ENERGY FUELS

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DRC-2019-003761

April 18, 2019

SENT VIA OVERNIGHT DELIVERY

Div of Waste Management
and Radiation Control

APR 24 2019

Mr. Ty L. Howard
Director
Division of Waste Management and Radiation Control
Utah Department of Environmental Quality
195 North 1950 West
P.O. Box 144880
Salt Lake City, UT 84114-4880

Re: Application by Energy Fuels Resources (USA) Inc. ("EFRI") for an amendment to State of Utah Radioactive Materials License No. 1900479 for the White Mesa Uranium Mill (the "Mill") to authorize processing of NPM Silmet OU ("Silmet") alternate feed material (the "Uranium Material")

Dear Mr. Howard:

We are pleased to enclose with this letter two copies of an application to amend the Mill's Radioactive Materials License No. 1900479 to authorize receipt and processing of the Uranium Material as an alternate feed material primarily for the recovery of uranium and disposal of the resulting tailings in the Mill's tailings impoundments as 11e.(2) byproduct material.

Silmet is licensed to store up to 615 metric tons of uranium material on site at their facility in Estonia. Based on current production rates, Silmet anticipates that limit will be reached by late 2019. EFRI plans to enter into an agreement with Silmet to allow shipment of the uranium material to the Mill as soon as reasonably possible. Please contact us as to the anticipated timeframe required for DWMRC to review this application.

If you should have any questions regarding this amendment application, please contact me.

Yours very truly,

Kathy Weinel

ENERGY FUELS RESOURCES (USA) INC.
Kathy Weinel
Quality Assurance Manager

cc: David Frydenlund
Mark Chalmers
Paul Goranson
Logan Shumway
Terry Slade
Scott Bakken

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REQUEST TO AMEND RADIOACTIVE MATERIALS LICENSE ENERGY FUELS RESOURCES (USA) INC. WHITE MESA URANIUM MILL SAN JUAN COUNTY, UTAH AND ENVIRONMENTAL REPORT

for
Processing of
Alternate Feed Material
from
NPM Silmet OÜ

Prepared for:

Utah Department of Environmental Quality
Division of Waste Management and Radiation Control
195 North 1950 West
Salt Lake City, UT 84114-4880

Prepared by:

Energy Fuels Resources (USA) Inc.
225 Union Boulevard, Suite 600,
Lakewood, CO 80228

April 18, 2019

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ATTACHMENTS

1.0 INTRODUCTION

1.1 White Mesa Mill

Energy Fuels Resources (USA) Inc. ("EFRI") operates the White Mesa Uranium Mill (the "Mill") located approximately six miles south of Blanding, Utah. The Mill processes natural (native, raw) uranium ores and alternate feed materials. Alternate feed materials are uranium-bearing materials other than natural ores, that meet the criteria specified in the United States Nuclear Regulatory Commission's ("NRC's") *Interim Position and Guidance on the Use of Uranium Mill Feed Material Other Than Natural Ores* (November 30, 2000) (the "Alternate Feed Guidance"). Alternate feed materials are processed as "ore" at the Mill primarily for their source material content. As a result, all waste associated with this processing is 11e.(2) byproduct material. The Uranium Material is similar to the alternate feed materials the Mill is currently licensed to receive from the Cabot and Fansteel Metals Recovery, Inc. ("FMRI") facilities, which are also residues from tantalum and niobium processing facilities.

1.2 Proposed Action

This is a request for an amendment to State of Utah Radioactive Materials License ("RML") No. UT 1900479 to authorize receipt and processing of certain uranium containing materials. These materials are residuals resulting from purification of columbite and tantalite mineral ores processed via an acid leach process for recovery of columbium ("niobium") and tantalum conducted in NPM Silmet OÜ's ("Silmet's") tantalum and niobium production plant (the "Facility") in Sillamäe, Estonia. For ease of reference, the uranium bearing material that results from this process, described further in Section 2, is referred to herein as "Uranium Material".

1.3 Purpose of Action

The Uranium Material contains greater than 0.05% uranium on both a wet and dry basis. The Uranium Material is the uranium-containing residue (or "tailings") from the Facility which has been dried and calcined to oxidize the residual minerals and remove water content (reduce volume), then cooled and packaged in closed drums for off-site recovery or disposal.

Because the Uranium Material contains elevated levels of naturally-occurring radionuclides, its collection and storage has been regulated by the Republic of Estonia under Silmet's Radioactivity License 14 010. License 14 010 limits the quantity of residue collected and stored on site at the Facility to 615.5 metric tonnes. To date, the Facility has accumulated and stored 600 metric tonnes (660 tons) of material, in over 2,000 drums. Because the Facility has approached its licensed storage limit, Silmet has temporarily suspended the niobium and tantalum recovery operations which produce the Uranium Material.

Silmet's Radioactivity License 14 010, authorized on January 30, 2014, expired on January 31, 2019. The Ministry of Environment of the Republic of Estonia has required that Silmet demonstrate they have arranged with an off-site facility appropriately licensed for recovery or disposal of the Uranium Material, prior to renewal of Silmet's license and resumption of niobium/tantalum recovery operations. Silmet is seeking to remove the material off-site, as soon as practicable, for reprocessing or disposal. No facility within the Republic of Estonia is currently licensed for either the direct disposal or the reprocessing of the Uranium Material. Although the Estonian government is planning to build a disposal facility, it is not expected to be completed for a number of years. Silmet would like to recycle the Uranium Material for the recovery of uranium if possible. No facility within the Republic of Estonia is capable of reprocessing and recovery of any component of the Uranium Material at this time. In order to recycle the Uranium Material, Silmet desires to send the material to the White Mesa Mill, which has a long history of successfully processing such types of alternate feed materials for the recovery of uranium.

EFRI has been requested by Silmet to make this application to process the Uranium Material as an alternate feed material at the Mill for the recovery of uranium and to dispose of the resulting tailings in the Mill's tailings management system as 11e.(2) byproduct material. Approval of this application will:

1. allow the recovery of valuable uranium, a resource that would otherwise be lost to direct disposal, and

2. allow Silmet to meet the requirement of the Estonian Ministry of Environment to confirm a licensed off-site destination for the Uranium Material, and to resume operations at the Facility.

Reprocessing at the Mill will afford Silmet a cost-effective and productive mechanism for managing the Uranium Material generated.

1.4 Amendment Application and Environmental Report

This application is intended to fulfill the requirements of an application for an amendment to the Mill's Radioactive Materials License set out in Utah Administrative Code ("UAC") R3I3-22-38 and includes the Environmental Report ("ER") required by UAC R3I3-24-3 to be contained in such an application.

For ease of review, this application contains a cross reference to the Utah Division of Waste Management and Radiation Control's ("DWMRC's") Interrogatory Template for Review of License Amendment Request and Environmental Report under UAC R313-24 that was provided to EFRI. The cross reference is provided in a table format in Attachment 6.

2.0 MATERIAL COMPOSITION AND VOLUME

2.1 General

The Facility currently operates a niobium and tantalum, production plant located in the Republic of Estonia.

The Republic of Estonia[1] is a country in Northern Europe. It is bordered to the north by the Gulf of Finland with Finland on the other side, to the west by the Baltic Sea with Sweden on the other

[11] This summary information about Estonia is drawn from Wikipedia.

side, to the south by Latvia (343 km), and to the east by Lake Peipus and Russia (338.6 km). The territory of Estonia consists of a mainland and 2,222 islands in the Baltic Sea, covering a total area of 45,227 km^2 (17,462 sq mi), water 2,839 km^2 (1,096 sq mi), land area 42,388 km^2 (16,366 sq mi), and is influenced by a humid continental climate. The official language of the country, Estonian, is the second most spoken Finnic language.

The territory of Estonia has been inhabited since at least 9,000 B.C. Ancient Estonians were some of the last European pagans to be Christianized, following the Livonian Crusade in the 13th century. After centuries of successive rule by Germans, Danes, Swedes, Poles and Russians, a distinct Estonian national identity began to emerge in the 19th and early 20th centuries. This culminated in independence from Russia in 1920 after a brief War of Independence at the end of World War I. Initially democratic, after the Great Depression Estonia was governed by authoritarian rule since 1934. During World War II (1939–1945), Estonia was repeatedly contested and occupied by the Soviet Union and Germany, ultimately being incorporated into the former as the Estonian Soviet Socialist Republic. After the loss of its de facto independence, Estonia's de jure state continuity was preserved by diplomatic representatives and the government-in-exile. In 1987 the peaceful "Singing Revolution" began against Soviet rule, resulting in the restoration of de facto independence on 20 August 1991.

The sovereign state of Estonia is a democratic unitary parliamentary republic divided into fifteen counties. Its capital and largest city is Tallinn. With a population of 1.3 million, it is one of the least-populous member states of the European Union since joining in 2004, the economic monetary Eurozone, Organization for Economic Co-operation and Development, Schengen Area, and of the Western military alliance of the North Atlantic Treaty Organization (NATO). It is a developed country with an advanced, high-income economy that has been among the fastest-growing in the European Union. Estonia ranks very high in the Human Development Index, and performs favorably in measurements of economic freedom, civil liberties, education, and press freedom (third in the world in 2012 and 2007). Estonian citizens are provided with universal health care, free education, and the longest-paid maternity leave in the Organization for Economic Cooperation and Development. One of the world's most digitally advanced societies, in 2005 Estonia became the first state to hold elections over the Internet, and in 2014 the first state to provide e-residency.

The Facility is located on a property which formerly contained a shale oil production plant from 1927 to 1940. A uranium production pilot plant was constructed on the site in 1944, following the commencement of the Soviet Union's occupation of Estonia. A separate portion of the Facility produced uranium oxides from local shale ores from 1944 through 1952. The Facility subsequently began receiving other uranium-containing ores in 1952, and continued to produce uranium oxides, including reactor-grade enriched uranium products from 1982-1988, in this separate portion of the Facility, until uranium production ceased in 1990. In 1970, concurrent with the uranium operations, the plant began receiving loparite ores and began the recovery of niobium and tantalum in one process area, and rare earths from loparite ores in a separate process area, both of which were separate and independent from the uranium processing and enrichment areas. After 1990, the plant no longer received loparite ores, and began to process columbite and tantalite ore residue concentrates for niobium and tantalum production. Processing of columbite and tanatalite ores occurs in the same separate portion of the Facility used to process the loparite ores. Niobium and tantalum recovery continues to the present time. The Uranium Material was produced specifically from operations since 2000 in the plant area and process operation which recovers niobium and tantalum, as discussed in Section 2.3, below.

Prior to 2000, all tailings and wastes from the uranium processing and enrichment activities, as well as tailings from the loparite ore processing and columbite and tantalite ore residue concentrates, were disposed of in a radioactive tailings pond near the Facility. That pond was taken out of service in 1999 and decommissioned by a third party between 1999 and 2009. From 1999 onward, because the pond was no longer available, the residues from the ongoing columbite and tantalite ore residue processing operations were filtered into filter cake, calcined to remove the remaining moisture, and packaged in 55-gallon metal drums lined with triple-walled polyethylene bag liners and stored as Uranium Material. The currently accumulated Uranium Material is comprised of the drums of material that had accumulated through this process and have been stored at the Facility since 1999. As the columbite and tantalite ore residue processing operations continue to be active, Uranium Material is expected to continue to be produced in this same fashion at the rate of approximately 80 tons/yr. indefinitely. This license amendment application covers the currently accumulated Uranium Material as well as the Uranium Material that is expected to continue to be produced going forward.

The Uranium Material does not include residuals from oil shale production, from uranium production or enrichment, rare earth recovery, or from other previous operations at the Facility. It does not include any material from the former radioactive tailings pond or from the decommissioning of the former pond which has been conducted by entities other than Silmet. The Uranium Material is comprised only of residuals from the current Silmet niobium and tantalum recovery unit, which were directly calcined, dried, and drummed after generation in a closed process, independent of other historic activities at the Facility. No other processing activities, other than the current niobium and tantalum recovery operations, have occurred at the site since 2000.

2.2 Historical Summary of Sources

The Uranium Material consists of the residuals from niobium and tantalum recovery from columbite and tantalite ore concentrates. It does not include residuals from oil shale production, from uranium production or enrichment, rare earth recovery, or from other previous operations at the Facility. It does not include materials from the former radioactive materials pond at the Facility.

Columbite and tantalite-containing mineral ore concentrates were processed via acid-leaching to separate the insoluble impurities, including uranium and some thorium, from niobium and tantalum. The ores were crushed and milled, then dissolved in hydrofluoric and sulfuric acid, and removed in solution phase. The insolubles, containing uranium and thorium, were removed from solution. The precipitate was filtered, and the filter cake was transferred to the calcining unit, in the same building. The filter cake was calcined and dried in electric rotary kilns, cooled in rotary coolers and placed into metal drums lined with triple-walled polyethylene bags.

The process which generated the Uranium Material is isolated from the remainder of site operations. Columbite and tantalite ores are processed in a separate milling area, for which the feed, grinding and discharge steps are controlled by hermetically sealed equipment, primarily for the management of radioactive dusts. Acid leaching, washing, filtration, electric rotary calcining, rotary cooling and packaging are all conducted in automated closed systems. Hence, the Uranium Material is isolated from other materials on site from feed source through drum packaging.

The process which produced the Uranium Material is comparable to the process which produced other alternate feed materials previously licensed for receipt and processing at the Mill. The table below compares the source of Silmet Uranium Material to the sources of previously licensed alternate feeds.

Alternate Feed Source	Niobium Production	Tantalum Production
Cabot	x	x
Fansteel	x	x
Silmet	x	x

EFRI has been requested by Silmet to make this application to process the Uranium Material as an alternate feed material at the Mill and to dispose of the resulting tailings in the Mill's tailings management system as 11e.(2) byproduct material.. By providing Silmet with the option of processing the Uranium Material at the Mill, Silmet will be given the option of recycling the Uranium Material for the recovery of valuable uranium, a resource that would otherwise be lost to direct disposal.

2.3 Quantity of Material

Silmet has requested that EFRI recycle the uranium material and has asked that EFRI submit this Amendment Request. Silmet estimates that the total volume of Uranium Material accumulated to date is approximately 600 metric tonnes (660 tons). The material has been dried and calcined, therefore this value is essentially a dry weight quantity, and chemical and radiochemical data discussed in this application and attachments are on a dry weight basis. Based on Silmet's prior Radioactivity License, the Facility is permitted to accumulate an average of 72.5 metric tonnes (80 tons) per year of Uranium Material. This application anticipates that the Mill could potentially receive the accumulated material plus Uranium Material annually for a total of at least 1,325 metric tonnes (1,460 tons) assuming at least 10 years of annual Uranium Material production. It has been EFRI's experience with other alternate feed materials from comparable sources that the initial estimate may increase by as much as 50 percent or more by the time of receipt, due to factors such as under-estimation of numbers of containers and other variables. Therefore, in order to allow for these factors and the potential to receive annual increments of Uranium Material for greater than 10 years, this Request for Amendment is for approval of approximately 2,200 tons dry weight of Uranium Material, to ensure that all the Uranium Material for a reasonable period of time is covered by this Amendment.

2.4 Radiochemical Data

As noted, the process history demonstrates that the Uranium Material results from the recovery of niobium and tantalum from columbite and tantalite ore concentrates. Silmet has estimated that the current Uranium Material has a uranium content ranging from 0.14 to 0.35 dry weight percent natural uranium or 0.17 to 0.41 dry weight percent U_3O_8. The uranium content may be expected to average approximately 0.23 dry weight percent natural uranium or 0.27 dry weight percent U_3O_8. As discussed in section 1.3 above, the Uranium Material has been dried and calcined, hence all available data is on a dry weight basis. As noted in the Radioactive Materials Profile Record ("RMPR") and on the Table below, the Thorium-232 content will likely range from 542 to 2,160 picocuries per gram dry weight basis ("pCi/g-dry"). A more detailed radiological characterization of the Uranium Materials (see Section 2.6.1, below) is contained in the RMPR (Attachment 2). The radionuclide activity concentration of the Uranium Material is comparable to Colorado Plateau ores and alternate feed materials which the Mill is currently licensed to receive (see Section 2.6.1, below).

2.5 Physical and Chemical Data

Physically, the Uranium Material consists of dry, calcined, powdered solids, containing residual amounts of uranium and other metals. The chemical characterization data for the Uranium Materials is set out in the RMPR (Attachment 2). As with the radionuclides and as discussed in more detail in Section 4.4 below, all the chemical constituents in the Uranium Material have either been reported to be, or can be assumed to be, already present in the Mill's tailings management system or were reported in other licensed alternate feeds, at levels generally comparable to or higher than those reported in the Uranium Materials.

2.6 Comparison to Other Ores and Alternate Feed Materials Licensed for Processing at the Mill

2.6.1 Ores and Alternate Feed Materials With Similar Radiological Characteristics

With an average uranium content of approximately 0.17 to 0.41 percent U_3O_8, the Uranium Material is comparable to a high-grade Colorado Plateau ore. Colorado Plateau ores typically average from approximately 0.18 percent to 0.3 percent U_3O_8.

The estimated average content of total natural thorium (Th-232) ("Th-nat") of approximately 2,200 pCi/g-dry is higher than normally encountered with natural ores but well within the range of previously licensed alternate feed materials at the Mill.

For example, the average concentrations of Th-nat in the Sequoyah Fuels alternate feed material averaged 2,385 pCi/g Th-232, and many other alternate feed materials have had elevated concentrations of Th-nat. The Uranium Material will be handled at the Mill under the Mill's radiation safety program in a manner appropriate for such materials.

The table below compares the radionuclide content of the Uranium Material and that of other alternate feed materials and natural uranium ores previously approved for processing at the Mill.

Radionuclide	Range of Uranium Material Radionuclide Activity Concentration (pCi/g dry)	Previously Licensed Alternate Feed Radionuclide Activity Concentrations (pCi/g dry)	Source for Alternate Feed Information
Ra-226	Average 1332	2,000 avg; 10,400 max	W.R.Grace Application April 2000
		445 max	CaF_2 annual feed analysis 2018
		1650 pCi/g	Typical Arizona Strip Natural Uranium Ores
Th-228	527 to 1,790 Average 1,033	2,000 avg.; 3,222 max	W.R.Grace Application April 2000
		1,110 max	Sequoyah Fuels Application August 2013
Th-230	507 to 1,300 Average 900	75.5 mg/kg (1,555,000 pCi/g) avg., 143 mg/kg (2,330,000 pCi/g) max.	Nevada Test Site Cotter Concentrate Application March 1997
		8,000 avg.; 31,500 max	W.R.Grace Application April 2000
		46,300 pCi/g	Sequoyah Fuels annual alternate feed sample
Th-232	542 to 2,160 Average 1,200	2,385 avg.; 4,990 max	Sequoyah Fuels Application August 2013
		1,190 avg.	Heritage RMPR, undated
Unat	1,400 mg/kg to 3,500 mg/kg	686,000 mg/kg max	Mill lab monthly assays of Cameco UF_4

Note: Values are in pCi/g unless otherwise stated.

2.6.2 Ores and Alternate Feed Materials With Similar Chemical/Metal Characteristics

The Uranium Material is physically and chemically comparable to previously-approved alternate feed materials that the Mill has processed. As discussed in more detail in Section 4.5 below, all the constituents in the Uranium Material have either been reported to be, or can be assumed to be, already present in the Mill's tailings system or were reported in other licensed alternate feeds, at levels generally comparable to or higher than those reported in the Uranium Material.

3.0 REGULATORY CONSIDERATIONS

3.1 Alternate Feed Guidance

The Alternate Feed Guidance provides that if it can be determined, using the criteria specified in the Alternate Feed Guidance, that a proposed feed material meets the definition of "ore", that it will not introduce a hazardous waste not otherwise exempted (unless specifically approved by the EPA (or State) and the long-term custodian), and that the primary purpose of its processing is for its source material content, the request can be approved.

3.2 Uranium Material Qualifies as "Ore"

According to the Alternate Feed Guidance, for the tailings and wastes from the proposed processing to qualify as 11e.(2) byproduct material, the feed material must qualify as "ore". NRC has established the following definition of ore: Ore is a natural or native matter that may be mined and treated for the extraction of any of its constituents or any other matter from which source material is extracted in a licensed uranium or thorium mill. The Uranium Material is an "other matter" which will be processed primarily for its source material content in a licensed uranium mill, and therefore qualifies as "ore" under this definition. Further, the uranium concentration of the Uranium Material is greater than 0.05 percent on both a wet and dry basis, and the Uranium Material is an ore, the entire mass of Uranium Material is therefore Source Material.

3.3 Uranium Material Not Subject to RCRA

3.3.1 General

The Alternate Feed Guidance currently provides that if a proposed feed material contains hazardous waste, listed under Section 261.30-33, Subpart D, of 40 CFR (or comparable Resource Conservation and Recovery Act ("RCRA") authorized State regulations), it would be subject to EPA (or State) regulation under RCRA. However, the Guidance provides that if the licensee can show that the proposed feed material does not consist of a listed hazardous waste, this issue is resolved. NRC guidance further states that feed material exhibiting only a characteristic of hazardous waste (ignitability, corrosivity, reactivity, toxicity) that is being recycled, would not be regulated as hazardous waste and could therefore be approved for extraction of source material. The Alternate Feed Guidance concludes that if the feed material contains a listed hazardous waste, the licensee can process it only if it obtains EPA (or State) approval and provides the necessary documentation to that effect. The Alternate Feed Guidance also states that

NRC staff may consult with EPA (or the State) before making a determination on whether the feed material contains listed hazardous waste.

Subsequent to the date of publication of the Alternate Feed Guidance, NRC recognized that, because alternate feed materials that meet the requirements specified in the Alternate Feed Guidance must be ores, any alternate feed materials that contain greater than 0.05% source material are considered source material under the definition of source material in 10 CFR 40.4 and hence exempt from the requirements of RCRA under 40 CFR 261.4(a)(4). See *Technical Evaluation Report, Request to Receive and Process Molycorp Site Material* issued by the NRC on December 3, 2001 (the "Molycorp TER"). As a result, any such alternate feed ores are exempt from RCRA, regardless of whether they would otherwise have been considered to contain listed or characteristic hazardous wastes. Since the Uranium Material contains greater than 0.05% source material, it is exempt from RCRA, regardless of its process history or constituents, and no further RCRA analysis is required.

Nevertheless, because the Alternate Feed Guidance has not yet been revised to reflect this position recognized by NRC in the Molycorp TER, EFRI will demonstrate below that, even if the Uranium Material were not considered source material or 11e.(2) byproduct material, and as such exempt from RCRA, the Uranium Material would not, in any event, contain any RCRA listed hazardous wastes, as contemplated under the Alternate Feed Guidance as currently worded.

3.3.2 EFRI/UDEQ Listed Hazardous Waste Protocol

In a February 1999 decision regarding the Mill, the Atomic Safety and Licensing Board Presiding Officer suggested there was a general need for more specific protocols for determining if alternate feed materials contain hazardous components. In a Memorandum and Order of February 14, 2000, the full Commission of the NRC also concluded that this issue warranted further staff refinement and standardization. Cognizant at that time of the need for specific protocols to be used in making determinations as to whether or not any alternate feed materials considered for processing at the Mill contained listed hazardous wastes, EFRI took a proactive role in the development of such a protocol. Accordingly, EFRI established a "Protocol for Determining Whether Alternate Feed Materials are Listed Hazardous Wastes" (November 22, 1999). This Protocol was developed in conjunction with, and accepted by, the State of Utah Department of Environmental Quality ("UDEQ") (Letter of December 7, 1999). Copies of the Protocol and UDEQ letter are provided in Attachment 3. The provisions of the protocol can be summarized as follows:

a) In all cases, the protocol requires that EFRI perform a source investigation to collect information regarding the composition and history of the material, and any existing generator or agency determinations regarding its regulatory status;

b) The protocol states that if the material is known -- by means of chemical data or site history -- to contain no listed hazardous waste, EFRI and UDEQ will agree that the material is not a listed hazardous waste;

c) If such a direct confirmation is not available, the protocol describes the additional chemical process and material handling history information that EFRI will collect and evaluate to assess whether the chemical constituents in the material resulted from listed or non-listed sources;

d) The protocol also specifies the situations in which ongoing confirmation/acceptance sampling will be used, in addition to the chemical process and handling history, to make a listed waste evaluation;

e) If the results from any of the decision steps indicate that the material or a constituent of the material did result from a RCRA listed hazardous waste or RCRA listed process, the material will be rejected; and

f) The protocol identifies the types of documentation that EFRI will obtain and maintain on file, to support the assessment for each different decision scenario.

The above components and conditions of the Protocol are summarized in a decision tree diagram, or logic flow diagram, included in Attachment 3, and hereinafter referred to as the "Protocol Diagram".

