SCIENTECH

March 8, 2005
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Ms. Marjorie McLaughlin
U.S. Nuclear Regulatory Commission
475 Allendale Rd.
King of Prussia, PA 19406

Subject: Program Plan for Whittaker Site Remediation
License Number SMA-1018
Mail Control # 135078 04007455

Dear Ms. McLaughlin:

On behalf of the Whittaker Corporation, Scientech, LLC is please to submit Revision 1 of the *Program Plan for Material Excavation, Staging, Crushing, and Blending For the Purpose of Reducing Bulk Waste Activity to Levels Less than 0.05% By Weight Uranium and Thorium*, Scientech Document No. 82A9526. Revision 0 of this document was originally submitted to the NRC in May 2004 to be included in renewal of U.S. Nuclear Regulatory Commission license number SMA-1018. This new revision should replace Revision 0 as part of the license renewal.

Please execute the enclosed Document Transmittal Control Form, acknowledging your receipt of this document.

If you have any questions or comments, please contact me at (864) 235-3695.

Sincerely,

Lou Czyz for

Kevin E. Taylor, PE, CHP
Radiation Safety Officer

KET:lhc
Enclosure
cc: P. Horkman
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PROGRAM PLAN FOR MATERIAL EXCAVATION, STAGING, CRUSHING, AND BLENDING FOR THE PURPOSE OF REDUCING BULK WASTE ACTIVITY TO LEVELS LESS THAN 0.05% BY WEIGHT URANIUM AND THORIUM

WHITTAKER CORPORATION WASTE AND SLAG STORAGE AREA TRANSFER, PENNSYLVANIA

Prepared for:

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Prepared by:

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March 2005

CONTROLLED COPY No. 743

Project Application	*Prepared By*	*Date*
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APPROVALS:

Title	*Signature*	*Date*
Corporate Radiation Safety Officer	Kenneth M. Kasper, CHP	3/8/05
D&D Operations Manager	Lee G. Penney	3/8/05

REVISION LOG

Revision Number	Affected Pages	CRA Number	Approval
1	All	11633	K. Taylor

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APPENDIX

1.0 INTRODUCTION

The Whittaker Corporation (Whittaker) waste and slag storage site is currently regulated under U.S. Nuclear Regulatory Commission (NRC) radioactive materials license number SMA-1018, which authorizes the possession of thorium and uranium in any chemical and/or physical form in quantities that were present in contaminated materials at the site as of June 1, 1985. SMA-1018 also authorizes the performance of specific activities that are related to the ongoing surveillance, maintenance, and control of licensed materials on-site, as well as, the packaging and storage of stock material and radioactive waste prior to shipment. There is currently no active use for the radioactive materials on-site. Site activities performed under SMA-1018 have included routine and non-routine maintenance and surveillance to monitor and maintain the integrity of the Radiologically Controlled Area (RCA), monitoring well installation and groundwater sampling, and collection and analysis of waste/slag materials. All current activities are performed on a travel-in basis as there are no personnel employed at the site.

Most areas of the Whittaker property have been impacted to some degree by subsurface and/or surface storage of slag material, some of which is radioactively contaminated with uranium-238 (U-238), natural uranium (U-nat), or natural thorium (Th-nat). Most of southern and central areas of the site (Sections 1 and 2 respectively) and an area in the northeast corner of the northern area (Section 3) clearly indicate subsurface disposal of contaminated waste slag and other materials to substantial depths, possibly as deep as 5 meters. The concrete pad portion of Section 3, site embankments, and areas at the bases of embankments contain primarily surface debris. Remaining areas encompassed by the property fencing, such as the ravine and the northeastern flood way, indicate a low probability for the presence of residual radioactivity.

This Program was prepared to support an amendment to SMA-1018 to allow the excavation, staging, crushing, and blending of radioactively contaminated slag and slag-like debris. Whittaker waste materials fall into three broad categories provided in Table 1-1. These materials will be referred to as Type 1, Type 2, and Type 3 materials.

