDL 50%-80%
CHROMIUM	3.9		
LEAD	14.6	UJ	IDL > RDL
MERCURY	0.06	U	RINSATE BLANK CONTAMINATION
SELENIUM	6.4	UJ	IDL > RDL
SILVER	3.1	U	

Table A.12 TOTAL METALS, SOIL SAMPLES, RELEASE NO. 4968

SAMPLE NO. 930802-054	ASL: C	UNITS: MG/KG	
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC	20.1	UJ	IDL > RDL
BARIUM	15.1	J	DUPLICATE RPD OUT OF RANGE
CADMIUM	1.2	UJ	RDL 50%-80%
CHROMIUM	4.3		
LEAD	16.7	J	IDL > RDL
MERCURY	0.18	U	RINSATE BLANK CONTAMINATION
SELENIUM	6.3	UJ	IDL > RDL
SILVER	3.0	U	

RDL - REQUIRED DETECTION LIMIT
IDL - INSTRUMENT DETECTION LIMIT
N/A - NOT ANALYZED

Table A.13 TOTAL METALS, SOIL SAMPLES, RELEASE NO. 4968

SAMPLE NO. 930802-055 ASL: C UNITS: MG/KG			
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC	20.1	UJ	IDL > RDL
BARIUM	11.4	J	DUPLICATE RPD OUT OF RANGE
CADMIUM	1.2	UJ	RDL 50%-80%
CHROMIUM	4.2		
LEAD	31.2	J	IDL > RDL
MERCURY	0.09	U	RINSATE BLANK CONTAMINATION
SELENIUM	6.3	UJ	IDL > RDL
SILVER	3.0	U	

Table A.14 TOTAL METALS, SOIL SAMPLES, RELEASE NO. 4968

SAMPLE NO. 930802-056 ASL: D UNITS: MG/KG			
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC	23.3	UJ	IDL > RDL
BARIUM	119	J	DUPLICATE RPD OUT OF RANGE
CADMIUM	1.4	UJ	RDL 50%-80%
CHROMIUM	22.3		
LEAD	16.9	J	IDL > RDL
MERCURY	0.14	U	RINSATE BLANK CONTAMINATION
SELENIUM	7.3	UJ	IDL > RDL
SILVER	3.5	U	

RDL - REQUIRED DETECTION LIMIT
IDL - INSTRUMENT DETECTION LIMIT
N/A - NOT ANALYZED

Table A.15 TOTAL METALS, TANK SAMPLES, RELEASE NOs. 5299 AND 5315

SAMPLE NO. 930826-039 (FIELD BLANK) ASL: D UNITS: µG/L			
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC	1.0	UJ	DUPLICATE RPD OUT OF RANGE
BARIUM	2.0	U	
CADMIUM	5.0	U	
CHROMIUM	6.0	UJ	RDL RECOVERY LOW
LEAD	1.0	UJ	DUPLICATE RPD OUT OF RANGE
MERCURY	0.1	U	
SELENIUM	2.0	R	SPIKE < 30%
SILVER	1.0	U	

Table A.16 TOTAL METALS, TANK SAMPLES, RELEASE NO. 5299 AND 5315

SAMPLE NO. 930826-040 (RINSE BLANK) ASL: D UNITS: µG/L			
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC	1.0	UJ	DUPLICATE RPD OUT OF RANGE
BARIUM	2.6		
CADMIUM	5.0	U	METHOD BLANK CONTAMINATION
CHROMIUM	6.0	UJ	RDL RECOVERY LOW
LEAD	1.0	UJ	DUPLICATE RPD OUT OF RANGE
MERCURY	0.1	U	
SELENIUM	2.0	R	SPIKE < 30%
SILVER	1.0	U	