3.3.3 Application of the Listed Hazardous Waste Protocol

EFRI has conducted a RCRA evaluation of the Uranium Material and, specifically, applied the Listed Hazardous Waste Protocol to the Uranium Material. A copy of the analysis is included as Attachment 4. The analysis evaluated the following regulatory history to develop the conclusions enumerated below.

The Uranium Material is produced solely as a residual from the processing of columbite and tantalite ore concentrates for recovery of tantalum and niobium, a known process under the control of the generator. No other wastes from the niobium/tantalum process, and no residuals from any other process at the Facility enter the rotary kilns, the rotary coolers or the collection drums where the Uranium Material is generated and packaged.

NPM Silmet OÜ Radiation Activity License 14 010, approved on January 30, 2014, authorized Silmet to collect and store up to a licensed limit of 615.5 metric tonnes of calcined Uranium Material generated from the tantalum/niobium circuit. Silmet's Radiation Activity License expired on January 30, 2019. The quantity collected on site prior to expiration of the Radiation Activity License, 600 metric tonnes, approached the licensed limit.

Although the license limit has not been reached, Silmet and the Ministry of Environment of the Republic of Estonia have agreed that Silmet will cease further production of niobium/tantalum, and therefore cease production of Uranium Material, and that renewal of the Radioactivity License will be delayed until such time as Silmet demonstrates they have confirmed an appropriately-licensed off-site destination for the material. Silmet has suspended niobium/tantalum processing, the only source of the Uranium Material, pending renewal of the Radioactivity License.

The Uranium Material has not been classified or treated as listed hazardous waste nor has it been in contact with any listed hazardous wastes.

The RCRA analysis concluded that, based on the information that is available,

1. The Uranium Material would not be a RCRA listed hazardous waste because it is an ore that has a natural uranium content of greater than 0.05 weight percent, is therefore source material and, as a result, is exempt from regulation under RCRA.

2. Even if the Uranium Material were not source material, it would not be a RCRA listed hazardous waste for the following additional reasons:

   a) It was generated from a known process under the control of the generator, who has provided an affidavit declaring that the Uranium Material is not and does not contain RCRA listed hazardous waste. This determination is consistent with Boxes 1 and 2 and Decision Diamonds 1 and 2 in the EFRI/UDEQ Protocol Diagram;

   b) None of the metals in the Uranium Material samples came from RCRA listed hazardous waste sources. This determination is consistent with Box 8 and Decision Diamonds 9 through 11 in the EFRI/UDEQ Protocol Diagram.

   c) Analysis by a Utah approved laboratory, process history, and review of minerology literature confirms that all of the metal and inorganic constituents in the material are consistent with those expected to result from columbite and tantalite ores and the niobium and tantalum recovery process described by the generator;

   d) No volatile or semi-volatile organic compounds were detected in any of the analyses performed by the certified analytical laboratory.

3. The Uranium Material does not exhibit any of the RCRA characteristics of ignitability, corrosivity, reactivity, or toxicity for any constituent.

3.3.4 Radioactive Material Profile Record

Furthermore, in order for EFRI to characterize the Uranium Material, Silmet has completed EFRI's RMPR form, stating that the material is not RCRA listed waste. The certification section of the RMPR includes the following text:

> I certify that the material described in this profile has been fully characterized and that hazardous constituents listed in 10 Code of Federal Regulations ("CFR") 40 Appendix A Criterion 13 which are applicable to this material have been indicated on this form. I further certify and warrant to EFRI that the material represented on this form is not a hazardous waste as identified by 40 CFR 261 and/or that this material is exempt from RCRA regulation under 40 CFR 261.4(a)(4).

3.3.5 Conclusion

Because the Uranium Material is an ore that contains greater than 0.05% source material, the Uranium Material is exempt from RCRA under 40 CFR 261.4(a)(4). In addition, based on the site history, the determinations by Silmet, and the analysis of the EFRI's chemical engineering consultant, EFRI has also concluded that, even if not exempted from RCRA under 40 CFR 261.4(a)(4), on the application of the Listed Hazardous Waste Protocol, Uranium Material from the Facility would not be listed hazardous waste subject to RCRA.

3.4 Uranium Material is Processed Primarily for its Source Material Content

In its Memorandum and Order, February 14, 2000, In the Matter of International Uranium (USA) Corp. (Request for Materials License Amendment), Docket No. 40-8681-MLA-4, the NRC concluded that an alternate feed material will be considered to be processed primarily for its source material content if it is reasonable to conclude that uranium can be recovered from the Uranium Material and that the processing will indeed occur. The Uranium Material will be processed for the recovery of uranium at the Mill. Based on the uranium content of the Uranium Material, its physical and chemical characteristics, and EFRI's success in recovering uranium from a variety of different types of materials, including materials that were similar to the Uranium Materials, at the Mill, it is reasonable to expect that uranium can be recovered from the Uranium Material. As a result, the Uranium Material is an ore that will be processed primarily for the recovery of source material, and the tailings resulting from processing the Uranium Material will therefore be 11e.(2) byproduct material under the definition set out in 10 CFR 40.4.

3.5 Other Licensing Considerations

As stated above, according to the Alternate Feed Guidance, for the tailings and wastes from the proposed processing to qualify as 11e.(2) byproduct material, the feed material must qualify as "ore". NRC has established the following definition of ore: Ore is a natural or native matter that may be mined and treated for the extraction of any of its constituents or any other matter from which source material is extracted in a licensed uranium or thorium mill. The Uranium Material is an "other matter" which will be processed primarily for its source material content in a licensed uranium mill, and therefore qualifies as "ore" under this definition. Further, because the uranium concentration of the Uranium Material is greater than 0.05 percent on both a wet and dry basis, and the Uranium Material is an ore, the entire mass of Uranium Material is therefore Source Material under 10 CFR 40.4.

Upon issuance of a license amendment authorizing the Mill to receive and process the Uranium Material as an alternate feed material, the Uranium Material may be imported into the United States as "source material" under 10 CFR 110.20(a), because it is covered by the NRC general license described in 10 CFR 110.27(a), and because the Uranium Material:

- is not in the form of irradiated fuel, as contemplated by 10 CFR 110.27(b); and
- is not a radioactive waste, as contemplated by 10 CFR 110.27(c). As an approved alternate feed material ore, the Uranium Material will not be a radioactive waste as defined in 10 CFR 110.2 because (A) the Uranium Material will be processed for its source material content and will therefore be imported solely for the purposes of

recycling and not for waste management or disposal, and (B) there is a market for the recycled uranium.

In its November 1998 approval of Amendment 9 to the Mill's Source Material License SUA-1358, White Mesa Uranium Mill – Approval to Process Materials from Cameco Corporation's Facilities in Ontario, Canada," which are alternate feed materials from Canada, the NRC came to the same conclusion in the same circumstances:

> "Finally, import of radioactive materials from Canada required a license from NRC. As discussed above, the staff has determined that these uranium-bearing materials from Cameco's Blind River and Port Hope facilities will be processed for their source-material content. Therefore, with the staff's approval of IUC's request to process these materials, IUC also is authorized to import them under the general license at 10 CFR 110.27."

Because the import of the Uranium Material into the United States is covered by the general license in 10 CFR Part 110.27(a), a specific import license is not required.

It should also be noted that Estonia is a member of the Nuclear Suppliers Group as stipulated under 10 CFR 110.30 and is not considered an "embargoed destination" or "restricted destination" by the NRC under 10 CFR 110.28 and 110.29, respectively.

4.0 AFFECTED ENVIRONMENT

4.1 General

The Mill is a licensed uranium processing facility that has processed to date over 5,000,000 tons of uranium-bearing conventionally mined ores and alternate feed materials primarily for the recovery of uranium, with the resulting tailings being permanently disposed of as 11e.(2) byproduct material in the Mill's tailings management system. Environmental impacts associated with such previously licensed Mill operations have been thoroughly evaluated and documented in the past. See, for example:

- the original 1979 Final Environmental Statement ("FES") for the Mill,
- Environmental Assessments ("EAs"), dated 1985 and 1997,
- an EA for the Mill's reclamation plan dated 2000,
- EAs for alternate feed materials dated 2001 and 2002, in each case prepared by the NRC,
- the Safety Evaluation Report for the Receipt, Storage and Processing of Fansteel Alternate Feed Material prepared by DWMRC,
- the Safety Evaluation Report for the Receipt, Storage and Processing of Dawn Mining Alternate Feed Material prepared by DWMRC,
- the Safety Evaluation Report for the Receipt, Storage and Processing of Sequoyah Fuels Corporation ("SFC") Alternate Feed Material prepared by DWMRC, and
- The Technical Evaluation and Environmental Assessment Report prepared in connection with the 2018 Radioactive Materials License Renewal for the Mill, prepared by DWMRC.

The Uranium Material will also be processed as an alternate feed at the Mill for the recovery of uranium and the resulting tailings will be permanently disposed of in the Mill's tailings management system as 11e.(2) byproduct material, in a similar fashion to other conventionally mined ores and alternate feed materials that have been processed or licensed for processing at the Mill.

Accordingly, this Environmental Report will focus on the various pathways for potential radiological and non-radiological impacts on public health, safety and the environment and determine if the receipt and processing of the Uranium Material would result in any potential significant *incremental* impacts over and above previously licensed activities.

The pathways that are analyzed are the following:

a) potential impacts from transportation of the Uranium Material to the Mill;
b) potential impacts from radiation released from the Uranium Material while in storage at the Mill;
c) any chemical reactions that may occur in the Mill's process;
d) any potential reactions or inconsistencies with the existing tailings or tailings facilities;
e) potential impacts on groundwater;
f) potential impacts on surface water;
g) potential airborne radiologic impacts;
h) potential radon and gamma impacts; and
i) worker health and safety issues.

These potential pathways will be discussed in the following sections of this document. The findings below will demonstrate that, because all the constituents in the Uranium Material have either been reported to be, or can be assumed to be, already present in the Mill's tailings system or were reported in other licensed alternate feed materials, at levels generally comparable to or higher than those reported in the Uranium Material, the resulting tailings will not be significantly different from existing tailings at the facility. As a result, there will be no incremental public health, safety or environmental impacts over and above previously licensed activities.

Processing of the Uranium Material involves no new construction, no additional use of land, no modification of the Mill, main circuit, alternate feed circuit, or tailings management system of any significance. The Uranium Material contains no new chemical or radiological constituents beyond those already processed in ores and approved alternate feed materials, or already known or expected to be present in the tailings management system. As a result, there are no anticipated impacts to the environment via any of the above pathways, above those already anticipated in the existing environmental statements and environmental assessments associated with the Mill's approved license, which have addressed, among other issues and requirements:

- Geology and soils,
- Liquid effluents,
- Airborne effluents,
- Direct radiation,

- Management of sanitary wastes,
- Human and ecological receptor hazard assessment,
- Mill accidents,
- Transportation accidents,
- Groundwater impacts,
- Surface water impacts,
- Mill decommissioning,
- Land, structures, site and tailings reclamation,
- Internal inspection program,
- Corporate organization and management,
- Radiological protection training,
- Security,
- Quality assurance for all phases of the milling program,
- Operational effluent monitoring,
- Operational radiological monitoring,
- Meteorological monitoring,
- Capacity of tailings system over the lifetime of the Mill operations,
- Permanent isolation of tailings including slope stability, settlement, and liquefaction potential,
- Consideration of below-grade disposal of tailings,
- Tailings design requirements including site location and layout, site area, geography, land use and demographic surveys, use of adjacent lands and waters, population distribution, demography, meteorology, air models, geology and soils, seismology, hydrologic description of the site, surface water, flooding determination, surface water profiles, channel velocities, shear stresses, groundwater hydrology, radiological surveys, site and uranium mill tailings characteristics, disposal cell cover engineering design, and design of erosion protection covers,
- Groundwater protection standards,
- Liner construction,
- Prevention of overtopping,
- Dike design, construction, and maintenance,
- Cover and closure at end of operations including radon attenuation, gamma attenuation, and cover radioactivity content,
- Effectiveness of final radon barrier including verification and reporting,
- Radium in cover materials,
- Radionuclides other than radium in soils,
- Non-radiological hazards,
- Completion of final radon barrier,
- Preoperational and operational monitoring programs,
- Effluent control during operations including gaseous and airborne particulates, liquids and solids, contaminated equipment, sources and controls of Mill wastes and effluents, sanitary and other Mill waste systems, effluents in the environment, effluent control techniques, external radiation monitoring program, airborne radiation monitoring, exposure calculations, bioassay program, contamination control program, airborne

effluent and environmental monitoring program, groundwater and surface water monitoring program, control of windblown tailings and ore,

- Daily tailings inspections,
- Financial surety,
- Costs of long-term surveillance,
- Application for a groundwater discharge permit,
- Groundwater permit compliance monitoring,
- Background groundwater quality determination,
- Submission of data,
- Reporting of mechanical problems or discharge system failures,
- Correction of adverse effects, and
- Out of compliance status and procedures.

4.2 Transportation Considerations

4.2.1 Packaging and Mode of Transportation

The drummed Uranium Material from the Facility accumulated to date will be loaded into closed cargo containers, such as Container Express ("Conex"), Sea Box, Intermodal Containers ("IMCs") or the equivalent and transported by truck to a port of departure in Estonia. The containers will be transferred to a container ship and will be transported by sea from Estonia to a Port of arrival (such as Houston, Texas) in one seaborne shipment. The closed cargo containers will be transferred either to:

- intermodal rail cars at the port of entry and transported by rail to one of the existing rail transfer yards in Utah (e.g., Green River), followed by transfer to intermodal truck tractors from the railhead to the Mill, or

- multi-unit truck tractors at the port of entry and transported by truck over public highways from the port of entry to the Mill.

The Uranium Material will be shipped as Radioactive LSA I (low specific activity) Hazardous Material as defined by U.S. Department of Transportation ("DOT") regulations. Silmet will arrange with a material handling contractor for the proper marking, labeling, placarding, manifesting and transport of each truckload of the Uranium Material. Shipments will be tracked by the shipping company from the Facility until they reach the Mill. Each shipment will be "exclusive use" (i.e., the only material on each vehicle will be the Uranium Material).

Silmet will ship a total of approximately 50 IMCs or the equivalent to transfer all the material currently on site in Estonia. If the Facility continues to ship material produced for the next 10 years, Silmet will ship an additional 6 containers per year, or a total of approximately 110 containers, over that time period. Once a shipment reaches the Port of arrival, the entire consignment of containers might potentially be transferred directly to rail cars or to individual truck tractors without interim-term storage at dockside or at the terminal. In the maximum theoretical case for Uranium Material accumulated to date, if 50 truck chassis were available for container pickup at the Port, and were continuously loaded and released from dockside at one per hour, or if the rail shipment was transferred to IMCs at the rail terminal in Utah at the rate of one container per hour, the entire initial shipment of 50 containers could conceivably travel SR 191 over a period of slightly more than two days. Subsequent future shipments of annual Uranium Material would be expected to be transported periodically in similar or smaller-sized batches.

The containers and trucks involved in transporting the Uranium Material to the Mill site will be surveyed and decontaminated, as necessary, prior to leaving the Facility for the port of departure from Estonia. The containers and trucks will be decontaminated again, as necessary, prior to leaving the Mill site.

In the maximum theoretical case, for the Uranium Material accumulated to date, the Mill may potentially receive the trucks over a period of two to three days, stage the trucks on site as they are received, and release them over a period of one week or more as each truck and container is scanned, decontaminated as needed, for release.

Alternatively, the shipper may be requested to transport the initial shipment to the Mill at a preferred frequency of no more than 10 containers per day. This rate would allow the Mill to receive, scan, decontaminate and release each truck as it arrives, with no staging on the Mill site required.

4.2.2 Transportation Impacts

For the following reasons, it is not expected that transportation impacts associated with the movement of the Uranium Material by cargo ship and truck from the Facility to the Mill will be significant:

a) Radiological Matters

The transport of radioactive materials is subject to limits on radiation dose rate measured at the transport vehicle as specified in the US Code of Federal Regulations. The external radiation standards for these shipments are specified in 10 CFR 71.47 sections (2) and (3) as less than 200 millirems per hour ("mrem/h") at any point on the outer surface of the vehicle, and less than 10 mrem/h at any point two meters from the outer lateral surfaces of the vehicle. All exclusive use trailer trucks will be scanned by Silmet prior to departure from the Facility to ensure that these limits are satisfied. From a radiologic standpoint, the Uranium Material is within the bounds of other ores and alternate feed materials licensed for processing at the Mill. The Uranium Material will be transported in covered exclusive use box-style trailers or IMCs, in a similar fashion to other conventional ores and alternate feed materials, and as a result there will be no significant incremental radiological impacts associated with transportation of Uranium Material to the Mill, over and above other previously licensed ores and alternate feed materials at the Mill or from licensed activities at other facilities in the State of Utah.

b) Traffic Volume Matters

(i) *Comparison to Licensed Mill Operations*

Section 4.8.5 of the 1979 FES for the Mill noted that during the operations period, when area mining was at expected peak levels, approximately 68 round trips on local highways would be made by 30-ton ore trucks to the Mill per day (see the 1978 Dames and Moore Environmental

Report for the Mill, p. 5-34). In contrast, the entire quantity of Uranium Material accumulated to date is expected to be transported in a total of approximately 50 truckloads of 20-ton containers. Whether the material shipments are received over a week or, in the worst case, condensed into a period of two days, the maximum additional truck traffic generated will be no greater than 25 trucks per day or approximately one truck per hour over two days.

In future years, the entire annual production of Uranium Material could potentially be transported to the Mill in six 20-ton containers, once per year.

In addition, based on a licensed yellowcake capacity of 4,380 tons U_3O_8 per year (Mill license condition 10.1) a maximum of approximately 8,760,000 pounds of yellowcake would require shipment from the Mill to conversion facilities. This would require approximately 183-275 truck shipments from the Mill per year (based on 40-60 drums per truck, 800 lbs. per drum), or one truck every one to two days based on a seven-day work week (one truck every day or so, based on a five-day work week). In contrast, the entire volume of yellowcake to be produced from processing the Uranium Material accumulated to date is expected to be transported in approximately 11 drums or a fraction of one truckload. In future years, the entire volume of yellowcake produced may be transported in one drum per year. These frequencies are minimal in comparison to the estimated yellowcake transport frequency at licensed capacity. Moreover, during the period of transportation of the Uranium Material to the Mill, EFRI does not expect that ore deliveries from all other sources would, in total, exceed a small fraction of the truck transportation associated with licensed capacity.

After leaving the port of arrival, the shipments will travel west via one of several routes to the Mill. Potential routes considered include:

- Rail shipment to one of the existing rail transfer yards in southeastern Utah or western Colorado, followed by transfer of the containers to intermodal trucks, and transport by truck the remainder of the trip to the Mill. These potential transfer locations would result in truck travel for a short distance on Interstate Highway 70 to Utah State Highway ("SH") 191, and south along SH 191 to the Mill.

- Interstate Highway 45 to Interstate Highway 35 to Interstate Highway 40, followed by US and State Highways to the Four Corners area, to SH 191 and north on SH 191 to the Mill.

- Interstate Highway 10 to Interstate Highway 25 to Interstate Highway 40, followed by US and State Highways to the Four Corners area, to SH 191 and north on SH 191 to the Mill.

(ii) *Comparison to Existing Truck Traffic on US Highway 191*
Whether the shipments from the port of entry arrive by rail and truck or directly by truck, the multi-unit trucks will travel over Utah Highway 191 either north or south of the Mill, to reach the Mill.

In the most conservative case, based on information from the Utah Department of Transportation ("UDOT") analysis reports, 319 multi-unit trucks traveled daily on segments of US Highway 191 south of the Mill. Based on the 2017 UDOT truck traffic information, the maximum of 25 additional trucks per day traveling this route to the Mill during the limited period anticipated for shipment of the Uranium Material represents an increased traffic load of approximately 8 percent for no longer than two to three days. Alternatively, at a lower truck frequency of 10 per day, the increased traffic load of 3 percent may last no longer than a week. Therefore, the truck traffic to the Mill from this project is expected to be an insignificant portion of existing truck traffic on US Highway 191 and well within the level of truck traffic expected from normal Mill operations, even in the most conservative case.

In theoretical future years, the incremental increase of six trucks per year, transported in one day, would produce an increased traffic load of less than 2 percent for one day.

4.2.3 Transportation Accidents

As discussed in Section 2.3 and Attachment 5, the Uranium Material has a uranium content and radioactivity levels comparable to Colorado Plateau ores and previously-approved alternate feed materials and contains no additional constituents beyond those associated with other ores or alternate feed materials previously transported to the Mill. Therefore, the Uranium Material poses no additional hazards during transport above previously licensed activities. Existing accident response and spill response procedures are therefore sufficient for management of potential transportation accidents or spills of the Uranium Material.

4.3 Storage

4.3.1 Manner of Storage

Trucks arriving at the Mill site will be received according to existing Mill procedures. The drums will be unloaded from the trucks onto the ore pad for temporary storage until the material is scheduled for processing.

4.3.2 Environmental Impacts Associated With Storage

Because the Uranium Material does not significantly differ in radiological activity from other ores and alternate feed materials, and because the Uranium Material will be stored in metal drums with triple-walled polyethylene bag liners on the Mill's ore pad pending processing, there will be no environmental impacts associated with the Uranium Material over and above those associated with other ores and alternate feed materials handled at the Mill on a routine basis. Experience at the Facility has determined that the Uranium Material is stable under ambient environmental conditions and does not require any special handling.

4.4 Process

The Uranium Material will be introduced to the process in either the alternate feed circuit or in the main circuit either alone or in combination with other conventional ores or other alternate feed materials. Because the Uranium Material is in a dry, powdered state, the drum contents will be managed, as required, to minimize dust generation upon emptying. Dust management may include emptying the drums within an enclosure with water sprays, wetting the drum contents before emptying, or emptying the drums submerged, as determined to be appropriate based on the material condition after receipt. In either case, the material will be processed through existing acid leach, solid liquid separation and solvent extraction circuits for the recovery of uranium values. The leaching process will begin either in the main circuit leach tanks with the addition of sulfuric acid, or in the alternate feed circuit. The solution will be advanced through the remainder of the Mill or alternate feed circuit with no significant modifications to either the circuit or the recovery process anticipated. The only wastes or effluents to be generated from processing the Uranium Material are tailings solutions or solids to be transferred to the Mill's existing tailings management system.

Since no significant physical changes to the Mill circuit and no new process chemicals will be necessary to process this Uranium Material, no significant construction impacts beyond those previously assessed will be involved. Recovery of additional contained metals is not anticipated at this time.

As with other alternate feed materials, a Standard Operating Procedure ("SOP") specific to processing of the Uranium Material, addressing processing procedures, personnel safety and radiation or other exposure monitoring will be developed and reviewed by the Mill's Safety and Environmental Review Panel ("SERP"), and Mill personnel will be trained in the approved SOP prior to processing of the Uranium Material. Because the Uranium Material contains elevated concentrations of Th-232, relative to conventional ores (but within the concentrations of other approved and processed alternate feed materials) the Mill's existing high-thorium content SOP will also be utilized or modified for the specific alternate feed material as applicable.

The effects of introducing the Uranium Material into the Mill's process and tailings were reviewed by EFRI's consulting chemical process engineer. The consulting engineer's Technical Memorandum is included as Attachment 5. The Technical Memorandum provides, in Tables 4-1 and 4-2, comparisons of the concentrations of all known constituents of the Uranium Material to the tailings and other previously processed ores and alternate feed materials. As discussed in Section 4.5 below, and in Attachment 5, the existing tailings management system controls are adequate for management of any tailings generated from the Uranium Material.

4.4.1 Mill Accidents and Emergency Response

As discussed in Section 2.4 and Attachment 5, the Uranium Material has a uranium content and radioactivity levels comparable to Colorado Plateau ores, and previously-approved alternate feed materials, and contains no additional constituents beyond those associated with other ores or alternate feed materials previously transported to the Mill. Therefore, the Uranium Material poses no additional hazards during storage, processing or disposal of tailings. As discussed in Attachment 5, the Uranium Material will not introduce any new hazardous constituents, and processing will not require the introduction of any new processing chemicals. Existing emergency response and spill response procedures are therefore sufficient for management of potential accidents or spills of the Uranium Material on the Mill site.

4.5 Compatibility with EFRI Mill Tailings

4.5.1 Physical Compatibility

The Uranium Material will be received as dried powdered solids from rotary calcining at the Silmet Facility. All the non-uranium components of the material will eventually be discharged to the Mill's tailings management system. Cell 3 and Cell 4A are currently the active tailings cells at the Mill and either could receive tailings from the Uranium Material. However, because filling of Cell 3 is nearing completion, tailings from the Uranium Material will more likely be placed in Cell 4A. The evaluations in this application and its attachments are therefore based on placement of tailings in Cell 4A. For purposes of comparison, calculations of concentration changes in the tailings management system have been prepared both for Cell 3 and Cell 4A.

