

From: Trisha Haverkamp
To: "Patricia Swain" <PBS2@nrc.gov>,"Allen Gross" <ajg@nrc.gov>,"Michael Clark" <MJC1@nrc.gov>,"Andrea Kock" <ALK@nrc.gov>,"John Hayes" <JJH@nrc.gov>,"John Hull" <JTH@nrc.gov>,"Kenneth Kalman" <KLK@nrc.gov>,"Robert L. Johnson" <RLJ2@nrc.gov>,"Keith McConnell" <KIM@nrc.gov>,"Duane Schmidt" <DWS2@nrc.gov>,"Rebecca Tadesse" <RXT@nrc.gov>,"Shieldalloy_Public_Emails" <Shieldalloy_Public_Emails@nrc.gov>,"Jon Peckenpaugh" <JMP@nrc.gov>,"Sunil Weerakkody" <SDW1@nrc.gov>,"Shamica Walker" <SUW@nrc.gov>,"Brian Holian" <BEH@nrc.gov>,"Dana Caron" <DCC1@nrc.gov>,"Diane Screnci" <DPS@nrc.gov>,"Josephine Ambrosini " <JAT1@nrc.gov>,"John Kinneman" <JDK@nrc.gov>,"James Kottan" <JJK@nrc.gov>,"Mark Roberts" <MCR@nrc.gov>,"Marjorie McLaughlin" <MMM3@nrc.gov>,"Neil Sheehan" <NAS@nrc.gov>,"Nancy McNamara" <NTM@nrc.gov>,"Raymond Lorson" <RKL@nrc.gov>
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Recipients

"Patricia Swain" <PBS2@nrc.gov>
"Allen Gross" <ajg@nrc.gov>
"Michael Clark" <MJC1@nrc.gov>
"Andrea Kock" <ALK@nrc.gov>
"John Hayes" <JJH@nrc.gov>
"John Hull" <JTH@nrc.gov>
"Kenneth Kalman" <KLK@nrc.gov>
"Robert L. Johnson" <RLJ2@nrc.gov>
"Keith McConnell" <KIM@nrc.gov>
"Duane Schmidt" <DWS2@nrc.gov>
"Rebecca Tadesse" <RXT@nrc.gov>
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UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

January 11, 2008

Docket No. 04007102

License No. SMB-743

David Smith
Radiation Safety Officer
Shieldalloy Metallurgical Corporation
P.O. Box 768
Newfield, NJ 08344

SUBJECT: INSPECTION NO. 04007102/2006001, SHIELDALLOY METALLURGICAL CORPORATION, NEWFIELD, NEW JERSEY

Dear Mr. Smith:

On November 29, 2007, Mark Roberts of this office completed a safety inspection of activities associated with the decommissioning of the Shieldalloy Metallurgical Corporation site, 12 West Boulevard, Newfield, NJ. The inspection examined your licensed activities as they related to radiation safety and compliance with the Commission's regulations and license conditions. The inspector observed field activities, interviewed personnel, examined selected records, and made independent measurements of site radiation exposure rates. In addition, the inspector observed groundwater monitoring well water sample collection by your contractor, TRC Environmental Corporation. These water samples were split with the NRC and the New Jersey Department of Environmental Protection (NJDEP) for independent analysis of radiological parameters. The groundwater samples were analyzed by the NRC's contractor, the Oak Ridge Institute for Science and Education, a New Jersey state laboratory, and your contract laboratory. Following the on-site portion of the inspection, the inspector reviewed analytical data from the groundwater samples and related documents in the Region I office. The inspection results were discussed with you and David White by teleconference on November 29, 2007.

The enclosed report presents the results of this inspection. Analytical data for the groundwater samples from all three laboratories is tabulated in this report.

Based on the results of this inspection, the NRC has determined that one Severity Level IV violation of NRC requirements occurred. This violation is being treated as a Non-Cited Violation (NCV), consistent with Section VI.A. of the NRC Enforcement Policy. This violation is described in the subject inspection report. If you contest the violation or significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to; (1) the Regional Administrator, Region I and (2) the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001.

Current NRC regulations are included on the NRC's website at www.nrc.gov ; select **Nuclear Materials; Medical, Academic, and Industrial Uses of Nuclear Material**; then **Regulations, Guidance, and Communications**. The current NRC Enforcement Policy is included on the NRC's website at www.nrc.gov ; select **About NRC; Organization & Functions; Office of**

D. Smith

2

Enforcement; About Enforcement; then Enforcement Policy. You may also obtain these documents by contacting the Government Printing Office (GPO) toll-free at 1-866-512-1800. The GPO is open from 7:00 a.m. to 8:00 p.m. EST, Monday through Friday (except Federal holidays).

Please contact Mark Roberts at 610-337-5094 if you have any questions regarding this report.

Sincerely,

/RA/

Raymond K. Lorson, Chief
Decommissioning Branch
Division of Nuclear Materials Safety

Enclosure:
Inspection Report No. 04007102/2006001

cc w/encl:
State of New Jersey
Sue Mounier, Newfield Public Library
Joseph Curcio III, Mayor, Borough of Newfield, NJ
Jenny Goodman, NJDEP

D. Smith

2

NRC's website at www.nrc.gov ; select **About NRC; Organization & Functions; Office of Enforcement; About Enforcement**; then **Enforcement Policy**. You may also obtain these documents by contacting the Government Printing Office (GPO) toll-free at 1-866-512-1800. The GPO is open from 7:00 a.m. to 8:00 p.m. EST, Monday through Friday (except Federal holidays).

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U.S. NUCLEAR REGULATORY COMMISSION
REGION I

INSPECTION REPORT

Inspection No. 04007102/2006001

Docket No. 04007102

License No. SMB-743

Licensee: Shieldalloy Metallurgical Corporation

Location: Shieldalloy Metallurgical Corporation
Newfield Site
12 West Avenue
Newfield, NJ 08344

Onsite Inspection Dates: November 16, 2006
December 5, 2006
July 24 -25, 2007

In Office data review dates: October 14 - November 10, 2007

Inspector: Mark C. Roberts, Senior Health Physicist,
Division of Nuclear Materials Safety, Region I

Maisha Murry, Student Engineer
Division of Nuclear Materials Safety, Region I

John Hayes, Senior Project Manager
Office of Federal and State Materials and Environmental
Management Programs (FSME)

Approved By: Raymond Lorson, Chief
Decommissioning Branch
Division of Nuclear Materials Safety
Region I

Enclosure

EXECUTIVE SUMMARY

Shieldalloy Metallurgical Corporation

NRC Inspection Report No. 04007102/2006001

This inspection was a series of announced site visits by a regional inspector, a regional student engineer, and an NRC headquarters senior project manager to review site security, access control, storage and transfer of radioactive material, the site radiation protection program, and groundwater monitoring well sampling.