RDL - REQUIRED DETECTION LIMIT
IDL - INSTRUMENT DETECTION LIMIT
N/A - NOT ANALYZED

Table A.17 TOTAL METALS, TANK SAMPLES. RELEASE NO. 5299 AND 5315

SAMPLE NO. 930826-041 ASL: D UNITS: µG/L			
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC	270	J	DUPLICATE RPD OUT OF RANGE
BARIUM	1470	J	SERIAL DILUTION
CADMIUM	271	J	SERIAL DILUTION
CHROMIUM	2030000		
LEAD	199	J	DUPLICATE RPD OUT OF RANGE
MERCURY	0.57		
SELENIUM	2.0	R	SPIKE < 30%
SILVER	17.5		

Table A.18 TOTAL METALS, TANK SAMPLES, RELEASE NO. 5299 AND 5319

SAMPLE NO. 930830-049 ASL: D UNITS: µG/L			
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC	4.7	J	pH>2
BARIUM	4.1	UJ	pH>2
CADMIUM	5.0	UJ	pH>2
CHROMIUM	542	J	pH>2
LEAD	1.0	UJ	pH>2
MERCURY	0.1	UJ	pH>2
SELENIUM	2.0	R	SPIKE < 30%
SILVER	1.0	UJ	pH>2

RDL - REQUIRED DETECTION LIMIT
IDL - INSTRUMENT DETECTION LIMIT
N/A - NOT ANALYZED

Table A.19 TOTAL METALS, TANK SAMPLES, RELEASE NO. 5299 AND 5315

SAMPLE NO. 930830-050 ASL: D UNITS: μG/L			
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC	1.9	J	pH>2
BARIUM	5.6	UJ	pH>2
CADMIUM	5.0	UJ	pH>2
CHROMIUM	718	J	pH>2
LEAD	1.0	UJ	pH>2
MERCURY	0.1	UJ	pH>2
SELENIUM	10	R	SPIKE >30%
SILVER	1.0	UJ	pH>2

Table A.20 TCLP METALS, SOIL SAMPLES, RELEASE NO. 4968

SAMPLE NO. 930802-047 ASL: D UNITS: μG/L			
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC			
BARIUM			
CADMIUM			
CHROMIUM			
LEAD	39.0	UJ	IDL > RDL
MERCURY	0.1	U	
SELENIUM			
SILVER			

RDL - REQUIRED DETECTION LIMIT
IDL - INSTRUMENT DETECTION LIMIT
N/A - NOT ANALYZED

Table A.21 TCLP METALS, SOIL SAMPLES, RELEASE NO. 4968

SAMPLE NO. 930802-050 ASL: C UNITS: μG/L			
ANALYTE	RESULT	QUALIFIER	COMMENT
ARSENIC			
BARIUM			
CADMIUM			
CHROMIUM			
LEAD	47.0	J	IDL > RDL
MERCURY			
SELENIUM			
SILVER			

RDL - REQUIRED DETECTION LIMIT
IDL - INSTRUMENT DETECTION LIMIT
N/A - NOT ANALYZED

Table A.22 TOTAL URANIUM

RELEASE NO. 4968, SOIL SAMPLES (μG/G)				
ANAL. NO.	ASL	RESULT	QUALIFIER	COMMENT
930802-045	D	0.1	UJ	FIELD BLANK;$R^2<0.95$
930802-046	D	0.1	UJ	RINSE BLANK
930802-047	D	19.5		
930802-048	C	7.2		
930802-049	C	5.1		
930802-050	C	50.4		
930802-051	C	4.2		
930802-052	C	30.8	J	$R^2<0.95$
930802-053	D	5.1	J	$R^2<0.95$
930802-054	C	9.9	J	$R^2<0.95$
930802-055	C	14.6	J	$R^2<0.95$
930802-056	D	9.1		
RELEASE NO.s 5299 AND 5315, TANK SAMPLES (μG/L)				
930826-039	D	0.1	UJ	FIELD BLANK;DUP $R^2<0.95$
930826-040	D	0.1	UJ	RINSE BLANK;DUP $R^2<0.95$
930826-041	D	201	J	"
930830-049	D	0.2	J	"
930830-050	D	0.3	J	"