The solutions from the Uranium Material tailings will be recirculated through the mill process for reuse of the acidic properties in the solution. The solids will be only a portion of the total mass of Uranium Material. However, assuming a worst-case scenario that all of the solid material ends up in the tailings management system, it is estimated that for the main processing circuit, the additional load to the tailings management system is minimal (Attachment 5, Tables 4-1 and 4-2). It is expected that the percent increase to the system will be an average of 4 to 5 percent averaged over all components. Based on the calculations in Table 5, lead concentrations may theoretically increase up to 87% compared to the currently estimated concentration of lead in Cell 4A. It should be noted, however, that the existing concentrations of lead in Cell 4A are low and that the maximum lead content of 4,100 mg/kg in the Uranium Material is substantially lower than the elevated lead levels of previously approved alternate feeds such as Molycorp and others, which have ranged up to 236,000 mg/kg, and the quantity of Uranium Material is far lower than the quantities of those alternate feed materials.

As can be seen from Tables 4-1 and 4-2, the constituents in the Uranium Material are estimated to raise the current concentration in Cell 4A by no more than a few mg/L, and for many constituents, due to the low levels in the Uranium Material, the resulting concentration in tailings is expected to go down, in some cases significantly.

Based on Table 4-1 lead concentrations may increase by 14.9 mg/L compared to current concentrations in Cell 4A or by 3.4 mg/L over the life of Cell 4A, when represented by Cell 3 in Table 4-2. Again, it should be noted, that the level in the Uranium Material is 100 times lower than that of other alternate feed materials previously approved and processed at the Mill, such as the Molycorp Mountain Pass drummed material.

Based on Table 4-1 barium concentrations may increase by 1.6 mg/L compared to current concentrations in Cell 4A or by 0.4 mg/L over the life of Cell 4A, when represented by Cell 3 in Table 4-2.

Cell 4A, which has been in service since October of 2008, has received tailings solids and solutions primarily from conventional ore processing together with a small volume from alternate feed material processing. Cell 4B, placed into service in February 2011, currently serves as an evaporation pond and receives only solutions at this time. Cell 4A has primary and secondary high-density polyethylene ("HDPE") flexible membrane liners, a geosynthetic clay underliner, and a leak detection system design, selected specifically to meet current standards for uranium mill tailings management.

The constituents in the tailings resulting from processing the Uranium Material are not expected to be significantly different from those in the conventional ores either in composition or in concentration of constituents. The Technical Memorandum on Worker Safety, Environmental Issues and Chemical Compatibility (the "Safety and Compatibility Technical Memorandum", Attachment 5) indicates that all of the constituents found in the Uranium Material have previously been processed in the Mill's circuits and managed in the Mill's tailings management system.

The Safety and Compatibility Technical Memorandum identified that the components of the Uranium Material are not expected to have any adverse effect on the Mill processing system or the tailings cells. As described in Attachment 5, it is expected that most of the metal and non-metal impurities entering the leach system with the Uranium Material will be converted to sulfate ions, precipitated, and eventually discharged to the tailings management system.

Every metal and non-metal cation and anion component in the Uranium Material already exists or can be assumed to exist in the Mill's tailings management system, is already addressed in the Mill's groundwater monitoring program, or both. A summary of the anticipated tailings composition before and after the Uranium Material is processed is presented in the Safety and Compatibility Technical Memorandum Attachment 5.

Every identified component in the Uranium Material has been:

1. detected in analyses of the tailings management system;
2. detected in analyses of alternate feed materials licensed for processing at the Mill; or
3. detected in process streams or intermediate products when previous alternate feeds were processed at the Mill;

at concentrations that are generally comparable to the concentrations in the Uranium Material. However, even if the Uranium Material were to contain some constituents at significantly higher concentrations, due to the limited quantity of Uranium Material, any such increase in the concentration of any analyte in the Mill's tailings would not be expected to be significant. The estimated effect on tailings management system composition is discussed in the attached technical memorandum.

The constituents in the Uranium Material are expected to produce no incremental additional environmental, health, or safety impacts in the Mill's tailings management system beyond those produced by the Mill's processing of natural ores or previously approved alternate feed materials.

4.5.2 Capacity and Throughput

The amount of tailings that would potentially be generated from processing the Uranium Material is equivalent to the volume that would be generated from processing an equivalent volume of conventional ore. Processing of the Uranium Material will have no effect on the capacity of the tailings management system over the lifetime of the Mill operations beyond that of processing a similar amount of natural ore. The Facility, as described above, may be expected to ship a total of approximately 2,200 tons of Uranium Material to the Mill. This volume is well within the maximum annual throughput rate and tailings generation rate for the Mill of 720,720 tons per year. EFRI has updated the Tailings Capacity Review, a copy of which is available for review at the Mill. The Tailings Capacity Review confirms that there is more than adequate capacity to accommodate the tailings from the Uranium Material. Additionally, the design of the existing tailings management system has previously been approved by the Utah DWMRC (Cells 4A and 4B), and EFRI is required to conduct regular monitoring of the leak detection systems and of the groundwater in the vicinity of the tailings management system to detect any potential leakage should it occur. A copy of the updated Tailings Capacity Review is available for review at the Mill.

4.5.3 Mill Tailings Closure and Reclamation

Processing of the Uranium Material will have no effects beyond those identified in the approved ERs, Final Environmental Statements ("FESs"), and Reclamation Plans for tailings operational management and closure. The Uranium Material will have no effect on existing approved plans for decommissioning of the Mill, buildings, land or structures, or reclamation of the site. The Uranium Material will have no effect on tailings design components addressing permanent isolation of tailings, slope stability, settlement or liquefaction of reclaimed tailings, or design features addressing disposal cell covers or erosion protection.

Because radionuclide content is within the ranges associated with other ores and alternate feed materials approved for processing at the Mill, there will be no effect on radon attenuation, gamma attenuation or cover radionuclide content. Because it will not affect cover design at closure and reclamation, there will be no effect on the final radon barrier design or its method of emplacement, radium concentration in cover materials, or other cover radionuclide content. Processing of the Uranium Material will have no effect on completion of the final radon barrier or on the timetable for completion of reclamation. Processing of the Uranium Material will not require the acceptance of uranium byproduct material from other sources during closure.

Because processing the Uranium Material will have no effect on reclamation and closure design, construction or timing, it will have no effect on existing and approved financial surety estimates or arrangements and will not require any changes to costs of long-term surveillance.

4.6 Groundwater

In the 1997 EA, NRC staff concluded that, for a number of reasons, groundwater beneath or in the vicinity of the Mill site will not be adversely impacted by continued operation of the Mill. Because the Mill's tailings management system is not impacting groundwater, the receipt and processing of Uranium Material at the Mill will not have any incremental impacts on groundwater over and above existing licensed operations.

EFRI meets the State of Utah Groundwater Protection Standards by complying with the Mill's current Groundwater Discharge Permit ("GWDP"). The Mill initially applied for a GWDP in 2005. The current version was approved in March 2019. The primary groundwater protection standard in UAC R313-24-4 is a design standard for surface impoundments used to manage uranium and thorium byproduct material. The design of the Mill's Cell 4A, which will receive tailings from processing the Uranium Material, has been approved by DWMRC as meeting Best Available Technology ("BAT") Requirements for the liners and other components of the containment system.

The GWDP established points of groundwater monitoring compliance, a compliance monitoring program, and agreed to the establishment of intra-well background for comparison with groundwater compliance limits. The GWDP further established requirements for submission of field and laboratory monitoring data, reporting of mechanical problems or discharge system failures, correction of adverse effects, assessment of corrective actions, and notification, reporting and procedures during any out-of-compliance status. Since the issuance of the initial GWDP, the Mill has not sought to discontinue the GWDP.

All constituents identified in the Uranium Material, are already present or can be assumed to be present in the Mill's tailings system, are already included in the Mill's groundwater monitoring program, or both.

Chemical and radiological make-up of the Uranium Material is similar to other ores and alternate feed materials processed at the Mill, and their resulting tailings will have the chemical composition of typical uranium process tailings, for which the Mill's tailings system was designed. As a result, the existing groundwater monitoring program at the Mill will be adequate to detect any potential future impacts to groundwater.

As a result, there will be no incremental impacts over and above previously licensed activities.

4.7 Surface Water

There will be no discharge of Mill effluents to local surface waters. All Mill process effluents, and analytical laboratory liquid wastes will be discharged to the Mill's tailings management system for disposal by evaporation. Runoff from the Mill and facilities is directed to the tailings management system. Sanitary wastes are discharged to State-approved leach fields. Since there is no plausible pathway for Uranium Material to impact surface water, and, as indicated in Semi-Annual Effluent Reports filed by the Mill to date, there is no indication of the Mill impacting surface waters, then there will be no incremental impact to surface waters from any airborne particulates associated with processing the Uranium Material.

The Uranium Material will be transported to the Mill in closed metal drums with triple-walled polyethylene bag liners in exclusive use trucks. Upon introduction into the Mill circuit, the Uranium Material will be processed in a similar fashion as other ores and alternate feed materials. The Uranium Material will be dry, with an average moisture content estimated to be less than 1%. The drums will be opened and fed to the Mill process in an appropriate manner to minimize dust both for the purposes of worker safety and environmental protection. In addition, standard procedures at the Mill for dust suppression will be employed if necessary. There will therefore be no new or incremental risk of discharge to surface waters resulting from the receipt and processing of Uranium Material at the Mill or the disposition of the resulting tailings.

Finally, as the chemical and radiological make-up of the Uranium Material are sufficiently similar to natural ores and other alternate feed materials and resulting tailings, that the existing surface water monitoring program at the Mill will be adequate to detect any potential impacts to surface water. As a result, there will be no incremental impacts over and above previously licensed activities.

4.8 Airborne Radiological Impacts

The chemical and radiological make-up of the Uranium Material will not be significantly different from natural ores and other alternate feed materials that that have been licensed for processing at the Mill in the past. The existing air particulate monitoring program is equipped to handle all such ores and alternate feed materials.

4.9 Radon and Gamma Impacts

As discussed in Section 2.6.1 above, the uranium content and radioactivity levels of the Uranium Material is comparable to high grade Colorado Plateau ores and previously approved alternate feed materials. Therefore Rn-220 emanations from the Uranium Material will be comparable to emanations from the same quantity of Colorado Plateau ores. The gamma emanations from the Uranium Material will be elevated somewhat compared to Colorado Plateau ores, due to the elevated Th-228, but within the range of higher-grade conventional ores and other alternate feed materials. Overall, the Uranium Material will therefore pose a comparable or lower gamma and radon hazard as other ores and alternate feed materials that have already been processed or licensed for processing at the Mill.

4.10 Safety Measures

4.10.1 General

During unloading of the Uranium Material drums onto the ore pad, while the Uranium Material is being stored in drums on the ore pad pending processing, while feeding Uranium Material into the Mill process and while processing the Uranium Material and disposing of and managing the resulting tailings, the Mill will follow existing Mill SOPs, including the Mill's High Thorium Content SOP as applicable, in addition to an SOP to be developed specific to the Uranium Material, as discussed below.

4.10.2 Radiation Safety

a) Existing Radiation Protection Program at the Mill
The radiation safety program which exists at the Mill, pursuant to the conditions and provisions of the Mill's RML, and applicable State Regulations, is adequate to ensure the protection of the

worker and environment and is consistent with the principle of maintaining exposures of radiation to individual workers and to the general public to levels As Low As Reasonably Achievable ("ALARA"). Employees will be provided with personal protective equipment including full-face respirators, if required. In addition, all workers at the Mill are required to wear personal Optically Stimulated Luminescence ("OSL") badges or the equivalent to detect their exposure to gamma radiation.

b) Gamma Radiation
Gamma radiation levels associated with the Uranium Material are within levels of gamma radiation associated with other ores and alternate feed materials processed or licensed for processing at the Mill in the past. Gamma exposure to workers will be managed in accordance with existing Mill SOPs, including the Mill's High Thorium Content SOP as applicable.

c) Radon
Radon levels associated with the Uranium Material are within levels of radon associated with other ores and alternate feed materials processed or licensed for processing at the Mill in the past. Radon exposures to workers will be managed in accordance with existing Mill standard operating procedures.

d) Control of Airborne Contamination
The Uranium Material is a fine-grained powder with an average moisture content estimated to be less than 1%. While stored on the ore pad, the uranium material will remain within the metal drums with triple-walled polyethylene bag liners used for transport. The Uranium Material will be stored in an area on the ore pad separate from regular traffic and marked as Uranium Material.

Dust suppression techniques will be implemented, if required, while the Uranium Material is being introduced into the Mill process. Once in the Mill process, the Uranium Material will be in a dissolved form, and no special dust suppression procedures will be required. As is the practice at the Mill for other alternate feed materials, the Derived Air Concentration ("DAC") to be used in any analysis of airborne particulate exposure to workers will be developed specifically for the Uranium Material, based on applicable regulations and Mill procedures, in order to take into account the specific radionuclide make-up of the Uranium Material. The Mill has safely received and processed alternate feed materials with comparable concentrations of the radionuclides contained in the Uranium Material, under previous license amendments, and can safely handle the Uranium Material in accordance with existing Mill standard operating procedures.

4.10.3 Occupational Safety

The primary focus of safety and environmental control measures will be to manage potential exposures from radionuclide particulates. Response actions and control measures designed to manage particulate radionuclide hazards will be more than sufficient to manage chemical hazards from the metal oxides (see the conclusions of the Safety and Compatibility Technical Memorandum in Attachment 5).

4.10.4 Vehicle Scan

As stated in Section 4.2 above, the shipments of Uranium Material to and from the Mill will be dedicated, exclusive loads. Radiation surveys and radiation levels consistent with applicable DOT regulations will be applied to the exclusive use vehicles. For unrestricted use, radiation levels will be in accordance with applicable values contained in the NRC Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material, U.S. NRC, April 1993. If radiation levels indicate values in excess of the above limits, appropriate decontamination procedures will be implemented.

4.11 Long Term Impacts

The Uranium Material is comprised of similar chemical and radiological components as already exist in the Mill's tailings management system. Existing monitoring programs are therefore adequate and no new monitoring procedures are required. As a result, there will be no decommissioning, decontamination or reclamation impacts associated with processing the Uranium Material, over and above previously licensed Mill operations.

4.12 Other Operational Considerations

Processing of the Uranium Material will not require changes to corporate organization or administrative procedures, management control programs, management audit and inspection programs, staffing levels or staff qualifications. Processing will not require modifications to the Mill's existing security procedures.

4.13 Added Advantage of Recycling

Silmet has expressed its preference for use of recycling and mineral recovery technologies for the Uranium Material for three reasons: 1) for the environmental benefit of reclaiming valuable minerals; 2) for the added benefit of reducing radioactive material disposal costs; and 3) for the added benefit of minimizing or eliminating any long-term contingent liability for the waste materials generated during processing.

Silmet has noted that the Mill has the technology necessary to process materials for the extraction of uranium and to provide for disposal of the 11e.(2) byproduct material, resulting from processing primarily for the uranium, in the Mill's existing tailings management system. As a result, Silmet will contractually require EFRI to recycle the Uranium Material at the Mill for the recovery of uranium.

4.14 Consideration of Alternatives

This application is in response to a request by Silmet for disposal/processing options in connection with removal of uranium material from storage at the Facility to maintain compliance with the Facility's license conditions. The Mill is a facility that has been requested to provide these services, because it is licensed to process materials for the recovery of uranium and is licensed to create, possess and dispose of byproduct materials that are similar to the Uranium

Materials. Given that removal of the Uranium Material to an offsite facility is required to meet the Facility's license conditions, the only options are as to which offsite facility the Uranium Materials will ultimately be sent for reprocessing or disposal. Silmet has determined that the Mill is the only off-site facility capable of re-processing the Uranium Material. Therefore, the alternative to processing/disposal at the Mill would be direct disposal. If direct disposal is utilized, the value of the recoverable uranium in the Uranium Material would not be realized.

5.0 CERTIFICATION

This application and Environmental Report has been submitted as of April 18, 2019 by

Energy Fuels Resources (USA) Inc.

By:______________________________
David C. Frydenlund
Chief Financial Officer, General Counsel and Corporate Sectretary

ATTACHMENT 1
NPM Silmet OÜ Facility Information

neo
Performance Materials

HISTORICAL OVERVIEW OF THE SITE – NPM SILMET OÜ

General overview

1927-1940	A. Nobel established Shale Oil production factory, which was destroyed during Second World War
1944	Soviet Union occupied Estonia and restoration of facilities started, with the aim to produce Uranium from local Shale ore
1946-1952	The Pilot production of the Uranium from local Shale ore
1952-1970	Different Uranium containing ores processing to produce Uranium oxide
1970	Started the Loparite ore processing to produce Nb, Ta and Rare Earth Concentrates
1982-1988	Production of the reactor grade enriched uranium products
1988-1990	Soviet occupation in Estonia ended and uranium production stopped.
1990-1997	Facility reorganization as State owned company
1997	Private Company for Nb, Ta and REE production
1999-2009	The decomissioning process of the radioactive tailings pond.

Regulated quantites of the collection and storage of the NORM residues in NPM Silmet OÜ

NPM Silmet OÜ Radiation Activity License 14 010 (valid from 30.01.2014 to 30.01.2019) regulates the quantity of the NORM residue collected and stored on the site in period 2014-2019 is **362,5 Mt.** NPM Silmet OÜ has already collected and stored 255 Mt NORM residues during previous periods (2009-2014) after closing Sillamäe radioactive tailings pond at 2009. NPM Silmet OÜ has licensed limit to collect and storage altogether **615,5 Mt of NORM residues.**

NPM Silmet OÜ actual quantity of collected and storaged NORM residue will be **535,33 Mt** in the end of 2018.

Graph 1. NORM residue quantities in period 2009-2019.

NPM SILMET OÜ

www.neomaterials.com

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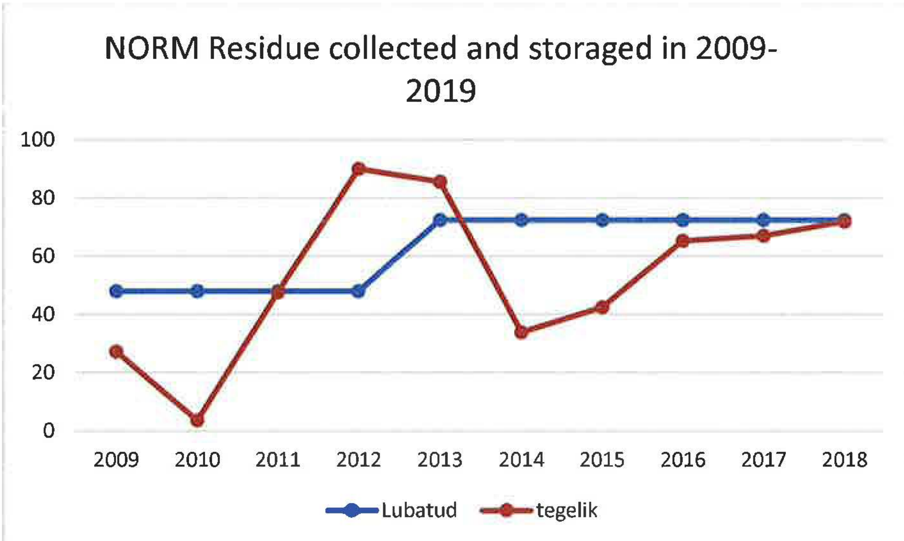
40231 Sillamäe, Estonia
Reg.nr. 10294959

+372 392 9100 PHONE



Jane Paju
Director of Technology
NPM Silmet OÜ

Performance Materials

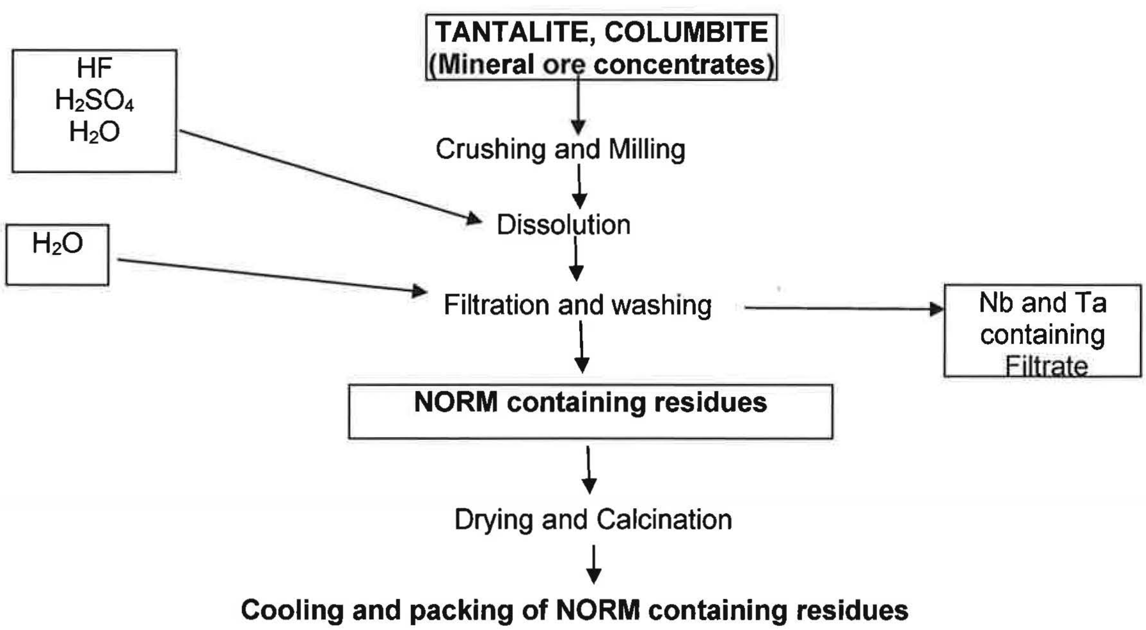
TECHNOLOGICAL PROCESS DESCRIPTION FOR PRODUCTION OF NORM CONTAINING RESIDUE

General description of the process

Columbite and tantalite - NORM (U 238 and Th 232) containing mineral ore concentrates are processed via leaching process to separate the insoluble impurities including NORM (U238 and Th232) and Nb, Ta. The process includes the following operations:

- Crushing and milling of the mineral ores Columbite and Tantalite;
- Dissolution of the mineral ores, columbite and tantalite in acid solutions (HF, H_2SO_4);
- Precipitation of insolubles from slurry and their filtration – Filter cake = NORM containing residue;
- Washing of the filter cake with water
- Filtration of the NORM containing residue
- Calcination, cooling and packing of the NORM containing residue

Figure 1. The principal flowchart of the NORM containing residue process



Raw material

NPM SILMET OÜ

www.neomaterials.com

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Reg.nr. 10294959

+372 392 9100 PHONE

Raw Materials

NPM Silmet OÜ is using several types of mineral ores – Columbite and Tanatlite, which are characterized by different rare metals Nb and Ta content, but also different impurities profile included content of naturally occuring radioactive materials U 238 and Th 232 and their decay products. Typical characteristics of Columbite and Tantalite are in Table 1.
Columbite and Tantalite are dark coarse mineral materials, what will be crushed and milled by vibrating mills. Raw materials are transported to NPM Silmet OÜ in 50 kg plastic bags or 200 liter metal drums.

Table 1

	Element	Columbite	Tantalite
1	Ta_2O_5, %	4	30
2	Nb_2O_5, %	40	20
3	ThO_2, %	0,5	0,2
4	U_2O_3, %	0,1	0,2
5	LOD, %	0,1	0,1

Crushing and milling of raw material

Columbite and tantalite are crushed and milled in isolated area - milling unit, because of the formation of the radioactive dust, which is the must hazardous factor of the entire process. Raw materials are loaded by hermetic feeder screws into vibrating mills, where material is milled until to required particle size, removed from mills by hermetical discharge systems and packed into metal drums. Milling unit has isolated ventilation system with filter systems, dust particles from the filtered air is removed by cyclons and recycled in the process with raw material.

Dissolution of raw material and filtration of the solutions.

Milled columbite and tantalite is transported into dissolution unit (located in the same territory, but separate building). Drums with the milled columbite and tantalite are placed on the top of automatic feeder systems, where material is loaded into dissolution reactors into hydrofluoric acid solution. Raw material is dissolved at temperature 80-85°C in hydrofluoric acid and sulphuric acid is added to precipitate out the impurities. The slurry is filtrated to remove the insoluble impurities including U and Th. After filtration the filtercake is washed with water several times to remove all Nb and Ta from the cake. Wet NORM containing cake is packed into 1Mt plastic bags (Big-bags) and transported into calcination unit (locating in the same building).