One Severity Level IV violation, failure to perform an annual review of the radiation protection program content and implementation as required by 10 CFR 20.1101, was identified. This violation is being dispositioned as a Non-Cited Violation (NCV) in accordance with the NRC Enforcement Policy, Section VI.A.

The licensee and their environmental sampling and laboratory contractors, New Jersey Department of Environmental Protection (NJDEP), and Region I staff coordinated splitting of groundwater monitoring well water samples during the routine groundwater sampling campaign in July 2007, and analyzed the samples for various radiological parameters. Elevated gross beta concentrations from two wells were attributable to naturally occurring potassium-40 (K-40). No elevated concentrations of total uranium were identified. The radium-226 (Ra-226) + radium-228 (Ra-228) concentration in one well, SC20D, exceeded the 5 pCi/l United States Environmental Protection Agency's (USEPA) Maximum Contaminant Level (MCL). Although this is not an NRC compliance issue regarding current site operations, the results are being considered in the NRC's review of the Shieldalloy Metallurgical Corporation (SMC) site decommissioning plan.

Enclosure

REPORT DETAILS

I. Site Security and Access Control

a. Inspection Scope

The inspector interviewed site personnel and toured the site perimeter to assess access controls for the site and controls of licensed materials.

b. Observations and Findings

Licensed material at the Shieldalloy Metallurgical Corporation (SMC) site consists of large piles of baghouse dust and slag materials stored on an eight-acre portion of the 60-acre site. (Note: baghouse dust is the large particulate material collected from the air filtration system during the smelting operations and slag is the ore residue remaining from the smelting operations following the removal of the metals of interest). Portions of the site, including the area where the baghouse dust and slag are stored, are surrounded by a chain-link fence topped with barbed wire. Locked gates on the north and south sides of the site provide access to groundwater monitoring wells. The gate on the west side of the site allows access to the site for trucks making pickups or deliveries of non-licensed material to or from warehouse buildings on the site. This gate is locked during non-business hours, but may be left open during regular business hours if a truck is expected and site personnel are available to visually monitor access. A gate allowing access only to a parking lot outside the controlled area is typically left open. Recently the licensee installed a new section of fence to separate the unrestricted portion of the SMC property (the warehouse buildings) from the controlled area. Sections of the fence and areas adjacent to the slag and baghouse dust piles were posted with "Caution - Radioactive Materials" signs.

c. Conclusions

No findings of significance were identified.

II. Storage and Transfer of Licensed Material

a. Inspection Scope

The inspector interviewed site personnel, reviewed selected documents, and toured the site to evaluate the storage and transfer of licensed material. The inspector also made independent measurements of exposure rates at various locations in the vicinity of the baghouse dust and slag piles.

b. Observations and Findings

Based on discussions with site personnel, SMC employed various smelting processes during prior operations at the site. Niobium ore containing NRC-licensed concentrations of thorium and uranium was utilized in some of the smelting operations to recover niobium metal. Vanadium and chrome ores that did not contain NRC-licensed concentrations of thorium and uranium were also used in site smelting operations. SMC

Enclosure

kept slag from these smelting operations separate from the licensed material on the site. Truckloads of the non-licensed slag were periodically shipped offsite for beneficial reuse and radiological screening controls were in place to prevent removal of NRC-regulated material. The eastern end of the site where much of this non-regulated material had been stored was generally clear of slag material, but the licensee has not conducted confirmatory radiation measurements in this area. This area remains under licensee control.

SMC estimated that approximately 18,000 m³ of slag and 15,000 m³ of baghouse dust is stored on the site. The material was in non-uniform piles with the slag piles located generally north and west of the baghouse dust piles. The slag ranged in size from gravel-sized pieces to over three feet in diameter. The baghouse dust was generally in large granular pieces. The piles were not covered, but the inspector noted that a "crust" had formed over the baghouse dust piles. The inspector measured radiation exposure rates using a Ludlum Measurements, Inc. Model 19 MicroR Survey meter at various locations in the piles and found values ranging from 16 to 3200 microrentgens per hour ($\mu\text{R/h}$). Radiation exposure rates were very non-uniform with the lowest levels measured on the baghouse dust piles and the highest levels measured on direct contact with some of the large slag pieces. The inspector measured background radiation exposure rates of 7 to 10 $\mu\text{R/h}$ in the vicinity of the site.

c. Conclusions

No findings of significance were identified.

III. Radiation Protection Program

a. Inspection Scope

The inspector interviewed site personnel, reviewed selected documents, and toured the site and site perimeter. The inspector made independent measurements of exposure rates at various locations along the fenceline where the licensee monitors the radiation exposure rate by thermoluminescent dosimeters (TLDs).

b. Observations and Findings

The RSO provided the inspector with a safety briefing prior to his initial site visit and updates upon subsequent visits. The inspector measured radiation exposure rates along the perimeter of the fenced storage yard. The inspector selected locations along the fence where the licensee monitors the radiation exposure rate with environmental TLDs. The inspector measured radiation exposure rates ranging from 22 to 300 $\mu\text{R/h}$ along the fenceline. The higher exposure rates were measured along the northern fence border, adjacent to the largest slag piles. The inspector reviewed quarterly monitoring reports from 2003 through the middle of 2007 for the fenceline TLDs and found the data to be consistent over time for each of the locations monitored; specifically, there appeared to be no upward or downward trend to the data. The TLD measurements were also consistent with the inspector's direct measurements.