RDL - REQUIRED DETECTION LIMIT
IDL - INSTRUMENT DETECTION LIMIT
N/A - NOT ANALYZED

Table A.23 ISOTOPIC URANIUM

RELEASE NO. 4968, SOIL SAMPLES (pCI/G)					
ANAL. NO.		AS	RESUL	QUALIFIER	COMMENT
930802-045	U234	D	0.1		FIELD BLANK
	U235	D	0.1	U	
	U238	D	0.1	U	
930802-046	U234	D	1.1		RINSE BLANK
	U235	D	0.1	U	
	U238	D	1.3		
930802-047	U234	D	3.6		
	U235	D	0.3		
	U238	D	4.6		
930802-048	U234	C	2.6		
	U235	C	0.2		
	U238	C	2.2		
930802-049	U234	C	2.2		
	U235	C	0.1		
	U238	C	2.32		
930802-050	U234	C	29.5		
	U235	C	1.6		
	U238	C	34.2		
930802-051	U234	C	1.7		
	U235	C	0.1		
	U238	C	2.0		
930802-052	U234	C	4.4		
	U235	C	0.2		

RDL - REQUIRED DETECTION LIMIT
IDL - INSTRUMENT DETECTION LIMIT
N/A - NOT ANALYZED

RELEASE NO. 4968, SOIL SAMPLES (pCI/G)					
ANAL. NO.		AS	RESUL	QUALIFIER	COMMENT
	U238	C	4.4		
930802-053	U234	D	0.9		
	U235	D	0.1		
	U238	D	1.0		
930802-054	U234	C	2.7		
	U235	C	0.2		
	U238	C	3.1		
930802-055	U234	C	4.3		
	U235	C	0.2		
	U238	C	4.9		
930802-056	U234	D	2.9		
	U235	D	0.2		
	U238	D	3.0		
RELEASE NO. 5299, TANK SAMPLES (pCI/L)					
930826-039	U234	D	0.3	U	FIELD BLANK
	U235	D	0.1	U	
	U238	D	0.3	U	
930826-040	U234	D	0.3	U	RINSE BLANK
	U235	D	0.1	U	
	U238	D	0.3	U	
930826-041	U234	D	N/A		
	U235	D	N/A		
	U238	D	N/A		

RDL - REQUIRED DETECTION LIMIT
IDL - INSTRUMENT DETECTION LIMIT
N/A - NOT ANALYZED

RELEASE NO. 4968, SOIL SAMPLES (pCI/G)					
ANAL. NO.		AS	RESUL	QUALIFIER	COMMENT
930830-049	U234	D	0.2	U	
	U235	D	0.1	U	
	U238	D	0.2	U	
930830-050	U234	D	0.2	U	
	U235	D	0.1	U	
	U238	D	0.2	U	

RDL - REQUIRED DETECTION LIMIT
IDL - INSTRUMENT DETECTION LIMIT
N/A - NOT ANALYZED

Table A.24 SOIL CONFIRMATION SAMPLES

RELEASE NO. 5417, TOTAL CHROMIUM (MG/KG)				
SAMPLE NO.	ASL	RESULT	QUALIFIER	COMMENT
93-401-8664	B	< 10	U	FIELD BLANK
93-401-8665	B	< 10	U	RINSE BLANK
93-401-8666	B	10.73		
93-401-8667	B	12.53		
93-401-8668	B	11.59		
TCLP CHROMIUM (MG/L)				
93-401-8666	B	<0.01	U	
93-401-8667	B	<0.01	U	
93-401-8668	B	<0.01	U	

Table A.25 SOIL CONFIRMATION SAMPLES

CONFIRMATION SAMPLES 1C-3C, TOTAL CHROMIUM (MG/KG)				
SAMPLE NO.	ASL	RESULT	QUALIFIER	COMMENT
93-401-5396	B	< 10	U	FIELD BLANK
93-401-5397	B	< 10	U	RINSE BLANK
93-401-5398	B	16.02		
93-401-5399	B	10.8		
93-401-5400	B	12.6		
93-401-5401	B	15.4	U	DUPLICATE OF 93-401-5398

RDL - REQUIRED DETECTION LIMIT
IDL - INSTRUMENT DETECTION LIMIT
N/A - NOT ANALYZED