Calcination of the NORM containing cake

NORM containing cake (NORM Residue) is loaded from big-bags into electric rotary kilns via feeder systems, and calcined at temperature 550-600 °C 1 hour. Calcined NORM residue is moving from rotary kiln into rotary coolers where material is cooled down and packed into 200 l metal drums what is insulated with triple wall PE bags. Quality Control Department with Governmental Lab Ökosil AS, are taking samples from every drum for gamma spectrometry analyze and all drums are measured for dose speed. The LOT is completed from 9 drums and transported into warehouse, photos 1,2,3.

Photos 1, 2: Packed NORM residues.

Photo 3. NORM residue warehouse

Jane paju
Director of Technology
NPM Silmet OÜ

ATTACHMENT 2
Radioactive Material Profile Record and Affidavit

RADIOACTIVE MATERIAL PROFILE RECORD

Name and Title of Person Completing Form: **JANE PAJU, DIRECTOR OF TECHNOLOGY**

Original Submission: **yes**; Revision # **1**; Date of Revision: **03 January 2019**

Generator Name: **NPM SILMET OÜ** Generator/Feed Stream #: **columbite/tantalite** Volume of Feed Material: **600 metric tons**

Contractor Name: ________________, Feed Stream Name: ____________________, Delivery Date: ______________________

Check all appropriate boxes:

Licensed: **Yes**

NORM/NARM X ; LLRW ___; MW ___; MW Treated ___; MW Needing Trtmt ___; DOE ___; 11e. (2) ___;

A. CUSTOMER INFORMATION:

GENERAL: Please read carefully and complete this form for one feed stream. This information will be used to determine how to properly manage the material. Should there be any questions while completing this form, contact Energy Fuels Resources (USA) Inc.'s ("EFRI's") Manager of Compliance and Licensing at 303.389.4132. MATERIALS CANNOT BE ACCEPTED AT EFRI'S WHITE MESA MILL UNLESS THIS FORM IS COMPLETED. If a category does not apply, please indicate. This form must be updated annually.

1. GENERATOR INFORMATION

EPA ID# ______________________ EPA Hazardous Waste Number(s) (if applicable) __________________________

Mailing Address: **KESK 2, SILLAMÄE, ESTONIA, EU**

Phone: ___________________________________ Fax: ______________________________________

Location of Material (City, ST): **KESK 2, SILLAMÄE, ESTONIA, EU**

Generator Contact: **Jane Paju** Title: **Director of Technology**

Mailing Address (if different from above): **j.paju@neomaterials.com**

Phone: **+372-392-9137** Fax: _____________________________________

B. MATERIAL PHYSICAL PROPERTIES (Should you have any questions while completing this section, contact EFRI's Manager of Compliance and Licensing at 303.389.4132.)

1. PHYSICAL DATA (Indicate percentage of material that will pass through the following grid sizes, e.g., 12" 100%, 4" 96%, 1" 74%, 1/4" 50%, 1/40" 30%, 1/200" .5%)

GRADATION OF MATERIAL:

12"	**100%**
4"	**100%**
1"	**100%**
1/4"	**100%**
1/40"	**99.83%**
1/200"	**61.72%**

2. DESCRIPTION: **Color _x_ Brown/Multi___** Odor___ **Odorless_x__**

   Liquid___ Solid___ Sludge___ **Powder/Dust_x_**

3. DENSITY RANGE: (Indicate dimensions) **0.9 - 1.2 S.G.** lb. /ft^3 lb. /yd^3

4. GENERAL CHARACTERISTICS (% OF EACH)

   Process Residue (concentrated and calcined NORM containing filter cake after ore (columbite/tantalite) leaching) - 100%

   Other constituents and approximate % contribution of each:

Generator or Contractor Initials: JP

5. MOISTURE CONTENT: (For soil or soil-like materials).
(Use Std Proctor Method ASTM D-698 or equivalent)

Low Moisture Content: _______%
High Moisture Content: _______%
Average Moisture Content: below 1%

DESCRIPTION OF MATERIAL Attach a description of the material (as *Attachment B.6*) with respect to its physical composition and characteristics such as geotechnical or engineering information (for example, if information is available regarding percent [%] sands, clay or debris).

C. RADIOLOGICAL EVALUATION

1. MATERIAL INFORMATION. For each radioactive isotope listed below, obtain sufficient samples to adequately determine a range and weighted average of activity in the material. If Uranium, Thorium, or other non-gamma emitting nuclides are present in the material, have at least (1) sample evaluated by radiochemistry to determine the concentration of these additional contaminants in the material. EFRI's license assumes daughter products to be present in equilibrium. Add isotope information as necessary for the proposed alternate feed material. Analytical data packages, including quality control information, MUST be included for all data summarized below (as *Attachment C.1*).

Isotope	Concentration Range (pCi/g)	Average (pCi/g)
Pb 210		904
U Nat (238)		1105
Th 228		1033
Th 230		902
Th 232		1199
Rad 226		1332
Rad 228		1394
Others (Please Specify)		
U 234		979
U 235		45

ND – Analyte not detected.

(Please Circle)

2. Y N Is the radioactivity contained in the feed material Low-Level Radioactive Waste as defined in the Low-Level Radioactive Waste Policy Amendments Act of 1985 or in DOE Order 5820.2A. Chapter III? *If yes, check "LLRW" block on line 3 of page 1.*

3. Y N LICENSED MATERIAL: Is the feed material listed or included on an active Nuclear Regulatory Commission or Agreement State license?
(If Yes) TYPE OF LICENSE: Source ____; Special Nuclear Material ____; By-Product ____; Norm ___; NARM ___;
LICENSING AGENCY: ____________________ LICENSE NUMBER: ____________

D. CHEMICAL AND HAZARDOUS CHARACTERISTICS

1. DESCRIPTION AND HISTORY OF MATERIAL

Please attach a description of the material to this profile (as *Attachment D.1 a through f*). Include the following as applicable:

a. The process by which the material was generated. Including available process knowledge of the material.
b. The basis of hazardous material determination or waste characterization determinations.
c. A list of the chemicals and materials used in or commingled with the material.
d. A list of any and all current or former applicable EPA Hazardous Waste Numbers.
e. A list of any and all applicable land-disposal prohibition or hazardous-waste exclusions, extensions, exemptions, effective dates, variances or delistings.
f. Attach any product information or Material Safety Data Sheets associated with the material.

If a category/description listed in a through f above does not apply, describe why it does not.

Generator or Contractor Initials: DR

Please describe the history, and include the following:

(Please Circle)

Y N Was this material mixed, treated, neutralized, solidified, commingled, dried, or otherwise processed at any time after generation?
Y N Has this material been transported or otherwise removed from the location or site where it was originally generated?
Y N Was this material derived from (or is the material a residue of) the treatment, storage, and/or disposal of hazardous waste defined by 40 CFR 261?
Y N Has this material been treated at any time to meet any applicable treatment standards?

2. LIST ALL KNOWN AND POSSIBLE CHEMICAL COMPONENTS OR HAZARDOUS WASTE CHARACTERISTICS

The generator may use its knowledge of processes and materials to in lieu of analytical data EXCEPT as required by Section 3. Any "*yes*" response will require the submission of appropriate analytical data with this RMPR (as *Attachment D.2*).

	Y	N		Y	N		Y	N
General			**Metals**			**Metals (cont'd)**		
Listed Waste		X	Arsenic – TCLP*			Nickel – Total*	X	
"Derived-From" HW			Barium – TCLP*			Selenium – Total*	X	
Characteristic			Cadmium – TCLP*			Silver – Total*	X	
Reactive - CN		X	Chromium – TCLP*			Thallium – Total*	X	
Reactive Sulfide		X	Lead – TCLP*			Tin – Total*	X	
Ignitable		X	Mercury – TCLP*			Uranium – Total*	X	
Corrosive		X	Selenium – TCLP*			Vanadium – Total*	X	
Toxic (as determined by TCLP analysis)			Silver – TCLP*			Zinc – Total*	X	
Organics			Arsenic – Total*	X		**Miscellaneous**		
VOCs		X	Barium – Total*	X		Explosives		X
SVOCs		X	Beryllium – Total*		X	Pyrophorics		X
Pesticides		X	Cadmium – Total*	X		Infectious		X
Herbicides		X	Chromium – Total*	X		Chelating Agents		X
Dioxins		X	Cobalt – Total*	X		Residue from WWT Plant		X
PCBs		X	Copper – Total*	X		**Anions**		
Solvents		X	Iron – Total*	X		Fluoride*	X	
Alcohols		X	Lead – Total*	X		Nitrate*	X	
Fuel		X	Manganese – Total*	X		Nitrite*	X	
Oil		X	Mercury – Total*	X		Sulfate*	X	
Phenolics		X	Molybdenum – Total*	X		Sulfide*	X	

**Analytical data are required for these constituents regardless of generator knowledge of process or materials.*

Generator or Contractor Initials: RL

3. REQUIRED ANALYTICAL RESULTS. Generator must submit results of analyses of samples of the material. Results are required from a qualified laboratory for the following analytical parameters. Attach all analytical results and QA/QC documentation available (as *Attachment D.3*). (CAUTION: PRIOR TO ARRANGING FOR LABORATORY ANALYSIS, CHECK WITH EFRI REGARDING UTAH LABORATORY CERTIFICATIONS.) Please summarize results on the blank spaces provided.

Analyte	**TCLP Range or Maximum (mg/L)**	**Total Concentration Range or Maximum (mg/kg)**
Arsenic	0.0125	4.9
Barium	ND	435
Beryllium		1.8
Cadmium	0.0198	3.5
Chromium	0.257	89
Cobalt		3.8
Copper		85.2
Iron		8766.7
Lead	1.114	4093
Manganese		1458
Mercury	ND	0.2
Molybdenum		2.3
Nickel		51.5
Selenium	ND	ND
Silver	ND	3.5
Thallium		1.3
Tin		88
Uranium		2306
Vanadium		7.4
Zinc		88.2
Fluoride		4933
Nitrate		0.2
Nitrite		NA
Sulfate		6051
Sulfide		NA

ND = Not Detected NA = Not Analyzed

Additional Required Analytical Information:

pH (liquids only): N/A

Paint Filter Liquids Test (Please Circle): Pass Fail

Free Liquid Present (Please Circle): Yes No

Is the material a RCRA oxidizer? (Please Circle): Yes No

4. PRE-SHIPMENT SAMPLES OF MATERIAL TO EFRI

Once permission has been obtained from EFRI, and unless amenability samples have previously been sent to EFRI, please send 5 representative samples of the material to EFRI. A completed chain of custody form must be included with the sampling containers. These samples will be used to establish the material's incoming shipment acceptance parameter tolerances and may be analyzed for additional parameters. Send about two pounds (one liter) for each sample in an air-tight clean glass container via United Parcel Post (UPS) or Federal Express to:

Energy Fuels Resources (USA) Inc., Attn: Sample Control, 6425 S. Highway 191, P.O. Box 809, Blanding, UT 84511
Phone: (435) 678-2221

Generator or Contractor Initials: RR

5. LABORATORY CERTIFICATION INFORMATION. Please indicate below which of the following categories applies to your laboratory data.

   a. All radiologic data used to support the data in item C.1. must be from a certified laboratory.

   X **UTAH CERTIFIED**. The laboratory holds a current certification for the applicable chemical or radiological parameters from the Utah Department of Health insofar as such official certifications are given.

   GENERATOR'S STATE CERTIFICATION. The laboratory holds a current certification for the applicable chemical parameters from the generator's State insofar as such official certifications are given, or

   GENERATOR'S STATE LABORATORY REQUIREMENTS. The laboratory meets the requirements of the generator's State or cognizant agency for chemical laboratories, or:

   If using a non-Utah certified laboratory, briefly describe the generator state's requirements for chemical analytical laboratories to defend the determination that the laboratory used meets those requirements, especially in terms of whether the requirements are parameter specific, method specific, or involve CLP or other QA data packages.

   b. For analytical work done by Utah-certified laboratories, please provide a copy of the laboratory's current certification letter for each parameter analyzed and each method used for analyses required by this form.

   c. For analytical work done by laboratories which are not Utah-Certified, please provide the following information:

State or Other Agency Contact Person	Generator's State	Telephone Number
Lab Contact Person	Laboratory's State	Telephone Number

E. CERTIFICATION

GENERATOR'S CERTIFICATION: I also certify that where necessary those representative samples were or shall be provided to EFRI and to qualified laboratories for the analytical results reported herein. I also certify that the information provided on this form is complete, true and correct and is accurately supported and documented by any laboratory testing as required by EFRI. I certify that the results of any said testing have been submitted to EFRI. I certify that the material described in this profile has been fully characterized and that hazardous constituents listed in 10 CFR 40 Appendix A Criterion 13 which are applicable to this material have been indicated on this form. I further certify and warrant to EFRI that the material represented on this form is not a hazardous waste as defined by 40 CFR 261 and/or that this material is exempt from RCRA regulation under 40 CFR 261.4(a)(4).

The Generator's responsibilities with respect to the material described in this form are for policy, programmatic, funding and scheduling decisions, as well as general oversight. The Contractor's responsibilities with respect to this material are for the day-to-day operations (in accordance with general directions given by the Generator as part of its general oversight responsibility), including but not limited to the following responsibilities: material characterization, analysis and handling; sampling; monitoring; record keeping; reporting and contingency planning. Accordingly, the Contractor has the requisite knowledge and authority to sign this certification on behalf of itself, and as agent for the Generator, on behalf of the Generator. By signing this certification, the Contractor is signing on its own behalf and on behalf of the Generator.

Generator's or Contractor's Signature: ________ Title: **attorney-in-fact** Date: **08 February 2019**
(Sign for the above certifications).
Print Name of Individual Signing above: **Randal Reid**

Generator or Contractor Initials: RR

List of Documentation Required With the Submission of This RMPR

Attachment B.6 – Description of Physical Attributes of the Material
Attachment C.1 – Radiological Analysis – Data Packages (including all pertinent Quality Control Data)
Attachment D.1 a through f – Material generation process history and description
Attachment D.2 – Analytical data (including all pertinent Quality Control Data) for all yes answers
Attachment D.3 – Analytical Data (including all pertinent Quality Control Data) for total and TCLP metals and anions

Attachment B.6

Description of Physical Attributes of the Material

(see Material Information Safety Sheet, dated 08/02/2013 – attached)

Generator or Contractor Initials: ____________________

Present Material Safety Information Sheet is only informative as described material is not the object of the Regulation (EC) No.1907/2006 (REACH Regulation) or Regulation (EC) No.1272/2008 (CLP Regulation).
Radioactive substances and mixtures are regulated by EC Directive No. 96/29/Euratom of 13 May 1996.

Created on August 02, 2013

MSIS (Material Safety Information Sheet)

LMF (Insoluble Mineral Fraction)

1. IDENTIFICATION OF THE SUBSTANCE AND OF THE COMPANY	
1.1 Product identifier	
Trade name:	LMF (Insoluble Mineral Fraction)
Other names:	LMF, Tantalum containing cake, Uranium containing cake
Chemical name:	N/A
INDEX number as listed in Annex VI of CLP:	N/A
ID number of the C&L inventory:	N/A
CAS number:	N/A
REACH registration no(s):	N/A
1.2 Relevant identified uses of the substance or mixture and uses advised against	
Uses:	LMF (Insoluble Mineral Fraction) is used as raw material of production of Light Rare Earth Elements, Ta, Zr, Sn and also U and Th for Energy solutions.
Uses advised against:	N/A
1.3 Details of the supplier of the safety data sheet	
Manufacturer:	AS MOLYCORP SILMET Kesk Str.2; 40231; Sillamäe; ESTONIA Tel.: +372 3929100 URL website: www.molycorp.com Email: silmet@molycorp.com
Person responsible for the Safety Data Sheet (with e-mail address)	Jane Paju Jane.paju@molycorp.com
1.4 Emergency telephone number	
Emergency phone number:	

2. HAZARDS IDENTIFICATION	
2.1 Other hazards	
Other hazards:	Contains traces of naturally occurring radionuclides (NORM) U-238, Th-232, Ra-226 and Ra-228. Total Activity (by U and Th) – below 191 Bq/g

3. COMPOSITION/INFORMATION ON INGREDIENTS				
Substances				
This material is intermediate which contains insoluble mixed metal oxides on fluorides.				
Chemical name	**CAS no.**	**EC no.**	**Classification information**	**Conc.% (max)**
Niobium Pentoxide (Nb_2O_5)	1313-96-8	215-213-6	Not classified according CLP	2,3
Tantalum Pentoxide (Ta_2O_5)	1314-61-0	215-238-2	Not classified according CLP	5,0
Silicon Dioxide (SiO_2)	7631-86-9	231-545-4	Not classified according CLP	11,0
Zirconium Dioxide (ZrO_2)	1314-23-4	215-227-2	Not classified according CLP	23,0
Dialuminium Trioxide (Al_2O_3)	1344-28-1	215-691-6	Not classified according CLP	9,0
Cerium Dioxide	1306-38-3	215-150-4	Not classified according CLP	1,5
Dilanthanum Trioxide	1312-81-8	215-200-5	Not classified according CLP	0,5
Dineodymium Trioxide	1313-97-9	215-214-1	Not classified according CLP	0,5
Diyttrium Trioxide	1314-36-9	215-233-5	Not classified according CLP	1,7
Diytterbium trioxide	1314-37-0	215-234-0	Not classified according CLP	0,7
Iron Oxide (Fe_2O_3)	1309-37-1	215-168-2	Not classified according CLP	8,5
Titanium Dioxide (TiO_2)	13463-67-7	236-675-5	Not classified according CLP	2,5
Tin Dioxide (SnO_2)	18232-10-5	242-159-0	Not classified according CLP	40,0

Tungsten Trioxide (WO_3)	1314-35-8	215-231-4	Not classified according CLP	0,1
Uranium Oxide (U_3O_8)	1344-59-8	215-702-4	Radioactive substance regulated by EC Directive **96/29/Euratom**	0,8
Thorium Oxide (ThO_2)	1314-20-1	215-225-1	Radioactive substance regulated by EC Directive **96/29/Euratom**	2,4
Fluoride content			Bonded with metals	13,0

4. FIRST-AID MEASURES

4.1 Description of first aid measures

Eye contact:	Hold eyelids apart and flush affected eye(s) with plenty of clean water (at least for 10 minutes)
Skin contact:	Flush with plenty of water and mild soap.
Ingestion:	Seek for medical attention
Inhalation:	Seek for medical attention.

4.2 Most important symptoms and effects

Acute effects	Dust may cause irritation of eyes and respiratory organs
Delayed effects	Can be harmful in case of prolonged contact due to radioactive properties particularly when swallowed or inhaled.

4.3 Indication of any immediate medical attention and special treatment needed

Note to physician: Radioactive substances

5. FIRE-FIGHTING MEASURES

5.1 Extinguishing media

Suitable:	Use extinguishing agent suitable for type of surrounding fire
Not suitable:	Not known

5.2 Special hazards arising from the substance or mixture

Not known

5.3 Advice for firefighters

Wear appropriate protective equipment. Move undamaged containers from immediate hazard area if it can be done with minimal risk. Dust could bear radioactive particles.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Avoid creating dusty conditions and prevent wind dispersal. Avoid contact with eyes, skin, and clothing. Use suitable protective equipment.
6.2 Environmental precautions
Prevent the material from contact with soil, entering surface water or sanitary sewer system. Do not discharge directly to a water source. If accidental spillage or washings enter drains or watercourses contact local authority.
6.3 Methods and material for containment and cleaning up
Vacuum or sweep up and place into suitable labelled containers for recovery or disposal. Clean up affected area with a large amount of water.
6.4 Reference to other sections
See section 8 for personal protective equipment and section 13 for waste disposal.

7. HANDLING AND STORAGE	
7.1 Precautions for safe handling	
Technical measures/ Precautions:	Use with adequate ventilation. Local exhaust ventilation should be provided. Avoid contact with eyes, skin and clothing. Avoid creating dusty conditions and prevent wind dispersal.
General occupation hygiene:	Do not eat, drink or smoke in work areas. Wash hands after use. Remove contaminated clothing and protective equipment before entering eating areas.
7.2 Conditions for safe storage, including any incompatibilities	
Technical measures/ Storage conditions:	Material is to be stored in area marked for radioactive material storage. Keep in the original container. Keep container tightly closed in a cool, dry, well-ventilated place. Packaging materials: Stainless steel (304). Synthetic material.
Incompatible products:	Not known
8. EXPOSURE CONTROLS / PERSONAL PROTECTION	
8.1 Control parameters	
Regulated occupational exposure limit values:	Effective dose: 100 mSv/5 years for workers (not exceeding 50 mSv in single year).
8.2 Exposure controls	
Appropriate engineering controls:	Use of adequate ventilation is good industrial practice. In addition, an eyewash facility and a safety shower for

	facilities storing or utilizing this material is good industrial practice.
Environmental exposure controls:	Dispose of rinse water in accordance with local and national regulations.
Individual protection measures, such as personal protective equipment	
General remark:	Only person wearing personal dosimeter can work with this material.
Respiratory protection:	Respiratory protection if high airborne concentrations prevail
Hand protection:	Protective gloves, impermeable to the dust
Eye protection:	Chemical goggles or face shield are recommended to prevent potential eye contact.
Skin and body protection:	Working clothes
Hygiene measures:	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing.

9. PHYSICAL AND CHEMICAL PROPERTIES	
9.1 Information on basic physical and chemical properties	
Appearance:	Beige or yellow clumpy powder material.
Odour:	Odourless
Melting/Freezing temperature:	N/A
Boiling temperature:	N/A
Flash-point:	N/A
Flammability:	Non flammable (based on molecular structure).
Explosive properties:	N/A
Oxidizing properties:	N/A
Vapour pressure:	N/A
Relative density (D4 (20)):	5-6 g/cm^3
Solubility in water:	negligible
Partition coefficient n-octanol/water:	N/A
Viscosity:	Not applicable to solids
Specific conductivity:	No data
Auto ignition temperature:	N/A

Surface tension:	Not surface active (based on molecular structure)
9.2 Other information	
10. STABILITY AND REACTIVITY	
10.1 Reactivity Stable under recommended storage and handling conditions (see section 7, handling and storage).	
10.2 Chemical stability Stable under recommended storage and handling conditions (see section 7, handling and storage).	
10.3 Possibility of hazardous reactions N/A	
10.4 Conditions to avoid None known	
10.5 Incompatible materials None known	
10.6 Hazardous decomposition products None known	
11. TOXICOLOGICAL INFORMATION	
11.1 Information on toxicological effects	
ACUTE TOXICITY	Oxides and fluorides contained in LMF are not toxic, but material is radioactive and could cause health risk due to radioactive properties.
OTHER	In case of prolonged eye contact or repeated inhalation or ingestion material can present a hazard due to radioactive properties.
12. ECOLOGICAL INFORMATION	
Avoid contamination and distribution in the environment due to radionuclide properties.	
13. DISPOSAL CONSIDERATIONS	
Waste from residues:	Special disposal in accordance with local and state regulations due to radioactivity.
Container:	Containers should be cleaned by appropriate method, in accordance with local and national regulations. Do not remove label until container is thoroughly cleaned. Empty containers should be decontaminated before reuse.
14. TRANSPORT INFORMATION	
UN Number:	2912

Proper shipping name:	Radioactive material, low specific activity LSA-1
Transport hazard classes:	ADR/RID: 7 (LSA I) IMO: 7 (LSA I) ICAO/IATA: 7 (LSA I) **Authorized carrier for class 7 required!**
Packaging group:	I type IP-1 (II yellow, T1=0,1)
Special precautions:	**HAZARDOUS MATERIAL, DANGEROUS GOOD, RADIOACTIVE!**

15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulation/legislation specific for the substance or mixture:	RADIOACTIVE National regulation observation recommended! Radioactive substances and mixtures are regulated by EC Directive No. 96/29/Euratom of 13 May 1996.
15.2 Chemical safety assessment:	This substance is not regulated by REACH. In accordance with REACH Article 14, a Chemical Safety Assessment has not been carried out for this substance.

16. OTHER INFORMATION

The information provided in this safety data sheet is correct to the best of our knowledge, information, and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal, and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any proceed, unless specified in the text.

Classification in accordance with Regulation 1272/2008, as listed in Annex VI:

Radioactive substances and mixtures, as such are not regulated by the Regulation 1272/2008

Version:	2
Creation date:	13.05.2013
Revision date:	12.08.2016
Printing date:	12.08.2016
Release info:	This version replaces all previous documents
Created/Revised by:	Jane Paju (jane.paju@molycorp.com)

2. HAZARDS IDENTIFICATION	
2.1 Other hazards	
Other hazards:	Contains traces of naturally occurring radionuclides (NORM) U-238, Th-232, Ra-226 and Ra-228. Total Activity (by U and Th) – below 191 Bq/g

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substances

This material is intermediate which contains insoluble mixed metal oxides on fluorides.