The inspector reviewed an independent assessment of the radiation protection program conducted by an SMC consultant. The assessment appeared thorough for the areas examined and appropriate for the licensee's limited radiation protection program scope since the licensee has notified the NRC that it ceased operations and intends to decommission the site. The assessment report identified one finding, areas for improvement, and noteworthy practices. The inspector noted that the one finding identified in the program evaluation concerned the licensee's failure to perform an annual review of the radiation protection program content and implementation as required by 10 CFR 20.1101. The RSO stated that a program evaluation would be conducted for the current year to meet this regulatory requirement. The inspector determined that this violation was of low safety significance (Severity Level IV) since the licensee has ceased active operations at the site. This violation is being treated as a Non-Cited Violation (NCV), consistent with Section VI.A. of the NRC Enforcement Policy, because the violation was self-identified, the licensee committed to appropriate and timely corrective actions, and was not repetitive nor willful. **(NCV 04007102/2006001-01)**

c. Conclusions

Quarterly TLD measurements showed no increasing or decreasing exposure rate trends for the fenced site perimeter and were in good agreement with independent measurements conducted by the inspector. One Severity Level IV violation, failure to perform an annual review of the radiation protection program content and implementation as required by 10 CFR 20.1101, was identified and is being dispositioned as an NCV in accordance with the NRC Enforcement Policy.

IV. Groundwater Monitoring Well Water Sampling and Analysis

a. Inspection Scope

The inspector reviewed selected documents and interviewed site personnel and contractors regarding the groundwater monitoring program at the SMC site. In addition, the inspector coordinated splitting groundwater monitoring well water samples with the licensee and New Jersey Department of Environmental Protection (NJDEP) representatives during a routine groundwater sampling campaign in July 2007. Groundwater samples were analyzed for various radiological parameters by the licensee's contractor laboratory, the NJDEP laboratory, and the NRC contractor laboratory, the Oak Ridge Institute for Science and Education (ORISE). Data from the sample analyses of the three laboratories is reported in the tables located at the back of this report. Radiological data was supplied by the licensee and NJDEP, respectively, and is being presented with their respective permission. A map (from the SMC groundwater monitoring plan) indicating the location of the groundwater monitoring wells follows the tables.

b. Observations and Findings

During the inspection period, the inspector discussed the desire to obtain groundwater samples from selected monitoring wells for independent analysis of radiological parameters. The purpose of obtaining analytical data from SMC groundwater monitoring wells was to determine current groundwater concentrations of various radiological parameters since there was limited information available, compare current measurements to available previous measurements, and provide staff from the NRC Office of Federal and State Materials and Environmental Management Programs (FSME) with data useful for their review of SMC's request for site decommissioning. NJDEP representatives had also expressed interest in obtaining aliquots of groundwater monitoring well water samples for their own independent analysis for radiological parameters. The inspector, FSME staff and NJDEP representatives identified fourteen wells for sampling. One additional well, SC13S was identified, but could not be sampled due to damage to the well. The licensee arranged for these wells to be sampled during SMC's routine quarterly sampling campaign in July 2007. SMC collects groundwater from numerous wells on the site and vicinity and analyzes for non-radiological parameters. In addition, NJDEP representatives coordinated the sampling of two Newfield Borough offsite potable water wells. These two wells are located approximately 2000 feet north (Newfield #3) and approximately 3000 feet northeast (Newfield #5) of the north site boundary fence. Because the general groundwater flow beneath the SMC site is generally northeast to southwest and these two wells are located up gradient of the site groundwater flow; these wells are not expected to be impacted by site operations.

The inspector reviewed the licensee's contractor's sampling and analysis plan and found it appropriately discussed sampling apparatus and sample containers, well purging prior to sampling, sample identification, and sample shipment and chain of custody. The inspector observed that the licensee's contractors followed the sampling plan.

Each of the three laboratories analyzed each of the samples to determine concentrations for the following radiological parameters: gross alpha activity, gross beta activity, potassium-40 (K-40), radium-226 (Ra-226), radium-228 (Ra-228), and isotopic uranium (uranium-234 (U-234), uranium-235 (U-235), and uranium-238 (U-238)). The licensee's contractor and ORISE also analyzed samples for isotopic thorium concentrations (thorium-228 (Th-228), thorium-230 (Th-230), and thorium-232 (Th-232)). Results were reported in units of picocuries per liter (pCi/l). NJDEP decommissioning criteria include a provision that groundwater comply with the NJ Groundwater Quality Standards, which for radionuclides, incorporate the drinking water standards of the U.S. Environmental Protection Agency (EPA) (40 CFR 141). Because of this provision, the NJDEP laboratory also reported the total uranium concentration for each sample in units of micrograms per liter ($\mu\text{g/l}$) so that the data could be compared to the EPA standard. Although ORISE and the licensee's contract laboratory did not report total uranium in units of $\mu\text{g/l}$, the inspector included total uranium concentrations in Table 1C in $\mu\text{g/l}$ by applying a standard conversion factor to the uranium isotopic data.

In accordance with EPA regulations, gross alpha and gross beta analyses are used as screening methods to make initial determinations regarding compliance with radiological parameters for public drinking water supplies. The EPA regulations establish a

maximum contaminant level (MCL) for gross alpha activity of 15 pCi/l (excluding the contribution from uranium and radon), 30 µg/l for total uranium, and 4 millirem (mrem)/year for gross beta activity (minus the contribution from naturally occurring K-40). If the gross alpha activity exceeds 5 pCi/l, specific Ra-226 and Ra-228 analyses are required. The EPA MCL for Ra-226 + Ra-228 is 5 pCi/l. A gross beta screening measurement is used to evaluate compliance with the gross beta MCL. If the gross beta activity does not exceed the screening criteria of 50 pCi/l (minus the contribution from naturally occurring K-40), no other analyses are required to determine compliance with the gross beta MCL.

Because one of the decay products of Ra-228 (Ra-224) has a short radioactive half-life (3.7 days) and can be a contributor to the radiation dose if present, NJDEP requires the gross alpha analysis to be performed within 48 hours of sample collection. Gross alpha analysis of water samples performed within 48 hours of collection will typically have a higher results than those analyzed beyond 48 hours of collection if Ra-224 is present.

The NRC considers the potential radiation dose from groundwater radioactivity concentrations in its decommissioning regulations, but does not have specific regulations regarding groundwater concentrations of radioactive nuclides. Because the NRC was comparing gross alpha results to previous data and was obtaining baseline data for other wells, the NRC laboratory was not requested to analyze the groundwater samples within 48 hours. Therefore, the NRC gross alpha and gross beta data are not directly comparable to the data from the NJDEP and contractor laboratories because of the different analytical techniques.