TABLE 1-1
RADIOACTIVE MATERIAL CATEGORIES

Designation	Description
Type 1	Material containing greater than 0.05% by weight uranium and or thorium.
Type 2	Material containing unimportant quantities of uranium and or thorium (less than 0.05% by weight) but with concentrations above yet to be determined release criteria [a].
Type 3	Material containing concentrations of uranium, thorium, or daughter products below yet to be determined release criteria [a].

Note:
[a] The release criteria will be established in an NRC-approved Decommissioning Plan.

The purpose of the crushing and blending operation is to create homogeneous mixtures of Type 1 and Type 2 wastes such that the bulk waste volumes contain unimportant quantities of source material that meet the waste acceptance criteria (WAC) for Waste Control Specialist (WCS) of Andrews County, Texas. Currently, an estimated 400 to 800 tons of slag is defined Type 1 material and exceeds the WCS WAC while an additional 8,000 to 10,000 tons of Type 2 material contains lower concentrations of radioactive materials. The remaining volume of waste is considered Type 3.

Blending the higher activity Type 1 material with the lower activity Type 2 material to meet the WAC is consistent with the NRC's policy published in SECY-04-0035, "Results of the License Termination Rule Analysis of the Use of Intentional Mixing of Contaminated Soil" (NRC 2004). Specifically, the proposed activities are consistent with the recommended Scenario 1a in Section 2.3 of SECY-04-0035. SECY-04-0035 falls short; however, of providing specific guidance on slag and other non-uniform (or non-soil like) materials. Therefore, Whittaker is proposing to crush the slag and other slag-like materials, such as contaminated refractory bricks, to a maximum size of about 2 inches and blend the material to provide a more homogeneous mixture of Type 1 and Type 2 material. This is intended to eliminate zones of high contamination (hot-spots) in waste containers. On-site analysis of large-volume samples using gross gamma measurements will be supplemented with on-site gamma spectroscopy measurements to confirm that the bulk waste meet the WSC WAC prior to shipment.

2.0 IDENTIFICATION OF RADIOACTIVE MATERIALS

One of the defining conditions in SECY-04-0035 is that every effort should be made to use only lower activity contaminated material to reduce the overall activity of the bulk material to meet the WAC at an offsite disposal facility. To address this condition, Scientech, LLC, Whittaker's decommissioning contractor, will use walkover gamma surveys, field measurements of large-volume composite samples, and/or *in situ* gamma spectroscopy to identify which slag materials contain uranium and/or thorium above background concentrations. These materials will be then eligible for crushing and blending.

2.1 SITE CHARACTERIZATION

In 2004 Scientech conducted several site characterization activities. These included a walk-over survey of Sections 1 and 2 of the site and exploratory excavations. These characterization activities have allowed Scientech to estimate where Type 1, Type 2, and Type 3 materials are on the site. The activities also helped to predict the expected volumes of the different types of materials.

2.2 LARGE-VOLUME COMPOSITE SAMPLING

Scientech may also analyze large-volume (e.g., 5-gallon buckets or 1.8 cubic yard bins) composite samples to estimate the classification of a volume of material as Type 1 or Type 2 material. This technique will involve using a 2x2 NaI detector to measure the net count rate from the sample in a fixed geometry. The results will be compared against computer modeling results using MicroShield. If a sample exceeds pre-determined action levels (in net cpm), based on the results of the measurements, the sample will be classified as Type 1, Type 2, or Type 3 material. Gamma spectroscopy will be used to identify the gamma emitting radioisotopes present and their respective concentrations to support the assumptions in the MicroShield modeling.

As noted above, a portion of the large-volume samples method may also be analyzed with a gamma spectroscopy system. A high-resolution germanium detector system can be used to quantify the activity (in pCi/g) of each isotope present above the detectors MDC.

2.3 *IN SITU* GAMMA SPECTROSCOPY

Scientech possess a Canberra *In Situ* Object Counting System (ISOCS) that may be used for *in situ* measurements of slag areas. The ISOCS can be applied in such a manner to provide quantitative analysis of slag in various geometries, such as on the ground surface or in a storage container such as a drum or bin.