Chemical name	**CAS no.**	**EC no.**	**Classification information**	**Conc.% (max)**
Niobium Pentoxide (Nb_2O_5)	1313-96-8	215-213-6	Not classified according CLP	2,3
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Silicon Dioxide (SiO_2)	7631-86-9	231-545-4	Not classified according CLP	11,0
Zirconium Dioxide (ZrO_2)	1314-23-4	215-227-2	Not classified according CLP	23,0
Dialuminium Trioxide (Al_2O_3)	1344-28-1	215-691-6	Not classified according CLP	9,0
Cerium Dioxide	1306-38-3	215-150-4	Not classified according CLP	1,5
Dilanthanum Trioxide	1312-81-8	215-200-5	Not classified according CLP	0,5
Dineodymium Trioxide	1313-97-9	215-214-1	Not classified according CLP	0,5
Diyttrium Trioxide	1314-36-9	215-233-5	Not classified according CLP	1,7
Diytterbium trioxide	1314-37-0	215-234-0	Not classified according CLP	0,7
Iron Oxide (Fe_2O_3)	1309-37-1	215-168-2	Not classified according CLP	8,5
Titanium Dioxide (TiO_2)	13463-67-7	236-675-5	Not classified according CLP	2,5
Tin Dioxide (SnO_2)	18232-10-5	242-159-0	Not classified according CLP	40,0

Tungsten Trioxide (WO_3)	1314-35-8	215-231-4	Not classified according CLP	0,1
Uranium Oxide (U_3O_8)	1344-59-8	215-702-4	Radioactive substance regulated by EC Directive **96/29/Euratom**	0,8
Thorium Oxide (ThO_2)	1314-20-1	215-225-1	Radioactive substance regulated by EC Directive **96/29/Euratom**	2,4
Fluoride content			Bonded with metals	13,0

4. FIRST-AID MEASURES

4.1 Description of first aid measures

Eye contact:	Hold eyelids apart and flush affected eye(s) with plenty of clean water (at least for 10 minutes)
Skin contact:	Flush with plenty of water and mild soap.
Ingestion:	Seek for medical attention
Inhalation:	Seek for medical attention.

4.2 Most important symptoms and effects

Acute effects	Dust may cause irritation of eyes and respiratory organs
Delayed effects	Can be harmful in case of prolonged contact due to radioactive properties particularly when swallowed or inhaled.

4.3 Indication of any immediate medical attention and special treatment needed

Note to physician: Radioactive substances

5. FIRE-FIGHTING MEASURES

5.1 Extinguishing media

Suitable:	Use extinguishing agent suitable for type of surrounding fire
Not suitable:	Not known

5.2 Special hazards arising from the substance or mixture

Not known

5.3 Advice for firefighters

Wear appropriate protective equipment. Move undamaged containers from immediate hazard area if it can be done with minimal risk. Dust could bear radioactive particles.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Avoid creating dusty conditions and prevent wind dispersal. Avoid contact with eyes, skin, and clothing. Use suitable protective equipment.

6.2 Environmental precautions

Prevent the material from contact with soil, entering surface water or sanitary sewer system. Do not discharge directly to a water source. If accidental spillage or washings enter drains or watercourses contact local authority.

6.3 Methods and material for containment and cleaning up

Vacuum or sweep up and place into suitable labelled containers for recovery or disposal. Clean up affected area with a large amount of water.

6.4 Reference to other sections

See section 8 for personal protective equipment and section 13 for waste disposal.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Technical measures/ Precautions:	Use with adequate ventilation. Local exhaust ventilation should be provided. Avoid contact with eyes, skin and clothing. Avoid creating dusty conditions and prevent wind dispersal.
General occupation hygiene:	Do not eat, drink or smoke in work areas. Wash hands after use. Remove contaminated clothing and protective equipment before entering eating areas.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/ Storage conditions:	Material is to be stored in area marked for radioactive material storage. Keep in the original container. Keep container tightly closed in a cool, dry, well-ventilated place. Packaging materials: Stainless steel (304). Synthetic material.
Incompatible products:	Not known

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters

Regulated occupational exposure limit values:	Effective dose: 100 mSv/5 years for workers (not exceeding 50 mSv in single year).

8.2 Exposure controls

Appropriate engineering controls:	Use of adequate ventilation is good industrial practice. In addition, an eyewash facility and a safety shower for

	facilities storing or utilizing this material is good industrial practice.
Environmental exposure controls:	Dispose of rinse water in accordance with local and national regulations.
Individual protection measures, such as personal protective equipment	
General remark:	Only person wearing personal dosimeter can work with this material.
Respiratory protection:	Respiratory protection if high airborne concentrations prevail
Hand protection:	Protective gloves, impermeable to the dust
Eye protection:	Chemical goggles or face shield are recommended to prevent potential eye contact.
Skin and body protection:	Working clothes
Hygiene measures:	Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing.

9. PHYSICAL AND CHEMICAL PROPERTIES	
9.1 Information on basic physical and chemical properties	
Appearance:	Beige or yellow clumpy powder material.
Odour:	Odourless
Melting/Freezing temperature:	N/A
Boiling temperature:	N/A
Flash-point:	N/A
Flammability:	Non flammable (based on molecular structure).
Explosive properties:	N/A
Oxidizing properties:	N/A
Vapour pressure:	N/A
Relative density (D4 (20)):	5-6 g/cm^3
Solubility in water:	negligible
Partition coefficient n-octanol/water:	N/A
Viscosity:	Not applicable to solids
Specific conductivity:	No data
Auto ignition temperature:	N/A

Surface tension:	Not surface active (based on molecular structure)

9.2 Other information

10. STABILITY AND REACTIVITY

10.1 Reactivity

Stable under recommended storage and handling conditions (see section 7, handling and storage).

10.2 Chemical stability

Stable under recommended storage and handling conditions (see section 7, handling and storage).

10.3 Possibility of hazardous reactions

N/A

10.4 Conditions to avoid

None known

10.5 Incompatible materials

None known

10.6 Hazardous decomposition products

None known

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

ACUTE TOXICITY	Oxides and fluorides contained in LMF are not toxic, but material is radioactive and could cause health risk due to radioactive properties.
OTHER	In case of prolonged eye contact or repeated inhalation or ingestion material can present a hazard due to radioactive properties.

12. ECOLOGICAL INFORMATION

Avoid contamination and distribution in the environment due to radionuclide properties.

13. DISPOSAL CONSIDERATIONS

Waste from residues:	Special disposal in accordance with local and state regulations due to radioactivity.
Container:	Containers should be cleaned by appropriate method, in accordance with local and national regulations. Do not remove label until container is thoroughly cleaned. Empty containers should be decontaminated before reuse.

14. TRANSPORT INFORMATION

UN Number:	2912

Proper shipping name:	Radioactive material, low specific activity LSA-1
Transport hazard classes:	ADR/RID: 7 (LSA I) IMO: 7 (LSA I) ICAO/IATA: 7 (LSA I) **Authorized carrier for class 7 required!**
Packaging group:	I type IP-1 (II yellow, T1=0,1)
Special precautions:	**HAZARDOUS MATERIAL, DANGEROUS GOOD, RADIOACTIVE!**

15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulation/legislation specific for the substance or mixture:	RADIOACTIVE National regulation observation recommended! Radioactive substances and mixtures are regulated by EC Directive No. 96/29/Euratom of 13 May 1996.
15.2 Chemical safety assessment:	This substance is not regulated by REACH. In accordance with REACH Article 14, a Chemical Safety Assessment has not been carried out for this substance.

16. OTHER INFORMATION

The information provided in this safety data sheet is correct to the best of our knowledge, information, and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal, and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any proceed, unless specified in the text.

Classification in accordance with Regulation 1272/2008, as listed in Annex VI:

Radioactive substances and mixtures, as such are not regulated by the Regulation 1272/2008

Version:	2
Creation date:	13.05.2013
Revision date:	12.08.2016
Printing date:	12.08.2016
Release info:	This version replaces all previous documents
Created/Revised by:	Jane Paju (jane.paju@molycorp.com)

Attachment C.1

Radiological Analysis – Data Packages (including all pertinent Quality Control Data)

(see ALS lab analysis results, dated 07/27/2018 – attached)

Generator or Contractor Initials: ____________

Friday, July 27, 2018

Jane Paju
Neo Performance Materials Silmet OÜ
Kesk tn 2, 40231
Sillamäe, Estonia,

Re: ALS Workorder: 1806204
Project Name: NEO Silmet
Project Number:

Dear Ms. Paju:

Fifteen solid samples were received from Neo Performance Materials Silmet OÜ, on 6/4/2018. The samples were scheduled for the following analyses:

Gamma Spectroscopy
Ignitability
Inorganics
Isotopic Thorium
Isotopic Uranium
Lead-210
Metals

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Jeff R. Kujawa
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	**License or Certification Number**
AIHA	214884
Alaska (AK)	UST-086
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1806204

Ignitability:
The samples were analyzed based on SW-846, 3rd Edition method 1010 and the current revision of SOP 629.

All acceptance criteria were met.

Metals:
The samples were analyzed following SW-846, 3rd Edition procedures. Analysis by Trace ICP followed method 6010B and the current revision of SOP 834. Analysis by ICPMS followed method 6020A and the current revision of SOP 827. Mercury analysis by CVAA followed method 7470A (leachate), 7471A (solid) and the current revision of SOP 812.

All acceptance criteria were met.

Inorganics:
The samples were analyzed following SW-846 and EMSL procedures for the current revisions of the following SOPs and methods:

Analyte	Method	SOP #
Ammonia as N	350.1	1129
Nitrate/nitrite as N	353.2 Revision 2.0	1127
pH	9045D	1126
Chloride	300.0 Revision 2.1	1113
Fluoride	300.0 Revision 2.1	1113
Sulfate	300.0 Revision 2.1	1113

All acceptance criteria were met.

Gamma Spectroscopy:
The samples were analyzed for the presence of gamma emitting radionuclides according to the current revision of SOP 713.

These samples were prepared according to the current revision of SOP 739. The samples were sealed in steel cans and stored for at least 21 days prior to analysis.

All acceptance criteria were met.

Isotopic Uranium:
The samples were analyzed for the presence of isotopic uranium according to the current revision of SOP 714.

U-234 activity is reported in the associated method blank above the minimum detectable concentration value. The measured blank activity is below the requested MDC. Results are acceptable according to the current revision of SOP 715, and are submitted without further qualification.

All remaining acceptance criteria were met.

Isotopic Thorium:
The samples were analyzed for the presence of isotopic thorium according to the current revision of SOP 714.

Due to a laboratory spill, sample 1806204-15DUP has a chemical recovery of 10.9%, below the 30% lower control limit. The duplicate error ratio (DER) values for the sample/duplicate pair for Th-228, Th-230, and Th-232 are in control. Please refer to NCR #14714 for further information.

All remaining acceptance criteria were met.

Lead-210:
The samples were analyzed for the presence of ^{210}Pb according to the current revisions of SOP 704.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1806204
Client Name: Neo Performance Materials Silmet OÜ
Client Project Name: NEO Silmet
Client Project Number:
Client PO Number:

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
LOT 20	1806204-1		SOLID	10-Apr-18	
LOT 21	1806204-2		SOLID	10-Apr-18	
LOT 22	1806204-3		SOLID	10-Apr-18	
LOT 31	1806204-4		SOLID	10-Apr-18	
LOT 32	1806204-5		SOLID	10-Apr-18	
LOT 34	1806204-6		SOLID	10-Apr-18	
LOT 35	1806204-7		SOLID	10-Apr-18	
LOT 58	1806204-8		SOLID	10-Apr-18	
LOT 60	1806204-9		SOLID	10-Apr-18	
LOT 64	1806204-10		SOLID	10-Apr-18	
LOT 69	1806204-11		SOLID	10-Apr-18	
LOT 76	1806204-12		SOLID	10-Apr-18	
LOT 84	1806204-13		SOLID	10-Apr-18	
LOT 85	1806204-14		SOLID	10-Apr-18	
LOT 86	1806204-15		SOLID	10-Apr-18	
LOT 20	1806204-16		LEACHAT	10-Apr-18	
LOT 21	1806204-17		LEACHAT	10-Apr-18	
LOT 22	1806204-18		LEACHAT	10-Apr-18	
LOT 31	1806204-19		LEACHAT	10-Apr-18	
LOT 32	1806204-20		LEACHAT	10-Apr-18	
LOT 34	1806204-21		LEACHAT	10-Apr-18	
LOT 35	1806204-22		LEACHAT	10-Apr-18	
LOT 58	1806204-23		LEACHAT	10-Apr-18	
LOT 60	1806204-24		LEACHAT	10-Apr-18	
LOT 64	1806204-25		LEACHAT	10-Apr-18	
LOT 69	1806204-26		LEACHAT	10-Apr-18	
LOT 76	1806204-27		LEACHAT	10-Apr-18	
LOT 84	1806204-28		LEACHAT	10-Apr-18	
LOT 85	1806204-29		LEACHAT	10-Apr-18	
LOT 86	1806204-30		LEACHAT	10-Apr-18	

18062104

ÖKOSIL

AS ÖKOSIL KESKKONNALABOR
Akrediteeritud katselaboratoorium
EN ISO/IEC 17025 Reg.nr. L 091

Kesk 2, 40231, Sillamäe
Tel. 39 29140, 39 29141
Faks 39 29152, e-mail: sekretar@ecosil.ee

MEASUREMENT PROTOCOL № 195/18

Date: 10.04.2018 Sheet 1(1)

Customer: NPM Silmet OÜ, Kesk 2, 40231 Sillamae
Order: NORM samples analysis, LOT 20,21,22,30,31,32,34,35,58,59,60,64,65,68,69,76,84,85,86
Target: Determination of radionuclide content: U-238, Th-232, Ra-226, Ra-228
Measurement method:
Measurement of the content of radionuclides on a gamma spectrometric unit using the Genie -2000 spectroscopy system*
Appliance:
Digital Spectrum Analyzer DSA-1000, s/n 00001181, Canberra Ind.Inc.
Germanium detector Model GR2520. Serial number: b 96517
Sample Geometry- Marinelly, 500 ml
Reference Materials
MBSS2, RGU-1, RGTh-1
Measurement results:

The content of radionuclides in the NORM samples, Bq/g.

	Samples	Weigh, g	U-238	Th-232	Ra-226	Ra-228
1	LOT 20	500	37	29	38	30
2	LOT 21	500	59	27	60	28
3	LOT 22	500	46	45	51	47
4	LOT 31	500	37	34	33	35
5	LOT 32	500	36	35	36	35
6	LOT 34	500	46	49	36	50
7	LOT 35	500	45	49	30	49
8	LOT 58	500	62	68	46	68
9	LOT 60	500	80	81	60	74
10	LOT 64	500	73	73	57	73
11	LOT 69	500	91	82	57	81
12	LOT 76	500	87	95	60	95
13	LOT 84	500	73	81	57	81
14	LOT 85	500	80	72	67	72
15	LOT 86	500	73	71	68	73

* The method is not accredited

Dina Shestakova
Sillamäe department director

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: NEO   Workorder No: 1806204

Project Manager: ______   Initials: CDT   Date: 6-12-18

1. Does this project require any special handling in addition to standard ALS procedures?		YES	NO
2. Are custody seals on shipping containers intact?	NONE	YES	NO
3. Are Custody seals on sample containers intact?	NONE	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		YES	NO
5. Are the COC and bottle labels complete and legible?		YES	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	YES	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	YES	NO
9. Are all aqueous non-preserved samples pH 4-9?	N/A	YES	NO
10. Is there sufficient sample for the requested analyses?		YES	NO
11. Were all samples placed in the proper containers for the requested analyses?		YES	NO
12. Are all samples within holding times for the requested analyses?		YES	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		YES	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ___ < green pea ___ > green pea	N/A	YES	NO
15. Do any water samples contain sediment? Amount. Amount of sediment: ___ dusting ___ moderate ___ heavy	N/A	YES	NO
16. Were the samples shipped on ice?		YES	NO
17. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #1 #3 #4	RAD ONLY	YES	NO

Cooler #:	1	2						
Temperature (°C):	Amb	Amb						
No. of custody seals on cooler:	1	1						
External μR/hr reading:	1500							
Background μR/hr reading:	12							

DOT Survey/ Acceptance Information

Were external μR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

If applicable, was the client contacted? YES / NO / NA Contact: ______ Date/Time: ______

Project Manager Signature / Date: 6-14-18

*IR Gun #1, VWR SN 170560549
*IR Gun #3, VWR SN 170647571
*IR Gun #4, Oakton, SN 2372220101-0002

Form 201r25.xls
(02/12/2018)

ALS -- Fort Collins **SAMPLE SUMMARY REPORT**

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 20	**Lab ID:**	1806204-1
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Ammonia as N		**EPA350.1**		Prep Date: **7/7/2018**		PrepBy: **HMA**
AMMONIA AS N	**47**		**0.99**	**MG/KG**	1	7/7/2018 13:31
Gamma Spectroscopy Results		**SOP 713**		Prep Date: **6/18/2018**		PrepBy: **NMP**
Ra-226	**900 (+/- 110)**	M3,G	**10**	**pCi/g**	NA	7/9/2018 07:33
Ra-228	**667 (+/- 78)**	M3,G	**8**	**pCi/g**	NA	7/9/2018 07:33
ICPMS Metals		**SW6020**		Prep Date: **7/16/2018**		PrepBy: **JML**
SILVER	**2.2**		**0.048**	**MG/KG**	10	7/21/2018 17:15
ALUMINUM	**1400**		**9.6**	**MG/KG**	10	7/21/2018 17:15
ARSENIC	**7.1**		**0.19**	**MG/KG**	10	7/21/2018 18:48
BARIUM	**320**		**0.48**	**MG/KG**	10	7/21/2018 17:15
BERYLLIUM	**1.3**		**0.048**	**MG/KG**	10	7/21/2018 17:15
CALCIUM	**2500**		**96**	**MG/KG**	10	7/21/2018 17:15
CADMIUM	**4**		**0.19**	**MG/KG**	10	7/21/2018 17:15
COBALT	**3.2**		**0.48**	**MG/KG**	10	7/21/2018 17:15
CHROMIUM	**34**		**0.96**	**MG/KG**	10	7/21/2018 17:15
COPPER	**32**		**1.9**	**MG/KG**	10	7/21/2018 17:15
IRON	**4500**		**9.6**	**MG/KG**	10	7/21/2018 17:15
POTASSIUM	**420**		**96**	**MG/KG**	10	7/21/2018 17:15
MAGNESIUM	**400**		**9.6**	**MG/KG**	10	7/21/2018 17:15
MANGANESE	**410**		**0.48**	**MG/KG**	10	7/21/2018 17:15
MOLYBDENUM	**0.74**		**0.19**	**MG/KG**	10	7/21/2018 17:15
SODIUM	**220**		**96**	**MG/KG**	10	7/21/2018 17:15
NIOBIUM	**350**		**0.96**	**MG/KG**	100	7/27/2018 11:15
NICKEL	**26**		**1.9**	**MG/KG**	10	7/21/2018 17:15
LEAD	**1700**		**19**	**MG/KG**	1000	7/22/2018 19:51
SELENIUM	ND		0.96	MG/KG	10	7/21/2018 18:48
TIN	**110**		**0.96**	**MG/KG**	10	7/21/2018 17:15
TANTALUM	**70**		**0.96**	**MG/KG**	100	7/27/2018 11:15
THORIUM	**5700**		**1.9**	**MG/KG**	1000	7/22/2018 19:51
THALLIUM	**0.5**		**0.0096**	**MG/KG**	10	7/21/2018 17:15
URANIUM	**1400**		**0.96**	**MG/KG**	1000	7/22/2018 19:51
VANADIUM	**5**		**0.48**	**MG/KG**	10	7/21/2018 17:15
ZINC	**48**		**9.6**	**MG/KG**	10	7/21/2018 17:15
ZIRCONIUM	**410**		**0.48**	**MG/KG**	100	7/27/2018 11:15
Ion Chromatography		**EPA300.0**		Prep Date: **6/18/2018**		PrepBy: **HMA**
CHLORIDE	ND		19	MG/KG	10	6/19/2018 03:30
FLUORIDE	**1600**		**48**	**MG/KG**	50	6/19/2018 03:45
SULFATE	**7300**		**96**	**MG/KG**	10	6/19/2018 03:30
Isotopic Thorium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: Th-229	*86.7*		*30-110*	*%REC*	DL = NA	7/14/2018 12:06
Th-228	**527 (+/- 83)**	M3	**4**	**pCi/g**	NA	7/14/2018 12:06
Th-230	**507 (+/- 80)**	M3	**6**	**pCi/g**	NA	7/14/2018 12:06
Th-232	**542 (+/- 85)**	M3	**1**	**pCi/g**	NA	7/14/2018 12:06
Isotopic Uranium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: U-232	*92.8*		*30-110*	*%REC*	DL = NA	7/16/2018 07:28

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 20	**Lab ID:**	1806204-1
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
U-234	518 (+/- 86)	M3	2	pCi/g	NA	7/16/2018 07:28
U-235	23.7 (+/- 6.1)	M3	1.8	pCi/g	NA	7/16/2018 07:28
U-238	545 (+/- 90)	M3	1	pCi/g	NA	7/16/2018 07:28
Lead-210 by Liquid Scintilation		**SOP 704**			Prep Date: **7/17/2018**	PrepBy: **NCC**
Pb-210	480 (+/- 120)	M3	0	pCi/g	NA	7/18/2018 15:44
Carr: LEAD	*93.1*		*40-110*	*%REC*	DL = NA	7/18/2018 15:44
Mercury		**SW7471**			Prep Date: **7/12/2018**	PrepBy: **KJM**
MERCURY	ND		0.031	MG/KG	1	7/13/2018 11:21
Nitrate/Nitrite as N		**EPA353.2**			Prep Date: **6/22/2018**	PrepBy: **HMA**
NITRATE/NITRITE AS N	ND		0.096	MG/KG	1	6/23/2018 09:18
pH		**SW9045**			Prep Date: **6/18/2018**	PrepBy: **AEJ**
PH	2.68		0.1	pH	1	6/18/2018

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 21	**Lab ID:**	1806204-2
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Ammonia as N		**EPA350.1**		Prep Date: **7/7/2018**		PrepBy: **HMA**
AMMONIA AS N	36		0.99	MG/KG	1	7/7/2018 13:32
Gamma Spectroscopy Results		**SOP 713**		Prep Date: **6/18/2018**		PrepBy: **NMP**
Ra-226	1140 (+/- 130)	M3,G	10	pCi/g	NA	7/9/2018 07:33
Ra-228	636 (+/- 75)	M3,G	12	pCi/g	NA	7/9/2018 07:33
ICPMS Metals		**SW6020**		Prep Date: **7/16/2018**		PrepBy: **JML**
SILVER	2.6		0.048	MG/KG	10	7/21/2018 17:18
ALUMINUM	1800		9.5	MG/KG	10	7/21/2018 17:18
ARSENIC	7.9		0.19	MG/KG	10	7/21/2018 18:54
BARIUM	460		0.48	MG/KG	10	7/21/2018 17:18
BERYLLIUM	2.2		0.048	MG/KG	10	7/21/2018 17:18
CALCIUM	3600		95	MG/KG	10	7/21/2018 17:18
CADMIUM	0.95		0.19	MG/KG	10	7/21/2018 17:18
COBALT	1.1		0.48	MG/KG	10	7/21/2018 17:18
CHROMIUM	24		0.95	MG/KG	10	7/21/2018 17:18
COPPER	24		1.9	MG/KG	10	7/21/2018 17:18
IRON	5400		9.5	MG/KG	10	7/21/2018 17:18
POTASSIUM	310		95	MG/KG	10	7/21/2018 17:18
MAGNESIUM	660		9.5	MG/KG	10	7/21/2018 17:18
MANGANESE	500		0.48	MG/KG	10	7/21/2018 17:18
MOLYBDENUM	0.65		0.19	MG/KG	10	7/21/2018 17:18
SODIUM	420		95	MG/KG	10	7/21/2018 17:18
NIOBIUM	430		0.95	MG/KG	100	7/27/2018 11:16
NICKEL	16		1.9	MG/KG	10	7/21/2018 17:18
LEAD	2100		19	MG/KG	1000	7/22/2018 19:54
SELENIUM	ND		0.95	MG/KG	10	7/21/2018 18:54
TIN	110		0.95	MG/KG	10	7/21/2018 17:18
TANTALUM	140		0.95	MG/KG	100	7/27/2018 11:16
THORIUM	4100		1.9	MG/KG	1000	7/22/2018 19:54
THALLIUM	0.61		0.0095	MG/KG	10	7/21/2018 17:18
URANIUM	1900		0.95	MG/KG	1000	7/22/2018 19:54
VANADIUM	4.2		0.48	MG/KG	10	7/21/2018 17:18
ZINC	42		9.5	MG/KG	10	7/21/2018 17:18
ZIRCONIUM	490		0.48	MG/KG	100	7/27/2018 11:16
Ion Chromatography		**EPA300.0**		Prep Date: **6/18/2018**		PrepBy: **HMA**
CHLORIDE	ND		20	MG/KG	10	6/19/2018 04:00
FLUORIDE	1400		49	MG/KG	50	6/19/2018 04:14
SULFATE	8500		98	MG/KG	10	6/19/2018 04:00
Isotopic Thorium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: Th-229	*81.7*		*30-110*	*%REC*	DL = NA	7/14/2018 12:06
Th-228	574 (+/- 91)	M3	7	pCi/g	NA	7/14/2018 12:06
Th-230	740 (+/- 120)	M3	10	pCi/g	NA	7/14/2018 12:06
Th-232	611 (+/- 96)	M3	2	pCi/g	NA	7/14/2018 12:06
Isotopic Uranium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: U-232	*92.1*		*30-110*	*%REC*	DL = NA	7/16/2018 07:28