Sample results overall show generally good agreement between the laboratories, but specific comparisons at very low concentrations are difficult due to the statistical nature of radioactive decay, sample homogeneity, and laboratory techniques. Data from all three laboratories for gross beta activity for wells SC12S and IWC1 exceeded the gross beta screening value of 50 pCi/l, but K-40 analyses showed that the gross beta results exceeded 50 pCi/l due to the presence of naturally occurring K-40. The Ra-226 + Ra-228 results for well SC20D from all three laboratories were greater than the 5 pCi/l MCL. Although this is not an NRC compliance issue regarding current site operations, the results are being considered in the NRC's review of the SMC site decommissioning plan. All total uranium results were less than the EPA MCL.

Monitoring wells SC25S, SC14S, SC11SR, and W2R were sampled by the NRC in April 2004 and analyzed by ORISE. The ORISE data, transmitted in their letter report dated April 28, 2004, is incorporated in inspection report 04007102/2003001 as a separate enclosure. The gross alpha data from 2004 and from 2007 are not statistically different. The gross beta activity for well SC14S is higher than the 2004 result, but the 2007 value is well below the 50 pCi/l gross beta screening value.

c. Conclusions

The licensee and their environmental sampling and laboratory contractors, NJDEP, and Region I staff coordinated splitting groundwater monitoring well water samples during the routine groundwater sampling campaign in July 2007, and analyzed the samples for various radiological parameters. Gross beta concentrations from two wells exceeding the 50 pCi/l screening value were attributable to naturally occurring K-40. No elevated concentrations of total uranium were identified. The Ra-226 + Ra-228 concentration in one well, SC20D, exceeded the 5 pCi/l EPA MCL. Although this is not an NRC compliance issue regarding current site operations, the results are being considered in the NRC's review of the SMC site decommissioning plan.

V. Exit Meeting Summary

An exit meeting was held with the SMC RSO and Technical Director by telephone on November 29, 2007. The licensee acknowledged the inspector's observations. The inspector confirmed that proprietary and safeguards information were not included in this inspection report.

TABLE 1A

Radiological Analysis of Groundwater Monitoring Well
Water Samples
Shieldalloy Metallurgical Corporation, Newfield, NJ
Gross Alpha, Gross Beta, Ra-226, Ra-228, and K-40 Concentrations
Results in Units of picocuries/liter ⁽¹⁾

| Sample Location | Analytical Laboratory | Gross Alpha | Gross Beta | Ra-226 | Ra-228 | K-40 |
|-----------------|-----------------------|-------------|-------------|-------------|-------------|------------------------|
| SC25S | Licensee | 6.52 ± 1.75 | 8.81 ± 4.28 | < 0.272 | 0.44 ± 0.05 | 2.28 ± 1.98 |
| | NJDEP | 0.76 ± 0.24 | 1.4 ± 0.28 | < 0.91 | < 2.0 | < 9.6 |
| | NRC | < 1.10 | 2.54 ± 0.97 | < 0.20 | < 0.88 | ⁽²⁾ |
| SC14S | Licensee | 3.56 ± 1.23 | 6.17 ± 2.93 | < 0.284 | 0.57 ± 0.05 | 3.50 ± 3.04 |
| | NJDEP | 2.35 ± 0.34 | 5.86 ± 0.38 | < 0.85 | < 2.0 | < 41 |
| | NRC | 1.17 ± 0.57 | 4.99 ± 0.91 | < 0.16 | < 0.78 | ⁽²⁾ |
| SC11SR | Licensee | < 0.943 | 4.20 ± 2.84 | < 0.408 | 0.25 ± 0.05 | 2.2 ± 1.91 |
| | NJDEP | 0.58 ± 0.18 | 3.09 ± 0.31 | < 0.95 | < 2.0 | < 56 |
| | NRC | < 0.55 | 1.77 ± 0.58 | < 0.16 | 1.14 ± 0.61 | ⁽²⁾ |
| SC12S | Licensee | 8.11 ± 3.81 | 115 ± 13 | 0.54 ± 0.23 | 1.04 ± 0.05 | 85 ± 74 |
| | NJDEP | 3.72 ± 0.64 | 56.7 ± 1.0 | < 1.0 | < 2.3 | 71 ± 19 |
| | NRC | < 4.4 | 99 ± 11 | 0.43 ± 0.13 | 1.48 ± 0.54 | 59 ± 66 ⁽²⁾ |
| SC12D | Licensee | 4.69 ± 1.57 | < 3.98 | 2.74 ± 0.31 | < 0.309 | 1.36 ± 1.18 |
| | NJDEP | 6.01 ± 0.44 | 4.27 ± 0.33 | 1.81 ± 0.53 | < 2.3 | < 11 |
| | NRC | 3.79 ± 0.60 | 2.79 ± 0.61 | 2.05 ± 0.28 | 2.28 ± 0.63 | ⁽²⁾ |
| W2R | Licensee | < 1.04 | 8.93 ± 3.14 | < 0.228 | < 0.491 | 9.31 ± 8.09 |
| | NJDEP | 1.40 ± 0.33 | 7.50 ± 0.42 | < 0.96 | < 2.1 | < 42 |
| | NRC | < 1.57 | 4.0 ± 1.5 | < 0.12 | 1.18 ± 0.47 | ⁽²⁾ |

(1) Uncertainties represent the 95% confidence level, based on total propagated uncertainties

(2) NRC laboratory performed K-40 analysis only on samples with elevated gross beta activity

(3) No data, sample container broken during shipment to laboratory

TABLE 1A (continued)