3.0 EXCAVATION AND STAGING

After areas of radioactive materials have been identified using the methods described in Section 2.0, the material will be excavated in lifts not greater than three feet. A qualified heavy equipment operator appropriately trained to work with radioactive materials will be used. All necessary and required safety measures involving excavations as defined by the U.S. Occupational Safety and Health Administration (OSHA) will be implemented during excavation activities. These involve proper sloping or shoring of excavated areas.

Excavated materials will be segregated into two primary waste streams, Type 1 and Type 2 material as defined in Table 1-1. The material will be stockpiled onsite. Health physics technicians using 2x2 NaI detectors will support excavation and direct the segregation of Type 1 and Type 2 materials using screening levels in gross cpm.

Scientech will assess the average activity of each stockpile using large-volume composite sampling and quantitative analysis as described in Section 2.2. This data will be used to determine the blending ratios needed to lower the average bulk container activities to levels below the WAC concentrations.

4.0 CRUSHING AND BLENDING

Once the Type 1 material has been stockpiled separately from the Type 2 material and the blending ratios have been determined, Scientech will feed the material, regardless of size, into a portable onsite crusher. The crusher will be a BL-Pegson Metrotrak track-mounted crusher capable of crushing the material to a 2-inch size at a rate of more than 100 tons per hour or similar. Material that is already less than 2 inches will pass through crushers with minimal size reduction. A product sheet is provided as Appendix A.

Material will be fed into the crusher at the pre-determined ratios. For example, if the pre-determined ratio is 1.5:1 (Type 2 volume to Type 1 volume), then one and a half "scoops" from the Type 2 pile will be immediately followed by one "scoop" from the Type 1 pile. This will result in piles of homogeneously mixed material that will be mixed even further when loaded into transportation containers. Using this method, there is a low probability of higher activity material collecting into a small volume. The resulting piles will be sampled and quantitatively analyzed using large-volume composite samples and an onsite high-resolution gamma spectroscopy system.

5.0 WASTE LOADING, TRANSPORTATION, AND DISPOSAL

Waste loading will involve loading material directly from the crushed and blended stockpiles into end-dump transport vehicles. The quantitative on-site analysis of stockpiled materials, supported by independent laboratory QA data, will be used as the data of record for the waste profile. The waste material in these vehicles will be transferred to gondola rail cars or other rail-compatible transportation containers at a transfer station. Because the average concentration of homogeneously blended bulk material in the trucks as it leaves the Whittaker site will be less than the disposal site WAC, there is no concern over whether the repackaged waste meets the WAC.

Scientech will use the services of a licensed waste broker to provide transportation services from the Whittaker site to the transloading facility and on to the disposal site. Scientech will ensure will ensure compliance with all applicable U.S. Department of Transportation regulations governing the transportation of the waste materials. It is expected that the bulk shipment containers will be transported as "Radioactive Materials, Excepted Package, Limited Quantity of Material" (UN 2910).

The eventual destination for the blended waste material will be WCS. This facility allows for shipments of bulk materials with concentrations less than those described in Table 5-1. Shipments will be made using the services of a certified radioactive waste broker.

TABLE 5-1
WCS WASTE ACCEPTANCE CRITERIA

Contaminant	WAC (pCi/g)
U-238	166.5
U-nat	355
Th-232	54.5
Th-nat	110

6.0 HEALTH AND SAFETY

All phases of the activities described in this Program will be conducted under a site-specific health and safety plan (SHASP) and a radiation work permit (RWP). The SHASP will address all physical hazards of site operations. The RWP will be prepared according to Scientech Document No. 82A8036, *Radiation Work Permit Procedure,* and will specify necessary radiological controls and monitoring. All site personnel performing work described under this Program will be required to read, understand, and sign the SHASP and RWP. Specific safety and environmental controls associated with the crushing and blending activities are provided in the following sections. All site operations will be conducted under Scientech Document No. 82A8042, *Radiation Protection Manual.* This manual complies with the requirements for radiation protection set forth in 10 CFR 20.

6.1 SITE SAFETY

As previously stated, Scientech will conduct onsite operations under a SHASP. This Program will cover all aspects for site safety including excavation, personal protective equipment, air monitoring, and so forth. Safety issues related with the crushing and blending operation include work around the crusher and loading equipment.