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 21	**Lab ID:**	1806204-2
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
U-234	**700 (+/- 120)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
U-235	**30.7 (+/- 7.4)**	M3	**1.4**	**pCi/g**	NA	7/16/2018 07:28
U-238	**750 (+/- 120)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
Lead-210 by Liquid Scintilation		**SOP 704**		Prep Date: **7/17/2018**		PrepBy: **NCC**
Pb-210	**660 (+/- 160)**	M3	**0**	**pCi/g**	NA	7/18/2018 16:33
Carr: LEAD	*93.8*		*40-110*	*%REC*	DL = NA	7/18/2018 16:33
Mercury		**SW7471**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	ND		0.033	MG/KG	1	7/13/2018 11:23
Nitrate/Nitrite as N		**EPA353.2**		Prep Date: **6/22/2018**		PrepBy: **HMA**
NITRATE/NITRITE AS N	ND		0.099	MG/KG	1	6/23/2018 09:19
pH		**SW9045**		Prep Date: **6/18/2018**		PrepBy: **AEJ**
PH	**2.72**		**0.1**	**pH**	1	6/18/2018

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 22	**Lab ID:**	1806204-3
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Ammonia as N		**EPA350.1**		Prep Date: **7/7/2018**		PrepBy: **HMA**
AMMONIA AS N	44		9.8	MG/KG	10	7/7/2018 13:34
Gamma Spectroscopy Results		**SOP 713**		Prep Date: **6/18/2018**		PrepBy: **NMP**
Ra-226	1070 (+/- 130)	M3,G	10	pCi/g	NA	7/9/2018 07:33
Ra-228	940 (+/- 110)	M3,G	10	pCi/g	NA	7/9/2018 07:33
ICPMS Metals		**SW6020**		Prep Date: **7/16/2018**		PrepBy: **JML**
SILVER	3.4		0.05	MG/KG	10	7/21/2018 17:21
ALUMINUM	1300		10	MG/KG	10	7/21/2018 17:21
ARSENIC	6.9		0.2	MG/KG	10	7/21/2018 19:00
BARIUM	250		0.5	MG/KG	10	7/21/2018 17:21
BERYLLIUM	0.86		0.05	MG/KG	10	7/21/2018 17:21
CALCIUM	3000		100	MG/KG	10	7/21/2018 17:21
CADMIUM	1.9		0.2	MG/KG	10	7/21/2018 17:21
COBALT	2.1		0.5	MG/KG	10	7/21/2018 17:21
CHROMIUM	20		1	MG/KG	10	7/21/2018 17:21
COPPER	26		2	MG/KG	10	7/21/2018 17:21
IRON	4900		10	MG/KG	10	7/21/2018 17:21
POTASSIUM	300		100	MG/KG	10	7/21/2018 17:21
MAGNESIUM	460		10	MG/KG	10	7/21/2018 17:21
MANGANESE	450		0.5	MG/KG	10	7/21/2018 17:21
MOLYBDENUM	0.49		0.2	MG/KG	10	7/21/2018 17:21
SODIUM	240		100	MG/KG	10	7/21/2018 17:21
NIOBIUM	390		1	MG/KG	100	7/27/2018 11:17
NICKEL	9.6		2	MG/KG	10	7/21/2018 17:21
LEAD	2300		20	MG/KG	1000	7/22/2018 19:57
SELENIUM	ND		1	MG/KG	10	7/21/2018 19:00
TIN	63		1	MG/KG	10	7/21/2018 17:21
TANTALUM	69		1	MG/KG	100	7/27/2018 11:17
THORIUM	6800		2	MG/KG	1000	7/22/2018 19:57
THALLIUM	0.44		0.01	MG/KG	10	7/21/2018 17:21
URANIUM	1600		1	MG/KG	1000	7/22/2018 19:57
VANADIUM	4.1		0.5	MG/KG	10	7/21/2018 17:21
ZINC	29		10	MG/KG	10	7/21/2018 17:21
ZIRCONIUM	720		0.5	MG/KG	100	7/27/2018 11:17
Ion Chromatography		**EPA300.0**		Prep Date: **6/18/2018**		PrepBy: **HMA**
CHLORIDE	ND		9.8	MG/KG	5	6/19/2018 04:29
FLUORIDE	1200		20	MG/KG	20	6/30/2018 12:49
SULFATE	6500		200	MG/KG	20	6/19/2018 05:15
Isotopic Thorium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: Th-229	*86.4*		*30-110*	*%REC*	DL = NA	7/14/2018 12:06
Th-228	740 (+/- 110)	M3	10	pCi/g	NA	7/14/2018 12:06
Th-230	650 (+/- 100)	M3	10	pCi/g	NA	7/14/2018 12:06
Th-232	770 (+/- 120)	M3	0	pCi/g	NA	7/14/2018 12:06
Isotopic Uranium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: U-232	*89.5*		*30-110*	*%REC*	DL = NA	7/16/2018 07:28

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 22	**Lab ID:**	1806204-3
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
U-234	**600 (+/- 99)**	M3	**1**	**pCi/g**	NA	7/16/2018 07:28
U-235	**28.2 (+/- 7)**	M3	**0.7**	**pCi/g**	NA	7/16/2018 07:28
U-238	**690 (+/- 110)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
Lead-210 by Liquid Scintilation		**SOP 704**			Prep Date: **7/17/2018**	PrepBy: **NCC**
Pb-210	**650 (+/- 160)**	M3	**0**	**pCi/g**	NA	7/18/2018 17:19
Carr: LEAD	*92.7*		*40-110*	*%REC*	DL = NA	7/18/2018 17:19
Mercury		**SW7471**			Prep Date: **7/12/2018**	PrepBy: **KJM**
MERCURY	ND		0.033	MG/KG	1	7/13/2018 11:26
Nitrate/Nitrite as N		**EPA353.2**			Prep Date: **6/22/2018**	PrepBy: **HMA**
NITRATE/NITRITE AS N	ND		0.1	MG/KG	1	6/23/2018 09:20
pH		**SW9045**			Prep Date: **6/18/2018**	PrepBy: **AEJ**
PH	**2.96**		**0.1**	**pH**	1	6/18/2018

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 31	**Lab ID:**	1806204-4
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Ammonia as N		EPA350.1			Prep Date: **7/7/2018**	PrepBy: **HMA**
AMMONIA AS N	82		10	MG/KG	10	7/7/2018 13:36
Gamma Spectroscopy Results		SOP 713			Prep Date: **6/18/2018**	PrepBy: **NMP**
Ra-226	1020 (+/- 120)	M3,G	10	pCi/g	NA	7/9/2018 07:33
Ra-228	950 (+/- 110)	M3,G	10	pCi/g	NA	7/9/2018 07:33
ICPMS Metals		SW6020			Prep Date: **7/16/2018**	PrepBy: **JML**
SILVER	4.5		0.046	MG/KG	10	7/21/2018 17:24
ALUMINUM	4300		9.1	MG/KG	10	7/21/2018 17:24
ARSENIC	9.3		0.18	MG/KG	10	7/21/2018 19:06
BARIUM	380		0.46	MG/KG	10	7/21/2018 17:24
BERYLLIUM	0.64		0.046	MG/KG	10	7/21/2018 17:24
CALCIUM	9400		91	MG/KG	10	7/21/2018 17:24
CADMIUM	28		0.18	MG/KG	10	7/21/2018 17:24
COBALT	20		0.46	MG/KG	10	7/21/2018 17:24
CHROMIUM	150		0.91	MG/KG	10	7/21/2018 17:24
COPPER	860		1.8	MG/KG	10	7/21/2018 17:24
IRON	11000		9.1	MG/KG	10	7/21/2018 17:24
POTASSIUM	790		91	MG/KG	10	7/21/2018 17:24
MAGNESIUM	880		9.1	MG/KG	10	7/21/2018 17:24
MANGANESE	630		0.46	MG/KG	10	7/21/2018 17:24
MOLYBDENUM	4.1		0.18	MG/KG	10	7/21/2018 17:24
SODIUM	1500		91	MG/KG	10	7/21/2018 17:24
NIOBIUM	710		0.91	MG/KG	100	7/27/2018 11:19
NICKEL	100		1.8	MG/KG	10	7/21/2018 17:24
LEAD	2600		18	MG/KG	1000	7/22/2018 20:00
SELENIUM	ND		0.91	MG/KG	10	7/21/2018 19:06
TIN	98		0.91	MG/KG	10	7/21/2018 17:24
TANTALUM	79		0.91	MG/KG	100	7/27/2018 11:19
THORIUM	3900		1.8	MG/KG	1000	7/22/2018 20:00
THALLIUM	0.66		0.0091	MG/KG	10	7/21/2018 17:24
URANIUM	1700		0.91	MG/KG	1000	7/22/2018 20:00
VANADIUM	18		0.46	MG/KG	10	7/21/2018 17:24
ZINC	150		9.1	MG/KG	10	7/21/2018 17:24
ZIRCONIUM	740		0.46	MG/KG	100	7/27/2018 11:19
Ion Chromatography		EPA300.0			Prep Date: **6/18/2018**	PrepBy: **HMA**
CHLORIDE	110		20	MG/KG	10	6/19/2018 05:30
FLUORIDE	2700		49	MG/KG	50	6/30/2018 13:04
SULFATE	9400		99	MG/KG	10	6/19/2018 05:30
Isotopic Thorium by Alpha Spectroscopy		SOP 714			Prep Date: **7/2/2018**	PrepBy: **SDW**
Tracer: Th-229	*87*		*30-110*	*%REC*	DL = NA	7/14/2018 12:06
Th-228	680 (+/- 110)	M3	0	pCi/g	NA	7/14/2018 12:06
Th-230	760 (+/- 120)	M3	10	pCi/g	NA	7/14/2018 12:06
Th-232	710 (+/- 110)	M3	0	pCi/g	NA	7/14/2018 12:06
Isotopic Uranium by Alpha Spectroscopy		SOP 714			Prep Date: **7/2/2018**	PrepBy: **SDW**
Tracer: U-232	*93.9*		*30-110*	*%REC*	DL = NA	7/16/2018 07:28

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 31	**Lab ID:**	1806204-4
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
U-234	730 (+/- 120)	M3	0	pCi/g	NA	7/16/2018 07:28
U-235	32.3 (+/- 7.4)	M3	1.2	pCi/g	NA	7/16/2018 07:28
U-238	790 (+/- 130)	M3	0	pCi/g	NA	7/16/2018 07:28
Lead-210 by Liquid Scintilation		**SOP 704**		Prep Date: **7/17/2018**		PrepBy: **NCC**
Pb-210	690 (+/- 170)	Y1,M3	0	pCi/g	NA	7/18/2018 18:07
Carr: LEAD	*102*	Y1	*40-110*	*%REC*	DL = NA	7/18/2018 18:07
Mercury		**SW7471**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	0.045		0.031	MG/KG	1	7/13/2018 11:28
Nitrate/Nitrite as N		**EPA353.2**		Prep Date: **6/22/2018**		PrepBy: **HMA**
NITRATE/NITRITE AS N	0.14		0.098	MG/KG	1	6/23/2018 09:20
pH		**SW9045**		Prep Date: **6/18/2018**		PrepBy: **AEJ**
PH	3.61		0.1	pH	1	6/18/2018

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 32	**Lab ID:**	1806204-5
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Ammonia as N		**EPA350.1**		Prep Date: **7/7/2018**		PrepBy: **HMA**
AMMONIA AS N	**69**		**9.9**	**MG/KG**	10	7/7/2018 13:39
Gamma Spectroscopy Results		**SOP 713**		Prep Date: **6/18/2018**		PrepBy: **NMP**
Ra-226	**930 (+/- 110)**	M3,G	**10**	**pCi/g**	NA	7/9/2018 07:33
Ra-228	**860 (+/- 100)**	M3,G	**10**	**pCi/g**	NA	7/9/2018 07:33
ICPMS Metals		**SW6020**		Prep Date: **7/16/2018**		PrepBy: **JML**
SILVER	**4.6**		**0.048**	**MG/KG**	10	7/21/2018 17:27
ALUMINUM	**2900**		**9.5**	**MG/KG**	10	7/21/2018 17:27
ARSENIC	**11**		**0.19**	**MG/KG**	10	7/21/2018 19:12
BARIUM	**490**		**0.48**	**MG/KG**	10	7/21/2018 17:27
BERYLLIUM	**0.36**		**0.048**	**MG/KG**	10	7/21/2018 17:27
CALCIUM	**4400**		**95**	**MG/KG**	10	7/21/2018 17:27
CADMIUM	**1.8**		**0.19**	**MG/KG**	10	7/21/2018 17:27
COBALT	**1.9**		**0.48**	**MG/KG**	10	7/21/2018 17:27
CHROMIUM	**57**		**0.95**	**MG/KG**	10	7/21/2018 17:27
COPPER	**55**		**1.9**	**MG/KG**	10	7/21/2018 17:27
IRON	**6300**		**9.5**	**MG/KG**	10	7/21/2018 17:27
POTASSIUM	**1100**		**95**	**MG/KG**	10	7/21/2018 17:27
MAGNESIUM	**450**		**9.5**	**MG/KG**	10	7/21/2018 17:27
MANGANESE	**360**		**0.48**	**MG/KG**	10	7/21/2018 17:27
MOLYBDENUM	**1.5**		**0.19**	**MG/KG**	10	7/21/2018 17:27
SODIUM	**2300**		**95**	**MG/KG**	10	7/21/2018 17:27
NIOBIUM	**780**		**0.95**	**MG/KG**	100	7/27/2018 11:20
NICKEL	**38**		**1.9**	**MG/KG**	10	7/21/2018 17:27
LEAD	**2200**		**19**	**MG/KG**	1000	7/22/2018 20:03
SELENIUM	ND		0.95	MG/KG	10	7/21/2018 19:12
TIN	**92**		**0.95**	**MG/KG**	10	7/21/2018 17:27
TANTALUM	**150**		**0.95**	**MG/KG**	100	7/27/2018 11:20
THORIUM	**3600**		**1.9**	**MG/KG**	1000	7/22/2018 20:03
THALLIUM	**0.44**		**0.0095**	**MG/KG**	10	7/21/2018 17:27
URANIUM	**1500**		**0.95**	**MG/KG**	1000	7/22/2018 20:03
VANADIUM	**14**		**0.48**	**MG/KG**	10	7/21/2018 17:27
ZINC	**38**		**9.5**	**MG/KG**	10	7/21/2018 17:27
ZIRCONIUM	**710**		**0.48**	**MG/KG**	100	7/27/2018 11:20
Ion Chromatography		**EPA300.0**		Prep Date: **6/18/2018**		PrepBy: **HMA**
CHLORIDE	ND		20	MG/KG	10	6/19/2018 05:59
FLUORIDE	**3200**		**49**	**MG/KG**	50	6/30/2018 13:20
SULFATE	**6700**		**99**	**MG/KG**	10	6/19/2018 05:59
Isotopic Thorium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: Th-229	*87.4*		*30-110*	*%REC*	DL = NA	7/14/2018 12:06
Th-228	**599 (+/- 94)**	M3	**5**	**pCi/g**	NA	7/14/2018 12:06
Th-230	**557 (+/- 88)**	M3	**7**	**pCi/g**	NA	7/14/2018 12:06
Th-232	**598 (+/- 94)**	M3	**2**	**pCi/g**	NA	7/14/2018 12:06
Isotopic Uranium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: U-232	*80*		*30-110*	*%REC*	DL = NA	7/16/2018 07:28

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 32	**Lab ID:**	1806204-5
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
U-234	**640 (+/- 110)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
U-235	**32.7 (+/- 8.2)**	M3	**0.8**	**pCi/g**	NA	7/16/2018 07:28
U-238	**730 (+/- 120)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
Lead-210 by Liquid Scintilation		**SOP 704**		Prep Date: **7/17/2018**		PrepBy: **NCC**
Pb-210	**490 (+/- 120)**	Y1,M3	**0**	**pCi/g**	NA	7/18/2018 18:55
Carr: LEAD	*104*	Y1	*40-110*	*%REC*	DL = NA	7/18/2018 18:55
Mercury		**SW7471**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	**0.46**		**0.032**	**MG/KG**	1	7/13/2018 11:30
Nitrate/Nitrite as N		**EPA353.2**		Prep Date: **6/22/2018**		PrepBy: **HMA**
NITRATE/NITRITE AS N	ND		0.95	MG/KG	10	6/23/2018 10:47
pH		**SW9045**		Prep Date: **6/18/2018**		PrepBy: **AEJ**
PH	**3.66**		**0.1**	**pH**	1	6/18/2018

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SAMPLE SUMMARY REPORT

Client: Neo Performance Materials Silmet OÜ
Date: *27-Jul-18*
Project: NEO Silmet
Work Order: 1806204
Sample ID: LOT 34
Lab ID: 1806204-6
Legal Location:
Matrix: SOLID
Collection Date: 4/10/2018
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Ammonia as N		**EPA350.1**		Prep Date: **7/7/2018**		PrepBy: **HMA**
AMMONIA AS N	**140**		**10**	**MG/KG**	10	7/7/2018 13:41
Gamma Spectroscopy Results		**SOP 713**		Prep Date: **6/18/2018**		PrepBy: **NMP**
Ra-226	**1130 (+/- 130)**	M3	**10**	**pCi/g**	NA	7/9/2018 07:34
Ra-228	**1360 (+/- 160)**	M3	**10**	**pCi/g**	NA	7/9/2018 07:34
ICPMS Metals		**SW6020**		Prep Date: **7/16/2018**		PrepBy: **JML**
SILVER	**4.1**		**0.049**	**MG/KG**	10	7/21/2018 17:29
ALUMINUM	**10000**		**9.7**	**MG/KG**	10	7/21/2018 17:29
ARSENIC	**1.1**		**0.19**	**MG/KG**	10	7/21/2018 19:18
BARIUM	**480**		**0.49**	**MG/KG**	10	7/21/2018 17:29
BERYLLIUM	**4.8**		**0.049**	**MG/KG**	10	7/21/2018 17:29
CALCIUM	**11000**		**97**	**MG/KG**	10	7/21/2018 17:29
CADMIUM	**0.38**		**0.19**	**MG/KG**	10	7/21/2018 17:29
COBALT	**1.7**		**0.49**	**MG/KG**	10	7/21/2018 17:29
CHROMIUM	**180**		**0.97**	**MG/KG**	10	7/21/2018 17:29
COPPER	**8.6**		**1.9**	**MG/KG**	10	7/21/2018 17:29
IRON	**19000**		**9.7**	**MG/KG**	10	7/21/2018 17:29
POTASSIUM	**7200**		**97**	**MG/KG**	10	7/21/2018 17:29
MAGNESIUM	**4200**		**9.7**	**MG/KG**	10	7/21/2018 17:29
MANGANESE	**3900**		**49**	**MG/KG**	1000	7/22/2018 20:06
MOLYBDENUM	**4.1**		**0.19**	**MG/KG**	10	7/21/2018 17:29
SODIUM	**2700**		**97**	**MG/KG**	10	7/21/2018 17:29
NIOBIUM	**2300**		**9.7**	**MG/KG**	1000	7/27/2018 11:51
NICKEL	**99**		**1.9**	**MG/KG**	10	7/21/2018 17:29
LEAD	**5900**		**19**	**MG/KG**	1000	7/22/2018 20:06
SELENIUM	ND		0.97	MG/KG	10	7/21/2018 19:18
TIN	**88**		**0.97**	**MG/KG**	10	7/21/2018 17:29
TANTALUM	**440**		**0.97**	**MG/KG**	100	7/27/2018 11:21
THORIUM	**1900**		**1.9**	**MG/KG**	1000	7/22/2018 20:06
THALLIUM	**5.1**		**0.0097**	**MG/KG**	10	7/21/2018 17:29
URANIUM	**1700**		**0.97**	**MG/KG**	1000	7/22/2018 20:06
VANADIUM	**13**		**0.49**	**MG/KG**	10	7/21/2018 17:29
ZINC	**180**		**9.7**	**MG/KG**	10	7/21/2018 17:29
ZIRCONIUM	**4300**		**4.9**	**MG/KG**	1000	7/27/2018 11:51
Ion Chromatography		**EPA300.0**		Prep Date: **6/18/2018**		PrepBy: **HMA**
CHLORIDE	ND		40	MG/KG	20	6/19/2018 06:29
FLUORIDE	**17000**		**490**	**MG/KG**	500	6/30/2018 13:36
SULFATE	**17000**		**200**	**MG/KG**	20	6/19/2018 06:29
Isotopic Thorium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: Th-229	*82.4*		*30-110*	*%REC*	DL = NA	7/14/2018 12:06
Th-228	**1090 (+/- 170)**	M3	**10**	**pCi/g**	NA	7/14/2018 12:06
Th-230	**780 (+/- 120)**	M3	**10**	**pCi/g**	NA	7/14/2018 12:06
Th-232	**1190 (+/- 190)**	M3	**0**	**pCi/g**	NA	7/14/2018 12:06
Isotopic Uranium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: U-232	*88*		*30-110*	*%REC*	DL = NA	7/16/2018 07:28

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 34	**Lab ID:**	1806204-6
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
U-234	**740 (+/- 120)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
U-235	**37.4 (+/- 8.7)**	M3	**1.4**	**pCi/g**	NA	7/16/2018 07:28
U-238	**860 (+/- 140)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
Lead-210 by Liquid Scintilation		**SOP 704**		Prep Date: **7/17/2018**		PrepBy: **NCC**
Pb-210	**1050 (+/- 250)**	M3	**0**	**pCi/g**	NA	7/18/2018 19:42
Carr: LEAD	*90.6*		*40-110*	*%REC*	DL = NA	7/18/2018 19:42
Mercury		**SW7471**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	**0.062**		**0.033**	**MG/KG**	1	7/13/2018 11:32
Nitrate/Nitrite as N		**EPA353.2**		Prep Date: **6/22/2018**		PrepBy: **HMA**
NITRATE/NITRITE AS N	ND		0.95	MG/KG	10	6/23/2018 10:49
pH		**SW9045**		Prep Date: **6/18/2018**		PrepBy: **AEJ**
PH	**2.4**		**0.1**	**pH**	1	6/18/2018