Radiological Analysis of Groundwater Monitoring Well
Water Samples
Shieldalloy Metallurgical Corporation, Newfield, NJ
Gross Alpha, Gross Beta, Ra-226, Ra-228, and K-40 Concentrations
Results in Units of picocuries/liter ⁽¹⁾

| Sample Location | Analytical Laboratory | Gross Alpha *** | Gross Beta | Ra-226 | Ra-228 | K-40 |
|-----------------|-----------------------|-----------------|----------------|----------------|----------------|------------------------|
| SC22S | Licensee | < 1.22 | < 4.08 | 0.49 ± 0.17 | <0.250 | 12.4 ± 10.8 |
| | NJDEP | 1.17 ± 0.36 | 13.7 ± 0.55 | < 0.93 | < 1.9 | <11 |
| | NRC | < 1.9 | 9.9 ± 1.9 | <0.14 | 1.09 ± 0.51 | ⁽²⁾ |
| IWC1 | Licensee | ⁽³⁾ | ⁽³⁾ | ⁽³⁾ | ⁽³⁾ | ⁽³⁾ |
| | NJDEP | 9.3 ± 1.3 | 51.4 ± 1.4 | < 0.78 | < 1.6 | 85 ± 16 |
| | NRC | 3.7 ± 2.4 | 50.2 ± 6.1 | 0.16 ± 0.10 | 2.17 ± 0.55 | 56 ± 66 ⁽²⁾ |
| IWC2 | Licensee | < 2.18 | 13.3 ± 4.31 | 1.27 ± 0.22 | < 0.194 | 20.8 ± 18.1 |
| | NJDEP | 3.71 ± 0.92 | 18.7 ± 0.89 | < 0.95 | < 2.2 | < 42 |
| | NRC | < 4.3 | 6.9 ± 3.7 | 0.75 ± 0.15 | 1.72 ± 0.56 | ⁽²⁾ |
| IWC3 | Licensee | 9.33 ± 1.98 | 11.7 ± 3.20 | 0.21 ± 0.11 | 1.86 ± 0.06 | 4.4 ± 3.82 |
| | NJDEP | 8.34 ± 0.63 | 8.98 ± 0.45 | < 0.66 | < 1.6 | <15 |
| | NRC | 2.75 ± 0.69 | 6.80 ± 0.92 | 0.12 ± 0.07 | 3.53 ± 0.63 | ⁽²⁾ |
| SC20S | Licensee | < 1.31 | 7.33 ± 3.42 | < 0.456 | 2.92 ± 0.05 | 11 ± 9.6 |
| | NJDEP | 1.94 ± 0.51 | 13.3 ± 0.8 | < 0.96 | < 2.1 | < 45 |
| | NRC | < 1.8 | 8.3 ± 1.7 | 0.21 ± 0.08 | 1.70 ± 0.59 | ⁽²⁾ |
| SC20D | Licensee | 24.8 ± 3.1 | 18.9 ± 3.7 | 3.34 ± 0.36 | 3.46 ± 0.07 | 1.97 ± 1.71 |
| | NJDEP | 23.5 ± 1.0 | 17.9 ± 0.6 | 2.88 ± 0.47 | 5.4 ± 1.0 | <11 |
| | NRC | 7.27 ± 0.89 | 8.6 ± 1.0 | 2.28 ± 0.24 | 6.03 ± 0.75 | ⁽²⁾ |

(1) Uncertainties represent the 95% confidence level, based on total propagated uncertainties

(2) NRC laboratory performed K-40 analysis only on samples with elevated gross beta activity

(3) No data, sample container broken during shipment to laboratory

TABLE 1A (continued)

Radiological Analysis of Groundwater Monitoring Well
Water Samples
Shieldalloy Metallurgical Corporation, Newfield, NJ
Gross Alpha, Gross Beta, Ra-226, Ra-228, and K-40 Concentrations
Results in Units of picocuries/liter ⁽¹⁾

| Sample Location | Analytical Laboratory | Gross Alpha | Gross Beta | Ra-226 | Ra-228 | K-40 |
|-----------------|-----------------------|-------------|-------------|-------------|-------------|----------------|
| SC26D | Licensee | 1.89 ± 1.30 | 4.88 ± 2.96 | <0.262 | <0.190 | 8.31 ± 7.22 |
| | NJDEP | 0.75 ± 0.35 | 7.91 ± 0.39 | < 0.98 | < 2.2 | 11.8 ± 5.8 |
| | NRC | 1.92 ± 0.95 | 8.1 ± 1.4 | <0.12 | 1.40 ± 0.53 | ⁽²⁾ |
| A | Licensee | < 1.71 | < 8.54 | 0.41 ± 0.20 | <0.244 | 2.46 ± 2.14 |
| | NJDEP | 1.53 ± 0.37 | 7.20 ± 0.50 | 0.50 ± 0.18 | < 0.71 | < 43 |
| | NRC | < 0.95 | 2.01 ± 0.95 | 0.13 ± 0.08 | 1.56 ± 0.61 | ⁽²⁾ |
| Newfield #3 | Licensee | 5.81 ± 1.67 | 5.55 ± 3.23 | 0.44 ± 0.16 | 0.55 ± 0.05 | 1.12 ± 0.97 |
| | NJDEP | 5.24 ± 0.40 | 7.12 ± 0.35 | 0.90 ± 0.24 | 0.98 ± 0.48 | < 13 |
| | NRC | 2.27 ± 0.70 | 4.9 ± 1.1 | 0.84 ± 0.15 | 1.89 ± 0.63 | ⁽²⁾ |
| Newfield #5 | Licensee | 16.6 ± 2.42 | 11.5 ± 3.16 | 1.25 ± 0.26 | 1.34 ± 0.06 | 2.1 ± 1.82 |
| | NJDEP | 12.0 ± 0.6 | 11.1 ± 0.4 | 1.75 ± 0.24 | 2.43 ± 0.31 | < 11 |
| | NRC | 2.54 ± 0.80 | 5.7 ± 1.2 | 0.91 ± 0.18 | 3.81 ± 0.68 | ⁽²⁾ |

(1) Uncertainties represent the 95% confidence level, based on total propagated uncertainties

(2) NRC laboratory performed K-40 analysis only on samples with elevated gross beta activity