Scientech will only use experienced onsite personnel. K&P Asphalt, the contractor providing the crusher will also provide experienced crusher operators that will be trained as described in Section 6.4.

6.2 DUST CONTROL AND AIR MONITORING

The Metrotrak crusher (or similar) will have an internal water spray that can be used to control dust during operations. Scientech may also use external water sprays to control dust external to the crusher. Should fence line dust monitoring indicate that contaminated dust is traveling offsite, Scientech will determine the source of the dust and implement airborne contamination controls.

Airborne-effluent sampling stations will be set up and operated during activities that might generate dust. These stations will be located along the site property boundary at points nearest to off-site receptors. Air sample filters will be changed and analyzed at a frequency not greater than weekly. High-volume air samplers will be used to monitor for work zone airborne contamination.

The derived air concentration (DAC) levels for occupational exposure limits and air effluent concentration limits for site contaminants of concern are provided in Table 6-1.

TABLE 6-1
AIRBORNE CONCENTRATION LIMITS
(10 CFR 20, Appendix B, Table 1)

Radionuclide	DAC (uCi/ml)	Effluent Limit (uCi/ml)
Th-232	1E-12	6E-15
U-238	2E-11	6E-14
U-nat	2E-11	9E-14

As shown in Table 6-1, the most restrictive DAC and effluent limits are those of Th-232. Therefore, in order to use traditional field survey instruments that count gross beta and alpha activity, all measured activity will be conservatively assumed to be from the Th-nat decay chain. However, because these airborne limits are so low, it will be difficult, and likely impractical, for standard field techniques to have MDCs less than these limits. Any positive results on these samples will indicate that there are high airborne concentrations, field activities will be stopped, and control measures will be evaluated by the RSO and implemented prior to restarting work activities.

Samples will be analyzed following a sufficient time for radon-222 decay (at least 90 minutes after the sample is collected). Taking a second count a minimum of 8 hours after the first count will assess contributions to the sample count rate from radon-220. Using the two counts, an initial net Th-232 activity in cpm will be calculated. From Scientech's *General Radiological Survey and Air Sampling Procedure*, Equation 6-1 will be used to calculate the airborne activity from the net Th-232 count rate.

$$\text{Airborne Activity (uCi/ml)} = \frac{\text{net Th232 count rate (cpm)}}{(\varepsilon_s)(\varepsilon_i)(V)(2.226E6)} \qquad \text{Equation 6-1}$$

where:

ε_s = Surface efficiency (0.5 for a filter with a light dust loading)
ε_i = Intrinsic instrument efficiency (cpm/dpm) (2x the 4π detector efficiency)
V = Volume of air sample (ml)
2.22E6 = conversion from cpm to uCi

If the MDC for the field survey method is more than one DAC for occupational monitoring or greater than the effluent limit for fence line monitoring, the sample filters will also be sent offsite for laboratory analysis. Initially, samples from the fence line and work area with a visible dust loading will be sent until trends can be established. If samples indicate that airborne concentrations are consistently below the concentration limits, the RSO may discontinue offsite analysis until either onsite activities change sufficiently to increase the potential for airborne contamination or an onsite analysis indicates airborne contamination near or greater than the applicable concentration limit.

Air samples collected during screening activities where an automated screener was used to separate soil from slag materials showed no detectable levels of airborne contamination. These samples were analyzed on-site and several samples were also sent off site for laboratory analysis. The on-site and off-site analyses were consistent.

6.3 DOSE MONITORING

Because of the external gamma radiation hazard associated with the higher-activity Type 1 material, all on-site personnel will be required to wear thermoluminescent dosimeter (TLD) or optically stimulated luminescent (OSL) badges for the duration of the Type 1 material blending and removal project described in this Program Plan. The dosimetry program will be administered according to Scientech Document No. 82A8042, *Radiation Protection Manual.* Because truck drivers will not be in close contact with Type 1 material that has not been crushed and blended, they will not be included in the dose-monitoring program. Site visitors will not require radiation dosimetry but must be escorted by a site worker with dosimetry at all times.