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 35	**Lab ID:**	1806204-7
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Ammonia as N		**EPA350.1**		Prep Date: **7/7/2018**		PrepBy: **HMA**
AMMONIA AS N	**150**		**9.8**	**MG/KG**	10	7/7/2018 13:45
Gamma Spectroscopy Results		**SOP 713**		Prep Date: **6/18/2018**		PrepBy: **NMP**
Ra-226	**1140 (+/- 130)**	M3	**10**	**pCi/g**	NA	7/9/2018 07:34
Ra-228	**1410 (+/- 170)**	M3	**10**	**pCi/g**	NA	7/9/2018 07:34
ICPMS Metals		**SW6020**		Prep Date: **7/16/2018**		PrepBy: **JML**
SILVER	**4.1**		**0.047**	**MG/KG**	10	7/21/2018 17:32
ALUMINUM	**10000**		**9.4**	**MG/KG**	10	7/21/2018 17:32
ARSENIC	**1**		**0.19**	**MG/KG**	10	7/21/2018 19:23
BARIUM	**480**		**0.47**	**MG/KG**	10	7/21/2018 17:32
BERYLLIUM	**5.5**		**0.047**	**MG/KG**	10	7/21/2018 17:32
CALCIUM	**10000**		**94**	**MG/KG**	10	7/21/2018 17:32
CADMIUM	**0.36**		**0.19**	**MG/KG**	10	7/21/2018 17:32
COBALT	**1.9**		**0.47**	**MG/KG**	10	7/21/2018 17:32
CHROMIUM	**190**		**0.94**	**MG/KG**	10	7/21/2018 17:32
COPPER	**7.8**		**1.9**	**MG/KG**	10	7/21/2018 17:32
IRON	**20000**		**9.4**	**MG/KG**	10	7/21/2018 17:32
POTASSIUM	**7100**		**94**	**MG/KG**	10	7/21/2018 17:32
MAGNESIUM	**3900**		**9.4**	**MG/KG**	10	7/21/2018 17:32
MANGANESE	**4000**		**47**	**MG/KG**	1000	7/22/2018 20:09
MOLYBDENUM	**3.8**		**0.19**	**MG/KG**	10	7/21/2018 17:32
SODIUM	**2600**		**94**	**MG/KG**	10	7/21/2018 17:32
NIOBIUM	**2300**		**9.4**	**MG/KG**	1000	7/27/2018 11:52
NICKEL	**120**		**1.9**	**MG/KG**	10	7/21/2018 17:32
LEAD	**6100**		**19**	**MG/KG**	1000	7/22/2018 20:09
SELENIUM	ND		0.94	MG/KG	10	7/21/2018 19:23
TIN	**51**		**0.94**	**MG/KG**	10	7/21/2018 17:32
TANTALUM	**430**		**0.94**	**MG/KG**	100	7/27/2018 11:22
THORIUM	**2000**		**1.9**	**MG/KG**	1000	7/22/2018 20:09
THALLIUM	**5.2**		**0.0094**	**MG/KG**	10	7/21/2018 17:32
URANIUM	**1600**		**0.94**	**MG/KG**	1000	7/22/2018 20:09
VANADIUM	**13**		**0.47**	**MG/KG**	10	7/21/2018 17:32
ZINC	**180**		**9.4**	**MG/KG**	10	7/21/2018 17:32
ZIRCONIUM	**4000**		**4.7**	**MG/KG**	1000	7/27/2018 11:52
Ion Chromatography		**EPA300.0**		Prep Date: **6/18/2018**		PrepBy: **HMA**
CHLORIDE	ND		39	MG/KG	20	6/19/2018 06:59
FLUORIDE	**20000**		**490**	**MG/KG**	500	6/30/2018 13:52
SULFATE	**18000**		**200**	**MG/KG**	20	6/19/2018 06:59
Isotopic Thorium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: Th-229	*85.2*		*30-110*	*%REC*	DL = NA	7/14/2018 12:06
Th-228	**1090 (+/- 170)**	M3	**0**	**pCi/g**	NA	7/14/2018 12:06
Th-230	**790 (+/- 120)**	M3	**10**	**pCi/g**	NA	7/14/2018 12:06
Th-232	**1220 (+/- 190)**	M3	**0**	**pCi/g**	NA	7/14/2018 12:06
Isotopic Uranium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: U-232	*88.5*		*30-110*	*%REC*	DL = NA	7/16/2018 07:28

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 35	**Lab ID:**	1806204-7
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
U-234	**830 (+/- 140)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
U-235	**42.7 (+/- 9.6)**	M3	**0.7**	**pCi/g**	NA	7/16/2018 07:28
U-238	**970 (+/- 160)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
Lead-210 by Liquid Scintilation		**SOP 704**			Prep Date: **7/17/2018**	PrepBy: **NCC**
Pb-210	**1260 (+/- 300)**	M3	**0**	**pCi/g**	NA	7/18/2018 20:30
Carr: LEAD	*73.8*		*40-110*	*%REC*	DL = NA	7/18/2018 20:30
Mercury		**SW7471**			Prep Date: **7/12/2018**	PrepBy: **KJM**
MERCURY	**0.039**		**0.033**	**MG/KG**	1	7/13/2018 11:39
Nitrate/Nitrite as N		**EPA353.2**			Prep Date: **6/22/2018**	PrepBy: **HMA**
NITRATE/NITRITE AS N	ND		0.97	MG/KG	10	6/23/2018 10:51
pH		**SW9045**			Prep Date: **6/18/2018**	PrepBy: **AEJ**
PH	**2.46**		**0.1**	**pH**	1	6/18/2018

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 58	**Lab ID:**	1806204-8
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Ammonia as N			**EPA350.1**		Prep Date: **7/7/2018**	PrepBy: **HMA**
AMMONIA AS N	**26**		**1**	**MG/KG**	1	7/7/2018 13:46
Gamma Spectroscopy Results			**SOP 713**		Prep Date: **6/18/2018**	PrepBy: **NMP**
Ra-226	**1480 (+/- 170)**	M3	**10**	**pCi/g**	NA	7/9/2018 07:34
Ra-228	**1830 (+/- 210)**	M3	**10**	**pCi/g**	NA	7/9/2018 07:34
ICPMS Metals			**SW6020**		Prep Date: **7/16/2018**	PrepBy: **JML**
SILVER	**7.6**		**0.049**	**MG/KG**	10	7/21/2018 17:47
ALUMINUM	**11000**		**9.9**	**MG/KG**	10	7/21/2018 17:47
ARSENIC	**0.92**		**0.2**	**MG/KG**	10	7/21/2018 19:38
BARIUM	**550**		**0.49**	**MG/KG**	10	7/21/2018 17:47
BERYLLIUM	**6.9**		**0.049**	**MG/KG**	10	7/21/2018 17:47
CALCIUM	**13000**		**99**	**MG/KG**	10	7/21/2018 17:47
CADMIUM	ND		0.2	MG/KG	10	7/21/2018 17:47
COBALT	**1.2**		**0.49**	**MG/KG**	10	7/21/2018 17:47
CHROMIUM	**100**		**0.99**	**MG/KG**	10	7/21/2018 17:47
COPPER	**26**		**2**	**MG/KG**	10	7/21/2018 17:47
IRON	**20000**		**9.9**	**MG/KG**	10	7/21/2018 17:47
POTASSIUM	**670**		**99**	**MG/KG**	10	7/21/2018 17:47
MAGNESIUM	**4100**		**9.9**	**MG/KG**	10	7/21/2018 17:47
MANGANESE	**1200**		**0.49**	**MG/KG**	10	7/21/2018 17:47
MOLYBDENUM	**1.6**		**0.2**	**MG/KG**	10	7/21/2018 17:47
SODIUM	**3300**		**99**	**MG/KG**	10	7/21/2018 17:47
NIOBIUM	**1000**		**9.9**	**MG/KG**	1000	7/27/2018 11:54
NICKEL	**150**		**2**	**MG/KG**	10	7/21/2018 17:47
LEAD	**5700**		**20**	**MG/KG**	1000	7/22/2018 20:23
SELENIUM	ND		0.99	MG/KG	10	7/21/2018 19:38
TIN	**69**		**0.99**	**MG/KG**	10	7/21/2018 17:47
TANTALUM	**210**		**0.99**	**MG/KG**	100	7/27/2018 11:31
THORIUM	**810**		**2**	**MG/KG**	1000	7/22/2018 20:23
THALLIUM	**2.6**		**0.0099**	**MG/KG**	10	7/21/2018 17:47
URANIUM	**2500**		**0.99**	**MG/KG**	1000	7/22/2018 20:23
VANADIUM	**14**		**0.49**	**MG/KG**	10	7/21/2018 17:47
ZINC	**56**		**9.9**	**MG/KG**	10	7/21/2018 17:47
ZIRCONIUM	**5100**		**4.9**	**MG/KG**	1000	7/27/2018 11:54
Ignitability			**SW1010**		Prep Date: **7/12/2018**	PrepBy: **JMD**
IGNITABILITY			**96**	**deg C**	1	7/12/2018
Ion Chromatography			**EPA300.0**		Prep Date: **6/18/2018**	PrepBy: **HMA**
CHLORIDE	ND		19	MG/KG	10	6/19/2018 08:18
FLUORIDE	**3900**		**97**	**MG/KG**	100	6/30/2018 14:08
SULFATE	**2600**		**97**	**MG/KG**	10	6/19/2018 08:18
Isotopic Thorium by Alpha Spectroscopy			**SOP 714**		Prep Date: **7/2/2018**	PrepBy: **SDW**
Tracer: Th-229	*74.1*		*30-110*	*%REC*	DL = NA	7/14/2018 12:06
Th-228	**1120 (+/- 170)**	M3	**10**	**pCi/g**	NA	7/14/2018 12:06
Th-230	**910 (+/- 140)**	M3	**10**	**pCi/g**	NA	7/14/2018 12:06
Th-232	**1370 (+/- 210)**	M3	**0**	**pCi/g**	NA	7/14/2018 12:06

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 58	**Lab ID:**	1806204-8
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Isotopic Uranium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: U-232	*85.7*		*30-110*	*%REC*	DL = NA	7/16/2018 07:28
U-234	**1080 (+/- 180)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
U-235	**52 (+/- 11)**	M3	**2**	**pCi/g**	NA	7/16/2018 07:28
U-238	**1300 (+/- 210)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
Lead-210 by Liquid Scintilation		**SOP 704**		Prep Date: **7/17/2018**		PrepBy: **NCC**
Pb-210	**1230 (+/- 300)**	M3	**0**	**pCi/g**	NA	7/18/2018 21:17
Carr: LEAD	*87.1*		*40-110*	*%REC*	DL = NA	7/18/2018 21:17
Mercury		**SW7471**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	ND		0.033	MG/KG	1	7/13/2018 11:41
Nitrate/Nitrite as N		**EPA353.2**		Prep Date: **6/22/2018**		PrepBy: **HMA**
NITRATE/NITRITE AS N	ND		1	MG/KG	10	6/23/2018 10:53
pH		**SW9045**		Prep Date: **6/18/2018**		PrepBy: **AEJ**
PH	**2.93**		**0.1**	**pH**	1	6/18/2018

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SAMPLE SUMMARY REPORT

Client: Neo Performance Materials Silmet OÜ
Date: *27-Jul-18*
Project: NEO Silmet
Work Order: 1806204
Sample ID: LOT 60
Lab ID: 1806204-9
Legal Location:
Matrix: SOLID
Collection Date: 4/10/2018
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Ammonia as N		**EPA350.1**		Prep Date: **7/7/2018**		PrepBy: **HMA**
AMMONIA AS N	**11**		**1**	**MG/KG**	1	7/7/2018 13:47
Gamma Spectroscopy Results		**SOP 713**		Prep Date: **6/18/2018**		PrepBy: **NMP**
Ra-226	**1520 (+/- 180)**	M3,G	**10**	**pCi/g**	NA	7/9/2018 08:21
Ra-228	**1810 (+/- 210)**	M3,G	**20**	**pCi/g**	NA	7/9/2018 08:21
ICPMS Metals		**SW6020**		Prep Date: **7/16/2018**		PrepBy: **JML**
SILVER	**3.2**		**0.046**	**MG/KG**	10	7/21/2018 17:50
ALUMINUM	**3400**		**9.2**	**MG/KG**	10	7/21/2018 17:50
ARSENIC	**1.4**		**0.18**	**MG/KG**	10	7/21/2018 19:44
BARIUM	**370**		**0.46**	**MG/KG**	10	7/21/2018 17:50
BERYLLIUM	**1.4**		**0.046**	**MG/KG**	10	7/21/2018 17:50
CALCIUM	**3500**		**92**	**MG/KG**	10	7/21/2018 17:50
CADMIUM	ND		0.18	MG/KG	10	7/21/2018 17:50
COBALT	ND		0.46	MG/KG	10	7/21/2018 17:50
CHROMIUM	**36**		**0.92**	**MG/KG**	10	7/21/2018 17:50
COPPER	ND		1.8	MG/KG	10	7/21/2018 17:50
IRON	**7000**		**9.2**	**MG/KG**	10	7/21/2018 17:50
POTASSIUM	**360**		**92**	**MG/KG**	10	7/21/2018 17:50
MAGNESIUM	**830**		**9.2**	**MG/KG**	10	7/21/2018 17:50
MANGANESE	**1300**		**0.46**	**MG/KG**	10	7/21/2018 17:50
MOLYBDENUM	**1**		**0.18**	**MG/KG**	10	7/21/2018 17:50
SODIUM	**420**		**92**	**MG/KG**	10	7/21/2018 17:50
NIOBIUM	**620**		**9.2**	**MG/KG**	1000	7/27/2018 11:55
NICKEL	**28**		**1.8**	**MG/KG**	10	7/21/2018 17:50
LEAD	**4600**		**18**	**MG/KG**	1000	7/22/2018 20:26
SELENIUM	ND		0.92	MG/KG	10	7/21/2018 19:44
TIN	**84**		**0.92**	**MG/KG**	10	7/21/2018 17:50
TANTALUM	**75**		**0.92**	**MG/KG**	100	7/27/2018 11:33
THORIUM	**2100**		**1.8**	**MG/KG**	1000	7/22/2018 20:26
THALLIUM	**0.54**		**0.0092**	**MG/KG**	10	7/21/2018 17:50
URANIUM	**2700**		**0.92**	**MG/KG**	1000	7/22/2018 20:26
VANADIUM	**3.9**		**0.46**	**MG/KG**	10	7/21/2018 17:50
ZINC	**74**		**9.2**	**MG/KG**	10	7/21/2018 17:50
ZIRCONIUM	**2200**		**4.6**	**MG/KG**	1000	7/27/2018 11:55
Ignitability		**SW1010**		Prep Date: **7/12/2018**		PrepBy: **JMD**
IGNITABILITY			**96**	**deg C**	1	7/12/2018
Ion Chromatography		**EPA300.0**		Prep Date: **6/18/2018**		PrepBy: **HMA**
CHLORIDE	ND		2	MG/KG	1	6/19/2018 08:33
FLUORIDE	**2100**		**9.8**	**MG/KG**	10	6/19/2018 08:48
FLUORIDE	**2200**		**98**	**MG/KG**	100	6/30/2018 14:23
SULFATE	**2500**		**98**	**MG/KG**	10	6/19/2018 08:48
Isotopic Thorium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: Th-229	*87.8*		*30-110*	*%REC*	DL = NA	7/14/2018 12:06
Th-228	**930 (+/- 140)**	M3	**10**	**pCi/g**	NA	7/14/2018 12:06
Th-230	**830 (+/- 130)**	M3	**10**	**pCi/g**	NA	7/14/2018 12:06

ALS -- Fort Collins	**SAMPLE SUMMARY REPORT**

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 60	**Lab ID:**	1806204-9
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Th-232	**1150 (+/- 180)**	M3	**0**	**pCi/g**	NA	7/14/2018 12:06
Isotopic Uranium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: U-232	*77.5*		*30-110*	*%REC*	DL = NA	7/16/2018 07:28
U-234	**1250 (+/- 210)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
U-235	**64 (+/- 14)**	M3	**2**	**pCi/g**	NA	7/16/2018 07:28
U-238	**1390 (+/- 230)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
Lead-210 by Liquid Scintilation		**SOP 704**		Prep Date: **7/17/2018**		PrepBy: **NCC**
Pb-210	**960 (+/- 230)**	M3	**0**	**pCi/g**	NA	7/18/2018 22:05
Carr: LEAD	*88.7*		*40-110*	*%REC*	DL = NA	7/18/2018 22:05
Mercury		**SW7471**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	ND		0.031	MG/KG	1	7/13/2018 11:43
Nitrate/Nitrite as N		**EPA353.2**		Prep Date: **6/22/2018**		PrepBy: **HMA**
NITRATE/NITRITE AS N	ND		0.1	MG/KG	1	6/23/2018 09:24
pH		**SW9045**		Prep Date: **6/18/2018**		PrepBy: **AEJ**
PH	**3.18**		**0.1**	**pH**	1	6/18/2018

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 64	**Lab ID:**	1806204-10
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Ammonia as N		EPA350.1		Prep Date: 7/7/2018		PrepBy: HMA
AMMONIA AS N	23		1	MG/KG	1	7/7/2018 13:48
Gamma Spectroscopy Results		SOP 713		Prep Date: 6/18/2018		PrepBy: NMP
Ra-226	1570 (+/- 180)	M3,G	10	pCi/g	NA	7/9/2018 08:22
Ra-228	1710 (+/- 200)	M3,G	20	pCi/g	NA	7/9/2018 08:22
ICPMS Metals		SW6020		Prep Date: 7/16/2018		PrepBy: JML
SILVER	3.9		0.049	MG/KG	10	7/21/2018 17:52
ALUMINUM	6200		9.8	MG/KG	10	7/21/2018 17:52
ARSENIC	5.5		0.2	MG/KG	10	7/21/2018 19:50
BARIUM	540		0.49	MG/KG	10	7/21/2018 17:52
BERYLLIUM	0.65		0.049	MG/KG	10	7/21/2018 17:52
CALCIUM	3700		98	MG/KG	10	7/21/2018 17:52
CADMIUM	0.6		0.2	MG/KG	10	7/21/2018 17:52
COBALT	2.1		0.49	MG/KG	10	7/21/2018 17:52
CHROMIUM	260		0.98	MG/KG	10	7/21/2018 17:52
COPPER	34		2	MG/KG	10	7/21/2018 17:52
IRON	7600		9.8	MG/KG	10	7/21/2018 17:52
POTASSIUM	840		98	MG/KG	10	7/21/2018 17:52
MAGNESIUM	870		9.8	MG/KG	10	7/21/2018 17:52
MANGANESE	1000		0.49	MG/KG	10	7/21/2018 17:52
MOLYBDENUM	4.6		0.2	MG/KG	10	7/21/2018 17:52
SODIUM	13000		98	MG/KG	10	7/21/2018 17:52
NIOBIUM	870		9.8	MG/KG	1000	7/27/2018 11:56
NICKEL	67		2	MG/KG	10	7/21/2018 17:52
LEAD	5400		20	MG/KG	1000	7/22/2018 20:29
SELENIUM	ND		0.98	MG/KG	10	7/21/2018 19:50
TIN	100		0.98	MG/KG	10	7/21/2018 17:52
TANTALUM	180		0.98	MG/KG	100	7/27/2018 11:34
THORIUM	2200		2	MG/KG	1000	7/22/2018 20:29
THALLIUM	0.69		0.0098	MG/KG	10	7/21/2018 17:52
URANIUM	3100		0.98	MG/KG	1000	7/22/2018 20:29
VANADIUM	5.5		0.49	MG/KG	10	7/21/2018 17:52
ZINC	78		9.8	MG/KG	10	7/21/2018 17:52
ZIRCONIUM	1700		4.9	MG/KG	1000	7/27/2018 11:56
Ignitability		SW1010		Prep Date: 7/12/2018		PrepBy: JMD
IGNITABILITY			96	deg C	1	7/12/2018
Ion Chromatography		EPA300.0		Prep Date: 6/18/2018		PrepBy: HMA
CHLORIDE	ND		20	MG/KG	10	6/19/2018 09:02
FLUORIDE	6800		99	MG/KG	100	6/30/2018 14:39
SULFATE	3100		99	MG/KG	10	6/19/2018 09:02
Isotopic Thorium by Alpha Spectroscopy		SOP 714		Prep Date: 7/2/2018		PrepBy: SDW
Tracer: Th-229	*83.1*		*30-110*	*%REC*	DL = NA	7/14/2018 12:06
Th-228	1380 (+/- 210)	M3	10	pCi/g	NA	7/14/2018 12:06
Th-230	1170 (+/- 180)	M3	10	pCi/g	NA	7/14/2018 12:06
Th-232	1650 (+/- 260)	M3	0	pCi/g	NA	7/14/2018 12:06

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 64	**Lab ID:**	1806204-10
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Isotopic Uranium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: U-232	*79.2*		*30-110*	*%REC*	DL = NA	7/16/2018 07:28
U-234	**1340 (+/- 220)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
U-235	**68 (+/- 14)**	M3	**2**	**pCi/g**	NA	7/16/2018 07:28
U-238	**1550 (+/- 250)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
Lead-210 by Liquid Scintilation		**SOP 704**		Prep Date: **7/17/2018**		PrepBy: **NCC**
Pb-210	**1160 (+/- 280)**	M3	**0**	**pCi/g**	NA	7/18/2018 23:40
Carr: LEAD	*91.1*		*40-110*	*%REC*	DL = NA	7/18/2018 23:40
Mercury		**SW7471**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	**0.88**		**0.03**	**MG/KG**	1	7/13/2018 11:45
Nitrate/Nitrite as N		**EPA353.2**		Prep Date: **6/22/2018**		PrepBy: **HMA**
NITRATE/NITRITE AS N	ND		1	MG/KG	10	6/23/2018 10:55
pH		**SW9045**		Prep Date: **6/18/2018**		PrepBy: **AEJ**
PH	**3.01**		**0.1**	**pH**	1	6/18/2018

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 69	**Lab ID:**	1806204-11
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Ammonia as N		**EPA350.1**		Prep Date: **7/7/2018**		PrepBy: **HMA**
AMMONIA AS N	78		9.8	MG/KG	10	7/7/2018 13:50
Gamma Spectroscopy Results		**SOP 713**		Prep Date: **6/18/2018**		PrepBy: **NMP**
Ra-226	1550 (+/- 180)	M3,G	10	pCi/g	NA	7/9/2018 08:22
Ra-228	1480 (+/- 170)	M3,G	20	pCi/g	NA	7/9/2018 08:22
ICPMS Metals		**SW6020**		Prep Date: **7/16/2018**		PrepBy: **JML**
SILVER	2.5		0.05	MG/KG	10	7/21/2018 17:55
ALUMINUM	3900		10	MG/KG	10	7/21/2018 17:55
ARSENIC	2.5		0.2	MG/KG	10	7/21/2018 19:56
BARIUM	460		0.5	MG/KG	10	7/21/2018 17:55
BERYLLIUM	0.41		0.05	MG/KG	10	7/21/2018 17:55
CALCIUM	2800		100	MG/KG	10	7/21/2018 17:55
CADMIUM	0.38		0.2	MG/KG	10	7/21/2018 17:55
COBALT	5.9		0.5	MG/KG	10	7/21/2018 17:55
CHROMIUM	33		1	MG/KG	10	7/21/2018 17:55
COPPER	11		2	MG/KG	10	7/21/2018 17:55
IRON	4900		10	MG/KG	10	7/21/2018 17:55
POTASSIUM	1000		100	MG/KG	10	7/21/2018 17:55
MAGNESIUM	520		10	MG/KG	10	7/21/2018 17:55
MANGANESE	740		0.5	MG/KG	10	7/21/2018 17:55
MOLYBDENUM	1.8		0.2	MG/KG	10	7/21/2018 17:55
SODIUM	1600		100	MG/KG	10	7/21/2018 17:55
NIOBIUM	780		10	MG/KG	1000	7/27/2018 11:58
NICKEL	18		2	MG/KG	10	7/21/2018 17:55
LEAD	5100		20	MG/KG	1000	7/22/2018 20:32
SELENIUM	ND		1	MG/KG	10	7/21/2018 19:56
TIN	110		1	MG/KG	10	7/21/2018 17:55
TANTALUM	120		1	MG/KG	100	7/27/2018 11:35
THORIUM	3500		2	MG/KG	1000	7/22/2018 20:32
THALLIUM	0.83		0.01	MG/KG	10	7/21/2018 17:55
URANIUM	3100		1	MG/KG	1000	7/22/2018 20:32
VANADIUM	2.2		0.5	MG/KG	10	7/21/2018 17:55
ZINC	75		10	MG/KG	10	7/21/2018 17:55
ZIRCONIUM	2500		5	MG/KG	1000	7/27/2018 11:58
Ignitability		**SW1010**		Prep Date: **7/12/2018**		PrepBy: **JMD**
IGNITABILITY			96	deg C	1	7/12/2018
Ion Chromatography		**EPA300.0**		Prep Date: **6/18/2018**		PrepBy: **HMA**
CHLORIDE	4.2		1.9	MG/KG	1	6/19/2018 09:32
FLUORIDE	3100		97	MG/KG	100	6/30/2018 15:28
SULFATE	2400		97	MG/KG	10	6/19/2018 09:47
Isotopic Thorium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: Th-229	*85.9*		*30-110*	*%REC*	DL = NA	7/14/2018 12:06
Th-228	1260 (+/- 200)	M3	10	pCi/g	NA	7/14/2018 12:06
Th-230	1000 (+/- 160)	M3	10	pCi/g	NA	7/14/2018 12:06
Th-232	1510 (+/- 230)	M3	0	pCi/g	NA	7/14/2018 12:06

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 69	**Lab ID:**	1806204-11
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Isotopic Uranium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: U-232	*79.6*		*30-110*	*%REC*	DL = NA	7/16/2018 07:28
U-234	**1280 (+/- 210)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
U-235	**64 (+/- 13)**	M3	**1**	**pCi/g**	NA	7/16/2018 07:28
U-238	**1380 (+/- 230)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
Lead-210 by Liquid Scintilation		**SOP 704**		Prep Date: **7/17/2018**		PrepBy: **NCC**
Pb-210	**1110 (+/- 270)**	M3	**0**	**pCi/g**	NA	7/19/2018 00:28
Carr: LEAD	*90.5*		*40-110*	*%REC*	DL = NA	7/19/2018 00:28
Mercury		**SW7471**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	**0.04**		**0.03**	**MG/KG**	1	7/13/2018 11:47
Nitrate/Nitrite as N		**EPA353.2**		Prep Date: **6/22/2018**		PrepBy: **HMA**
NITRATE/NITRITE AS N	**0.18**		**0.1**	**MG/KG**	1	6/23/2018 09:25
pH		**SW9045**		Prep Date: **6/18/2018**		PrepBy: **AEJ**
PH	**3.2**		**0.1**	**pH**	1	6/18/2018