(3) No data, sample container broken during shipment to laboratory

TABLE 1B

Radiological Analysis of Groundwater Monitoring Well
Water Samples
Shieldalloy Metallurgical Corporation, Newfield, NJ
Isotopic Thorium Concentrations
Results in Units of picocuries/liter ⁽¹⁾

| Sample Location | Analytical Laboratory ⁽²⁾ | Th-228 | Th-230 | Th-232 |
|-----------------|--------------------------------------|----------------|----------------|----------------|
| SC25S | Licensee | < 0.23 | < 0.52 | 0.34 ± 0.19 |
| | NRC | < 1.06 | 1.03 ± 0.41 | < 0.28 |
| SC14S | Licensee | < 0.21 | 0.66 ± 0.21 | 0.53 ± 0.18 |
| | NRC | < 0.31 | 1.13 ± 0.49 | < 0.50 |
| SC11SR | Licensee | < 0.18 | < 0.27 | < 0.25 |
| | NRC | < 0.72 | 0.58 ± 0.37 | < 0.35 |
| SC12S | Licensee | < 0.15 | 0.56 ± 0.20 | 0.70 ± 0.19 |
| | NRC | 0.71 ± 0.43 | 0.71 ± 0.36 | < 0.28 |
| SC12D | Licensee | 0.14 ± 0.09 | < 0.25 | 0.21 ± 0.12 |
| | NRC | < 0.76 | 0.92 ± 0.38 | < 0.11 |
| W2R | Licensee | 0.12 ± 0.09 | < 0.29 | 0.24 ± 0.11 |
| | NRC | < 0.78 | 0.81 ± 0.37 | < 0.28 |
| SC22S | Licensee | 0.15 ± 0.10 | 0.74 ± 0.21 | 0.72 ± 0.19 |
| | NRC | < 0.68 | 1.12 ± 0.46 | < 0.31 |
| IWC1 | Licensee | ⁽³⁾ | ⁽³⁾ | ⁽³⁾ |
| | NRC | < 0.87 | < 0.54 | < 0.50 |
| IWC2 | Licensee | 0.19 ± 0.10 | 0.30 ± 0.16 | 0.52 ± 0.15 |
| | NRC | < 0.79 | < 0.29 | < 0.11 |

(1) Uncertainties represent the 95% confidence level, based on total propagated uncertainties

(2) NJDEP laboratory did not perform isotopic thorium analyses

(3) No data, sample container broken during shipment to laboratory

Table 1B (continued)

Radiological Analysis of Groundwater Monitoring Well
Water Samples
Shieldalloy Metallurgical Corporation, Newfield, NJ
Isotopic Thorium Concentrations
Results in Units of picocuries/liter ⁽¹⁾

| Sample Location | Analytical Laboratory ⁽²⁾ | Th-228 | Th-230 | Th-232 |
|-----------------|--------------------------------------|-------------|-------------|-------------|
| IWC3 | Licensee | 0.30 ± 0.13 | 0.58 ± 0.20 | 0.35 ± 0.14 |
| | NRC | 1.25 ± 0.59 | 0.51 ± 0.34 | < 0.35 |
| SC20S | Licensee | 0.27 ± 0.12 | < 0.38 | 0.31 ± 0.13 |
| | NRC | 1.19 ± 0.58 | 1.11 ± 0.44 | < 0.13 |
| SC20D | Licensee | < 0.12 | 0.32 ± 0.16 | 0.17 ± 0.12 |
| | NRC | 1.15 ± 0.54 | 0.24 ± 0.19 | < 0.49 |
| SC26D | Licensee | < 0.17 | < 0.38 | 0.47 ± 0.15 |
| | NRC | 0.96 ± 0.50 | < 0.37 | < 0.29 |
| A | Licensee | < 0.08 | 0.44 ± 0.14 | 0.14 ± 0.07 |
| | NRC | 1.16 ± 0.55 | < 0.39 | < 0.34 |
| Newfield #3 | Licensee | < 0.16 | 0.45 ± 0.23 | 0.44 ± 0.17 |
| | NRC | 0.88 ± 0.49 | 0.31 ± 0.23 | < 0.34 |
| Newfield #5 | Licensee | 0.26 ± 0.16 | 0.58 ± 0.27 | 0.44 ± 0.20 |
| | NRC | < 0.99 | 0.44 ± 0.29 | < 0.46 |

(1) Uncertainties represent the 95% confidence level, based on total propagated uncertainties

(2) NJDEP laboratory did not perform isotopic thorium analyses

(3) No data, sample container broken during shipment to laboratory

Table 1C
 Radiological Analysis of Groundwater Monitoring Well
 Water Samples
 Shieldalloy Metallurgical Corporation, Newfield, NJ
 Isotopic and Total Uranium Concentrations
 Results in Units of picocuries/liter ⁽¹⁾

| Sample Location | Analytical Laboratory | U-234 | U-235 | U-238 | Total Uranium ^{(2) (3)} |
|-----------------|-----------------------|-------------|-------------|-------------|----------------------------------|
| SC25S | Licensee | 1.06 ± 0.49 | < 0.29 | < 0.46 | < 1.37 |
| | NJDEP | < 0.21 | < 0.12 | < 0.17 | < 0.49 |
| | NRC | < 0.59 | < 0.36 | < 0.29 | < 0.87 |
| SC14S | Licensee | < 0.39 | < 0.29 | < 0.46 | < 1.37 |
| | NJDEP | < 0.19 | < 0.11 | < 0.15 | < 0.44 |
| | NRC | < 0.77 | < 0.56 | < 0.28 | < 0.84 |
| SC11SR | Licensee | 1.36 ± 0.37 | < 0.19 | < 0.19 | < 0.57 |
| | NJDEP | < 0.19 | < 0.11 | < 0.15 | < 0.45 |
| | NRC | < 0.59 | < 0.41 | 0.22 ± 0.20 | 0.65 ± 0.59 |
| SC12S | Licensee | 1.04 ± 0.60 | < 0.51 | 0.49 ± 0.40 | 1.46 ± 1.19 |
| | NJDEP | < 0.43 | < 0.25 | < 0.34 | < 1.0 |
| | NRC | 0.25 ± 0.20 | < 0.39 | < 0.39 | < 1.16 |
| SC12D | Licensee | 1.18 ± 0.45 | 0.33 ± 0.26 | 0.84 ± 0.37 | 2.50 ± 1.10 |
| | NJDEP | < 0.18 | < 0.11 | < 0.15 | < 0.44 |
| | NRC | < 0.54 | 0.20 ± 0.20 | 0.16 ± 0.16 | 0.48 ± 0.48 |
| W2R | Licensee | 1.05 ± 0.72 | < 0.48 | < 0.77 | < 2.29 |
| | NJDEP | < 0.20 | < 0.11 | < 0.16 | < 0.47 |
| | NRC | < 0.72 | < 0.61 | < 0.43 | < 1.28 |