6.4 TRAINING

Radiation worker training will be required for all Scientech and subcontractor personnel working on the site, excluding truck drivers. These and other training requirements are provided in Scientech Document No. 82A8043, *Radiation Worker Training.* Site visitors will not require radiation worker training but must be escorted by a site worker with radiation worker training at all times.

APPENDIX A

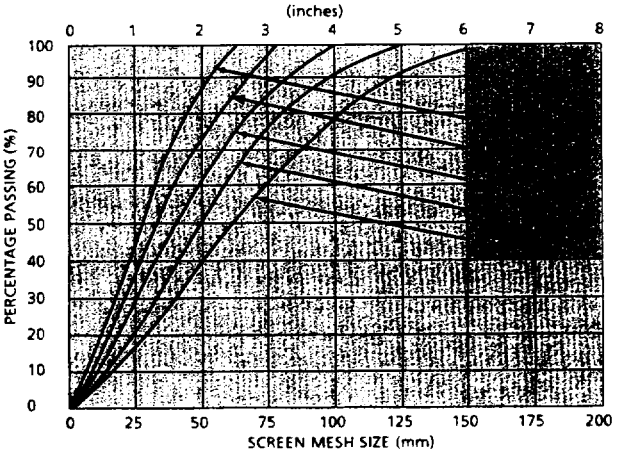
BL-PEGSON METROTRAK PRODUCT SHEET

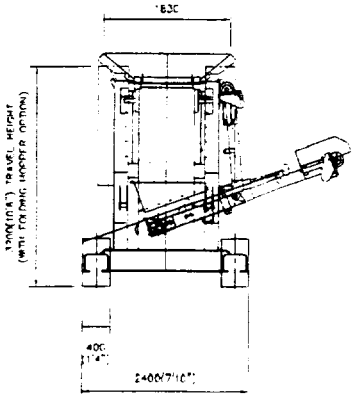
Metrotrak

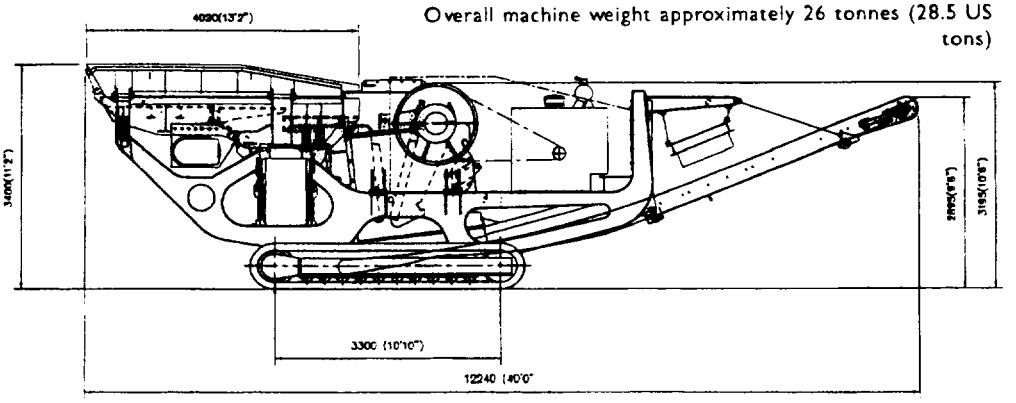
900x600 (24"x36")

- Rapid set-up time and ease of transportation.
- Well proven high performance 900mm x 600mm (24"x36") 'M' series single toggle jaw crusher.
- Heavy duty fabricated chassis and track frame.
- Remote control operation.
- Two step self cleaning Grizzly with underscreen option.
- Fully skirted product conveyor.
- Grizzly by-pass and fines chute.
- Dust suppression sprays.
- Dirt conveyor & magnetic separator fitted as standard.
- Hydraulically folding hopper.

Closed Side Setting		Typical Plant Output	
inches	mm	tph (U.S.)	mtph
See Notes 1½"	40	85	75
2"	50	105	95
2½"	63	125	110
3"	75	135	120
4"	100	160	145







Overall machine weight approximately 26 tonnes (28.5 US tons)