(1) Uncertainties represent the 95% confidence level, based on total propagated uncertainties

(2) Total uranium concentration in units of micrograms/liter

(3) Total uranium concentration calculated by NRC staff from measured U-238 concentration and applying conversion factor of 0.3365 pCi/μg

(4) No data, sample container broken during shipment to laboratory

Table 1C (Continued)
 Radiological Analysis of Groundwater Monitoring Well
 Water Samples
 Shieldalloy Metallurgical Corporation, Newfield, NJ
 Isotopic and Total Uranium Concentrations
 Results in Units of picocuries/liter ⁽¹⁾

| Sample Location | Analytical Laboratory | U-234 | U-235 | U-238 | Total Uranium ⁽²⁾⁽³⁾ |
|-----------------|-----------------------|-------------|-------------|-------------|---------------------------------|
| SC22S | Licensee | 0.64 ± 0.27 | 0.17 ± 0.13 | 0.31 ± 0.18 | 0.92 ± 0.54 |
| | NJDEP | < 0.036 | < 0.020 | < 0.028 | < 0.084 |
| | NRC | < 0.36 | < 0.14 | < 0.36 | < 1.07 |
| IWC1 | Licensee | (4) | (4) | (4) | (4) |
| | NJDEP | 0.06 ± 0.01 | < 0.034 | 0.05 ± 0.01 | 0.14 ± 0.03 |
| | NRC | < 0.32 | < 0.45 | < 0.47 | < 1.40 |
| IWC2 | Licensee | 1.37 ± 0.34 | 0.12 ± 0.10 | 0.16 ± 0.14 | 0.48 ± 0.42 |
| | NJDEP | < 0.29 | < 0.18 | < 0.20 | < 0.61 |
| | NRC | < 0.28 | < 0.14 | < 0.40 | < 1.19 |
| IWC3 | Licensee | 0.63 ± 0.24 | < 0.14 | 0.27 ± 0.17 | 0.80 ± 0.51 |
| | NJDEP | < 0.051 | < 0.032 | < 0.036 | < 0.11 |
| | NRC | < 0.11 | < 0.14 | < 0.11 | < 0.33 |
| SC20S | Licensee | 0.97 ± 0.39 | 0.29 ± 0.23 | < 0.41 | < 1.22 |
| | NJDEP | < 0.052 | < 0.032 | < 0.036 | < 0.11 |
| | NRC | < 0.32 | < 0.12 | < 0.25 | < 0.75 |
| SC20D | Licensee | 0.99 ± 0.34 | < 0.26 | < 0.45 | < 1.34 |
| | NJDEP | < 0.074 | < 0.046 | 0.09 ± 0.02 | 0.27 ± 0.05 |
| | NRC | < 0.27 | < 0.41 | < 0.39 | < 1.16 |

(1) Uncertainties represent the 95% confidence level, based on total propagated uncertainties

(2) Total uranium concentration in units of micrograms/liter

(3) Total uranium concentration calculated by NRC staff from measured U-238 concentration and applying conversion factor of 0.3365 pCi/μg

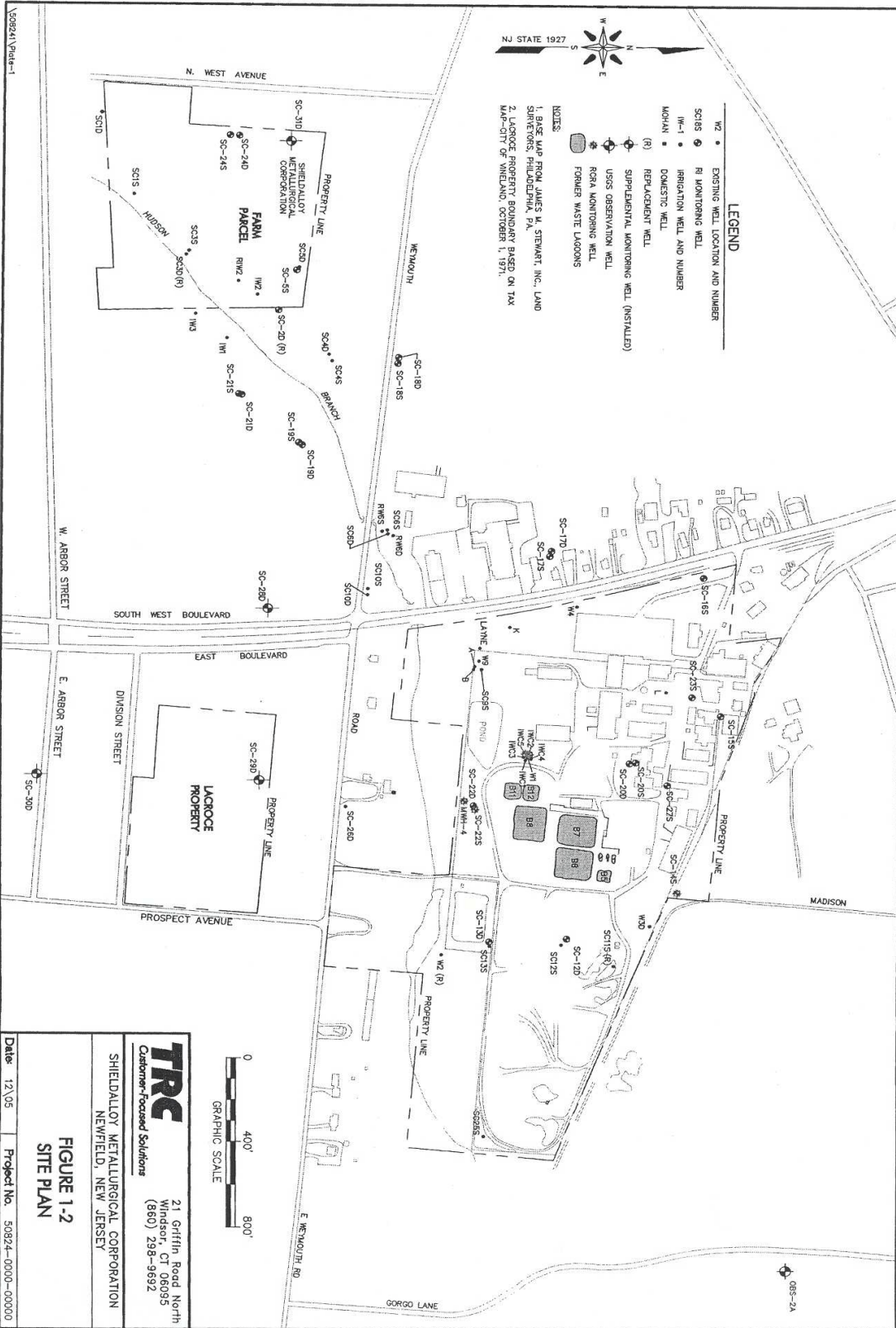
(4) No data, sample container broken during shipment to laboratory

Table 1C (Continued)
 Radiological Analysis of Groundwater Monitoring Well
 Water Samples
 Shieldalloy Metallurgical Corporation, Newfield, NJ
 Isotopic and Total Uranium Concentrations
 Results in Units of picocuries/liter ⁽¹⁾

| Sample Location | Analytical Laboratory | U-234 | U-235 | U-238 | Total Uranium ^{(2) (3)} |
|-----------------|-----------------------|-------------|-------------|-------------|----------------------------------|
| SC26D | Licensee | 3.18 ± 0.73 | 0.93 ± 0.46 | 0.99 ± 0.45 | 2.94 ± 1.34 |
| | NJDEP | 0.14 ± 0.02 | < 0.042 | 0.08 ± 0.02 | 0.23 ± 0.04 |
| | NRC | < 0.39 | < 0.13 | <0.27 | < 0.81 |
| A | Licensee | 0.77 ± 0.26 | 0.14 ± 0.12 | <0.24 | <0.72 |
| | NJDEP | < 0.053 | < 0.033 | < 0.037 | < 0.11 |
| | NRC | < 0.32 | < 0.13 | < 0.26 | <0.78 |
| Newfield #3 | Licensee | 1.13 ± 0.66 | < 0.52 | < 0.62 | < 1.85 |
| | NJDEP | < 0.052 | < 0.041 | 0.04 ± 0.01 | 0.11 ± 0.02 |
| | NRC | < 0.52 | < 0.50 | < 0.40 | < 1.19 |
| Newfield #5 | Licensee | 0.30 ± 0.22 | < 0.20 | < 0.31 | < 0.93 |
| | NJDEP | < 0.058 | 0.046 | 0.039 | < 0.12 |
| | NRC | < 0.45 | < 0.14 | < 0.11 | < 0.33 |

- (1) Uncertainties represent the 95% confidence level, based on total propagated uncertainties
 (2) Total uranium concentration in units of micrograms/liter
 (3) Total uranium concentration calculated by NRC staff from measured U-238 concentration and applying conversion factor of 0.3365 pCi/μg
 (4) No data, sample container broken during shipment to laboratory

1:500 1:1000 2:121 1:340



TRC
Customer-Focused Solutions
21 Griffin Road North
Windsor, CT 06095
(860) 298-9692

SHIELDALLOY METALLURGICAL CORPORATION
NEWFIELD, NEW JERSEY

FIGURE 1-2
SITE PLAN

Date: 12/05 Project No. 50824-0000-00000

Newfield # 3

Newfield # 5

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee and Contractors

| | |
|---------------|---|
| Carol Berger | Consultant, Integrated Environmental Management, Inc. (via phone) |
| Paul Cyr | Scientist, TRC Environmental Corporation |
| Jeff Saunders | Scientist, TRC Environmental Corporation |
| David Smith | Radiation Safety Officer, SMC |
| David White | Technical Director, SMC |

State of New Jersey

| | |
|----------------|--|
| John Caruso | Hazardous Site Mitigation Specialist II, NJDEP |
| Donna Gaffigan | Case Manager, NJDEP, |
| Jenny Goodman | Research Scientist I, NJDEP |

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened/Closed

| | | |
|---------------------|-----|--|
| 04007102/2006001-01 | NCV | Failure to perform an annual review of the radiation protection program content and implementation as required by 10 CFR 20.1101 |
|---------------------|-----|--|

Discussed - None

LIST OF DOCUMENTS REVIEWED

Ground Water Monitoring, Sampling and Analysis Plan - RCRA Monitoring Wells, prepared for Shieldalloy Metallurgical Corporation, prepared by TRC Environmental Corporation, December, 2005.

Radiation Protection Program Evaluation, Report No. 94005/A-122, Integrated Environmental Management, November 13, 2006.

Quarterly Perimeter Monitoring Results reports, January 2003 - June 2007, Integrated Environmental Management.

NRC contractor analytical results for July 2007 groundwater samples from the SMC Newfield, NJ site, Oak Ridge Institute for Science and Education, October 8 and November 26, 2007.

SMC contractor analytical data reports for July 2007 groundwater samples from the SMC Newfield, NJ site.

Spreadsheets and laboratory reports tabulating NJDEP analytical data from July 2007 groundwater samples from the SMC Newfield, NJ site.

LIST OF ACRONYMS

| | |
|----------------|---|
| CFR | Code of Federal Regulations |
| K-40 | Potassium-40 |
| m ³ | Cubic Meter |
| mrem | millirem |
| MCL | Maximum Contaminant Level |
| NCV | Non-cited Violation |
| NJDEP | New Jersey Department of Environmental Protection |
| NRC | Nuclear Regulatory Commission |
| Ra-226 | Radium-226 |
| Ra-228 | Radium-228 |
| RCRA | Resource Conservation Recovery Act |
| RSO | Radiation Safety Officer |
| SMC | Shieldalloy Metallurgical Corporation |
| Th-228 | Thorium-228 |
| Th-230 | Thorium-230 |
| Th-232 | Thorium-232 |
| TLD | Thermoluminescent Dosimeter |
| U-234 | Uranium-234 |
| U-235 | Uranium-235 |
| U-238 | Uranium-238 |
| µg/l | micrograms per liter |
| µR/h | microrentgens per hour |
| USEPA | United States Environmental Protection Agency |