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 76	**Lab ID:**	1806204-12
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Ammonia as N		EPA350.1		Prep Date: **7/7/2018**		PrepBy: **HMA**
AMMONIA AS N	29		0.98	MG/KG	1	7/7/2018 13:51
Gamma Spectroscopy Results		SOP 713		Prep Date: **6/18/2018**		PrepBy: **NMP**
Ra-226	1360 (+/- 160)	M3,G	10	pCi/g	NA	7/9/2018 08:22
Ra-228	2290 (+/- 270)	M3,G	20	pCi/g	NA	7/9/2018 08:22
ICPMS Metals		SW6020		Prep Date: **7/16/2018**		PrepBy: **JML**
SILVER	2		0.049	MG/KG	10	7/21/2018 17:58
ALUMINUM	2300		9.7	MG/KG	10	7/21/2018 17:58
ARSENIC	0.91		0.19	MG/KG	10	7/21/2018 20:02
BARIUM	490		0.49	MG/KG	10	7/21/2018 17:58
BERYLLIUM	0.49		0.049	MG/KG	10	7/21/2018 17:58
CALCIUM	1500		97	MG/KG	10	7/21/2018 17:58
CADMIUM	ND		0.19	MG/KG	10	7/21/2018 17:58
COBALT	ND		0.49	MG/KG	10	7/21/2018 17:58
CHROMIUM	42		0.97	MG/KG	10	7/21/2018 17:58
COPPER	2.5		1.9	MG/KG	10	7/21/2018 17:58
IRON	4100		9.7	MG/KG	10	7/21/2018 17:58
POTASSIUM	820		97	MG/KG	10	7/21/2018 17:58
MAGNESIUM	86		9.7	MG/KG	10	7/21/2018 17:58
MANGANESE	800		0.49	MG/KG	10	7/21/2018 17:58
MOLYBDENUM	1.7		0.19	MG/KG	10	7/21/2018 17:58
SODIUM	350		97	MG/KG	10	7/21/2018 17:58
NIOBIUM	390		9.7	MG/KG	1000	7/27/2018 11:59
NICKEL	28		1.9	MG/KG	10	7/21/2018 17:58
LEAD	5400		19	MG/KG	1000	7/22/2018 20:35
SELENIUM	ND		0.97	MG/KG	10	7/21/2018 20:02
TIN	70		0.97	MG/KG	10	7/21/2018 17:58
TANTALUM	32		0.97	MG/KG	100	7/27/2018 11:36
THORIUM	6000		1.9	MG/KG	1000	7/22/2018 20:35
THALLIUM	0.6		0.0097	MG/KG	10	7/21/2018 17:58
URANIUM	3500		0.97	MG/KG	1000	7/22/2018 20:35
VANADIUM	3		0.49	MG/KG	10	7/21/2018 17:58
ZINC	82		9.7	MG/KG	10	7/21/2018 17:58
ZIRCONIUM	1000		4.9	MG/KG	1000	7/27/2018 11:59
Ignitability		SW1010		Prep Date: **7/12/2018**		PrepBy: **JMD**
IGNITABILITY			96	deg C	1	7/12/2018
Ion Chromatography		EPA300.0		Prep Date: **6/18/2018**		PrepBy: **HMA**
CHLORIDE	ND		2	MG/KG	1	6/19/2018 10:02
FLUORIDE	2300		99	MG/KG	100	6/30/2018 15:44
SULFATE	570		9.9	MG/KG	1	6/19/2018 10:02
Isotopic Thorium by Alpha Spectroscopy		SOP 714		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: Th-229	*88.6*		*30-110*	*%REC*	DL = NA	7/14/2018 12:06
Th-228	1790 (+/- 280)	M3	10	pCi/g	NA	7/14/2018 12:06
Th-230	1300 (+/- 200)	M3	10	pCi/g	NA	7/14/2018 12:06
Th-232	2160 (+/- 330)	M3	0	pCi/g	NA	7/14/2018 12:06

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 76	**Lab ID:**	1806204-12
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Isotopic Uranium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: U-232	*79.6*		*30-110*	*%REC*	DL = NA	7/16/2018 07:28
U-234	**1380 (+/- 230)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
U-235	**71 (+/- 15)**	M3	**1**	**pCi/g**	NA	7/16/2018 07:28
U-238	**1610 (+/- 260)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
Lead-210 by Liquid Scintilation		**SOP 704**		Prep Date: **7/17/2018**		PrepBy: **NCC**
Pb-210	**960 (+/- 230)**	M3	**0**	**pCi/g**	NA	7/19/2018 01:16
Carr: LEAD	*96.3*		*40-110*	*%REC*	DL = NA	7/19/2018 01:16
Mercury		**SW7471**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	**0.077**		**0.032**	**MG/KG**	1	7/13/2018 11:49
Nitrate/Nitrite as N		**EPA353.2**		Prep Date: **6/22/2018**		PrepBy: **HMA**
NITRATE/NITRITE AS N	ND		0.098	MG/KG	1	6/23/2018 09:26
pH		**SW9045**		Prep Date: **6/18/2018**		PrepBy: **AEJ**
PH	**3.76**		**0.1**	**pH**	1	6/18/2018

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 84	**Lab ID:**	1806204-13
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Ammonia as N		**EPA350.1**		Prep Date: **7/7/2018**		PrepBy: **HMA**
AMMONIA AS N	**16**		**0.99**	**MG/KG**	1	7/7/2018 13:52
Gamma Spectroscopy Results		**SOP 713**		Prep Date: **6/18/2018**		PrepBy: **NMP**
Ra-226	**1530 (+/- 180)**	M3,G	**10**	**pCi/g**	NA	7/9/2018 08:22
Ra-228	**1970 (+/- 230)**	M3,G	**20**	**pCi/g**	NA	7/9/2018 08:22
ICPMS Metals		**SW6020**		Prep Date: **7/16/2018**		PrepBy: **JML**
SILVER	**1.4**		**0.046**	**MG/KG**	10	7/21/2018 18:01
ALUMINUM	**1700**		**9.2**	**MG/KG**	10	7/21/2018 18:01
ARSENIC	**0.39**		**0.18**	**MG/KG**	10	7/21/2018 20:08
BARIUM	**420**		**0.46**	**MG/KG**	10	7/21/2018 18:01
BERYLLIUM	**0.31**		**0.046**	**MG/KG**	10	7/21/2018 18:01
CALCIUM	**980**		**92**	**MG/KG**	10	7/21/2018 18:01
CADMIUM	ND		0.18	MG/KG	10	7/21/2018 18:01
COBALT	ND		0.46	MG/KG	10	7/21/2018 18:01
CHROMIUM	**25**		**0.92**	**MG/KG**	10	7/21/2018 18:01
COPPER	ND		1.8	MG/KG	10	7/21/2018 18:01
IRON	**2700**		**9.2**	**MG/KG**	10	7/21/2018 18:01
POTASSIUM	**690**		**92**	**MG/KG**	10	7/21/2018 18:01
MAGNESIUM	**170**		**9.2**	**MG/KG**	10	7/21/2018 18:01
MANGANESE	**480**		**0.46**	**MG/KG**	10	7/21/2018 18:01
MOLYBDENUM	**1.2**		**0.18**	**MG/KG**	10	7/21/2018 18:01
SODIUM	**310**		**92**	**MG/KG**	10	7/21/2018 18:01
NIOBIUM	**260**		**9.2**	**MG/KG**	1000	7/27/2018 12:00
NICKEL	**13**		**1.8**	**MG/KG**	10	7/21/2018 18:01
LEAD	**4700**		**18**	**MG/KG**	1000	7/22/2018 20:38
SELENIUM	ND		0.92	MG/KG	10	7/21/2018 20:08
TIN	**72**		**0.92**	**MG/KG**	10	7/21/2018 18:01
TANTALUM	**16**		**0.92**	**MG/KG**	100	7/27/2018 11:38
THORIUM	**9200**		**1.8**	**MG/KG**	1000	7/22/2018 20:38
THALLIUM	**0.57**		**0.0092**	**MG/KG**	10	7/21/2018 18:01
URANIUM	**2800**		**0.92**	**MG/KG**	1000	7/22/2018 20:38
VANADIUM	**2.3**		**0.46**	**MG/KG**	10	7/21/2018 18:01
ZINC	**51**		**9.2**	**MG/KG**	10	7/21/2018 18:01
ZIRCONIUM	**1000**		**4.6**	**MG/KG**	1000	7/27/2018 12:00
Ignitability		**SW1010**		Prep Date: **7/12/2018**		PrepBy: **JMD**
IGNITABILITY			**96**	**deg C**	1	7/12/2018
Ion Chromatography		**EPA300.0**		Prep Date: **6/18/2018**		PrepBy: **HMA**
CHLORIDE	ND		20	MG/KG	10	6/19/2018 10:17
FLUORIDE	**1600**		**49**	**MG/KG**	50	6/30/2018 16:00
SULFATE	**1100**		**99**	**MG/KG**	10	6/19/2018 10:17
Isotopic Thorium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: Th-229	*81.8*		*30-110*	*%REC*	DL = NA	7/14/2018 12:06
Th-228	**1620 (+/- 250)**	M3	**0**	**pCi/g**	NA	7/14/2018 12:06
Th-230	**1110 (+/- 170)**	M3	**10**	**pCi/g**	NA	7/14/2018 12:06
Th-232	**1930 (+/- 300)**	M3	**0**	**pCi/g**	NA	7/14/2018 12:06

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Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 84	**Lab ID:**	1806204-13
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Isotopic Uranium by Alpha Spectroscopy		**SOP 714**			Prep Date: **7/2/2018**	PrepBy: **SDW**
Tracer: U-232	*85.4*		*30-110*	*%REC*	DL = NA	7/16/2018 07:28
U-234	**1100 (+/- 180)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
U-235	**64 (+/- 13)**	M3	**1**	**pCi/g**	NA	7/16/2018 07:28
U-238	**1260 (+/- 210)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
Lead-210 by Liquid Scintilation		**SOP 704**			Prep Date: **7/17/2018**	PrepBy: **NCC**
Pb-210	**930 (+/- 220)**	M3	**0**	**pCi/g**	NA	7/19/2018 02:03
Carr: LEAD	*93.3*		*40-110*	*%REC*	DL = NA	7/19/2018 02:03
Mercury		**SW7471**			Prep Date: **7/12/2018**	PrepBy: **KJM**
MERCURY	**0.035**		**0.031**	**MG/KG**	1	7/13/2018 11:51
Nitrate/Nitrite as N		**EPA353.2**			Prep Date: **6/22/2018**	PrepBy: **HMA**
NITRATE/NITRITE AS N	ND		0.098	MG/KG	1	6/23/2018 09:26
pH		**SW9045**			Prep Date: **6/18/2018**	PrepBy: **AEJ**
PH	**3.78**		**0.1**	**pH**	1	6/18/2018

Client: Neo Performance Materials Silmet OÜ **Date:** *27-Jul-18*
Project: NEO Silmet **Work Order:** 1806204
Sample ID: LOT 85 **Lab ID:** 1806204-14
Legal Location: **Matrix:** SOLID
Collection Date: 4/10/2018 **Percent Moisture:**

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Ammonia as N		**EPA350.1**		Prep Date: **7/7/2018**		PrepBy: **HMA**
AMMONIA AS N	**46**		**0.99**	**MG/KG**	1	7/7/2018 13:52
Gamma Spectroscopy Results		**SOP 713**		Prep Date: **6/18/2018**		PrepBy: **NMP**
Ra-226	**1830 (+/- 210)**	M3,G	**10**	**pCi/g**	NA	7/9/2018 08:22
Ra-228	**1610 (+/- 190)**	M3,G	**10**	**pCi/g**	NA	7/9/2018 08:22
ICPMS Metals		**SW6020**		Prep Date: **7/16/2018**		PrepBy: **JML**
SILVER	**2.3**		**0.05**	**MG/KG**	10	7/21/2018 18:04
ALUMINUM	**2200**		**9.9**	**MG/KG**	10	7/21/2018 18:04
ARSENIC	**11**		**0.2**	**MG/KG**	10	7/21/2018 20:14
BARIUM	**320**		**0.5**	**MG/KG**	10	7/21/2018 18:04
BERYLLIUM	**0.5**		**0.05**	**MG/KG**	10	7/21/2018 18:04
CALCIUM	**2000**		**99**	**MG/KG**	10	7/21/2018 18:04
CADMIUM	**0.21**		**0.2**	**MG/KG**	10	7/21/2018 18:04
COBALT	**1.8**		**0.5**	**MG/KG**	10	7/21/2018 18:04
CHROMIUM	**45**		**0.99**	**MG/KG**	10	7/21/2018 18:04
COPPER	**6.7**		**2**	**MG/KG**	10	7/21/2018 18:04
IRON	**7800**		**9.9**	**MG/KG**	10	7/21/2018 18:04
POTASSIUM	**140**		**99**	**MG/KG**	10	7/21/2018 18:04
MAGNESIUM	**550**		**9.9**	**MG/KG**	10	7/21/2018 18:04
MANGANESE	**4400**		**50**	**MG/KG**	1000	7/22/2018 20:41
MOLYBDENUM	**2.6**		**0.2**	**MG/KG**	10	7/21/2018 18:04
SODIUM	**1100**		**99**	**MG/KG**	10	7/21/2018 18:04
NIOBIUM	**470**		**9.9**	**MG/KG**	1000	7/27/2018 12:02
NICKEL	**13**		**2**	**MG/KG**	10	7/21/2018 18:04
LEAD	**3900**		**20**	**MG/KG**	1000	7/22/2018 20:41
SELENIUM	ND		0.99	MG/KG	10	7/21/2018 20:14
TIN	**96**		**0.99**	**MG/KG**	10	7/21/2018 18:04
TANTALUM	**49**		**0.99**	**MG/KG**	100	7/27/2018 11:39
THORIUM	**3700**		**2**	**MG/KG**	1000	7/22/2018 20:41
THALLIUM	**0.27**		**0.0099**	**MG/KG**	10	7/21/2018 18:04
URANIUM	**2700**		**0.99**	**MG/KG**	1000	7/22/2018 20:41
VANADIUM	**4.6**		**0.5**	**MG/KG**	10	7/21/2018 18:04
ZINC	**130**		**9.9**	**MG/KG**	10	7/21/2018 18:04
ZIRCONIUM	**1500**		**5**	**MG/KG**	1000	7/27/2018 12:02
Ignitability		**SW1010**		Prep Date: **7/12/2018**		PrepBy: **JMD**
IGNITABILITY			**96**	**deg C**	1	7/12/2018
Ion Chromatography		**EPA300.0**		Prep Date: **6/18/2018**		PrepBy: **HMA**
CHLORIDE	ND		19	MG/KG	10	6/19/2018 10:31
FLUORIDE	**2800**		**48**	**MG/KG**	50	6/19/2018 11:16
SULFATE	**2800**		**480**	**MG/KG**	50	6/19/2018 11:16
Isotopic Thorium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: Th-229	*86.6*		*30-110*	*%REC*	DL = NA	7/14/2018 12:06
Th-228	**1080 (+/- 170)**	M3	**0**	**pCi/g**	NA	7/14/2018 12:06
Th-230	**1170 (+/- 180)**	M3	**10**	**pCi/g**	NA	7/14/2018 12:06
Th-232	**1310 (+/- 200)**	M3	**0**	**pCi/g**	NA	7/14/2018 12:06

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 85	**Lab ID:**	1806204-14
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Isotopic Uranium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: U-232	*74.9*		*30-110*	*%REC*	DL = NA	7/16/2018 07:28
U-234	**1290 (+/- 210)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
U-235	**63 (+/- 13)**	M3	**1**	**pCi/g**	NA	7/16/2018 07:28
U-238	**1440 (+/- 240)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:28
Lead-210 by Liquid Scintilation		**SOP 704**		Prep Date: **7/17/2018**		PrepBy: **NCC**
Pb-210	**1000 (+/- 240)**	M3	**0**	**pCi/g**	NA	7/19/2018 02:51
Carr: LEAD	*96*		*40-110*	*%REC*	DL = NA	7/19/2018 02:51
Mercury		**SW7471**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	**0.3**		**0.033**	**MG/KG**	1	7/13/2018 11:54
Nitrate/Nitrite as N		**EPA353.2**		Prep Date: **6/22/2018**		PrepBy: **HMA**
NITRATE/NITRITE AS N	ND		0.098	MG/KG	1	6/23/2018 09:27
pH		**SW9045**		Prep Date: **6/18/2018**		PrepBy: **AEJ**
PH	**3.31**		**0.1**	**pH**	1	6/18/2018

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 86	**Lab ID:**	1806204-15
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Ammonia as N		**EPA350.1**		Prep Date: **7/7/2018**		PrepBy: **HMA**
AMMONIA AS N	190		10	MG/KG	10	7/7/2018 13:55
Gamma Spectroscopy Results		**SOP 713**		Prep Date: **6/18/2018**		PrepBy: **NMP**
Ra-226	1820 (+/- 210)	M3,G	10	pCi/g	NA	7/9/2018 08:22
Ra-228	1400 (+/- 160)	M3,G	10	pCi/g	NA	7/9/2018 08:22
ICPMS Metals		**SW6020**		Prep Date: **7/16/2018**		PrepBy: **JML**
SILVER	5.4		0.046	MG/KG	10	7/21/2018 18:06
ALUMINUM	4000		9.2	MG/KG	10	7/21/2018 18:06
ARSENIC	7.4		0.18	MG/KG	10	7/21/2018 20:20
BARIUM	520		0.46	MG/KG	10	7/21/2018 18:06
BERYLLIUM	0.47		0.046	MG/KG	10	7/21/2018 18:06
CALCIUM	2300		92	MG/KG	10	7/21/2018 18:06
CADMIUM	0.56		0.18	MG/KG	10	7/21/2018 18:06
COBALT	2.7		0.46	MG/KG	10	7/21/2018 18:06
CHROMIUM	140		0.92	MG/KG	10	7/21/2018 18:06
COPPER	14		1.8	MG/KG	10	7/21/2018 18:06
IRON	6300		9.2	MG/KG	10	7/21/2018 18:06
POTASSIUM	460		92	MG/KG	10	7/21/2018 18:06
MAGNESIUM	560		9.2	MG/KG	10	7/21/2018 18:06
MANGANESE	1700		0.46	MG/KG	10	7/21/2018 18:06
MOLYBDENUM	4.8		0.18	MG/KG	10	7/21/2018 18:06
SODIUM	2900		92	MG/KG	10	7/21/2018 18:06
NIOBIUM	640		9.2	MG/KG	1000	7/27/2018 12:11
NICKEL	48		1.8	MG/KG	10	7/21/2018 18:06
LEAD	3700		18	MG/KG	1000	7/22/2018 20:44
SELENIUM	ND		0.92	MG/KG	10	7/21/2018 20:20
TIN	120		0.92	MG/KG	10	7/21/2018 18:06
TANTALUM	83		0.92	MG/KG	100	7/27/2018 11:40
THORIUM	2800		1.8	MG/KG	1000	7/22/2018 20:44
THALLIUM	0.47		0.0092	MG/KG	10	7/21/2018 18:06
URANIUM	2800		0.92	MG/KG	1000	7/22/2018 20:44
VANADIUM	3.9		0.46	MG/KG	10	7/21/2018 18:06
ZINC	110		9.2	MG/KG	10	7/21/2018 18:06
ZIRCONIUM	1900		4.6	MG/KG	1000	7/27/2018 12:11
Ignitability		**SW1010**		Prep Date: **7/12/2018**		PrepBy: **JMD**
IGNITABILITY			96	deg C	1	7/12/2018
Ion Chromatography		**EPA300.0**		Prep Date: **6/18/2018**		PrepBy: **HMA**
CHLORIDE	5		1.9	MG/KG	1	6/19/2018 11:31
FLUORIDE	4300		97	MG/KG	100	6/30/2018 16:15
SULFATE	2300		97	MG/KG	10	6/19/2018 11:46
Isotopic Thorium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: Th-229	*83.8*		*30-110*	*%REC*	DL = NA	7/14/2018 12:06
Th-228	1020 (+/- 160)	M3	0	pCi/g	NA	7/14/2018 12:06
Th-230	1260 (+/- 190)	M3	10	pCi/g	NA	7/14/2018 12:06
Th-232	1270 (+/- 200)	M3	0	pCi/g	NA	7/14/2018 12:06

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 86	**Lab ID:**	1806204-15
Legal Location:		**Matrix:**	SOLID
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Isotopic Uranium by Alpha Spectroscopy		**SOP 714**		Prep Date: **7/2/2018**		PrepBy: **SDW**
Tracer: U-232	*77.9*		*30-110*	*%REC*	DL = NA	7/16/2018 07:29
U-234	**1210 (+/- 200)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:29
U-235	**62 (+/- 13)**	M3	**2**	**pCi/g**	NA	7/16/2018 07:29
U-238	**1320 (+/- 220)**	M3	**0**	**pCi/g**	NA	7/16/2018 07:29
Lead-210 by Liquid Scintilation		**SOP 704**		Prep Date: **7/17/2018**		PrepBy: **NCC**
Pb-210	**930 (+/- 220)**	M3	**0**	**pCi/g**	NA	7/19/2018 03:39
Carr: LEAD	*93.8*		*40-110*	*%REC*	DL = NA	7/19/2018 03:39
Mercury		**SW7471**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	**0.13**		**0.032**	**MG/KG**	1	7/13/2018 11:56
Nitrate/Nitrite as N		**EPA353.2**		Prep Date: **6/22/2018**		PrepBy: **HMA**
NITRATE/NITRITE AS N	ND		0.099	MG/KG	1	6/23/2018 09:28
pH		**SW9045**		Prep Date: **6/18/2018**		PrepBy: **AEJ**
PH	**3.22**		**0.1**	**pH**	1	6/18/2018

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 20	**Lab ID:**	1806204-16
Legal Location:		**Matrix:**	LEACHATE
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
TCLP ICP Metals		**SW6010**		Prep Date: **7/11/2018**		PrepBy: **AJL2**
ARSENIC	ND		0.01	MG/L	1	7/12/2018 13:48
BARIUM	ND		0.1	MG/L	1	7/12/2018 13:48
CADMIUM	**0.018**		**0.005**	**MG/L**	**1**	7/12/2018 13:48
CHROMIUM	**0.059**		**0.01**	**MG/L**	**1**	7/12/2018 13:48
LEAD	**0.39**		**0.004**	**MG/L**	**1**	7/12/2018 13:48
SELENIUM	ND		0.006	MG/L	1	7/12/2018 13:48
SILVER	ND		0.01	MG/L	1	7/12/2018 13:48
TCLP Mercury		**SW7470**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	ND		0.002	MG/L	1	7/13/2018 09:43

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 21	**Lab ID:**	1806204-17
Legal Location:		**Matrix:**	LEACHATE
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
TCLP ICP Metals		**SW6010**		Prep Date: **7/11/2018**		PrepBy: **AJL2**
ARSENIC	**0.011**		**0.01**	**MG/L**	1	7/12/2018 14:09
BARIUM	ND		0.1	MG/L	1	7/12/2018 14:09
CADMIUM	**0.0054**		**0.005**	**MG/L**	1	7/12/2018 14:09
CHROMIUM	**0.02**		**0.01**	**MG/L**	1	7/12/2018 14:09
LEAD	**0.4**		**0.004**	**MG/L**	1	7/12/2018 14:09
SELENIUM	ND		0.006	MG/L	1	7/12/2018 14:09
SILVER	ND		0.01	MG/L	1	7/12/2018 14:09
TCLP Mercury		**SW7470**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	ND		0.002	MG/L	1	7/13/2018 09:45

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 22	**Lab ID:**	1806204-18
Legal Location:		**Matrix:**	LEACHATE
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
TCLP ICP Metals		**SW6010**		Prep Date: **7/11/2018**		PrepBy: **AJL2**
ARSENIC	ND		0.01	MG/L	1	7/12/2018 14:12
BARIUM	ND		0.1	MG/L	1	7/12/2018 14:12
CADMIUM	**0.0096**		**0.005**	**MG/L**	1	7/12/2018 14:12
CHROMIUM	**0.015**		**0.01**	**MG/L**	1	7/12/2018 14:12
LEAD	**0.39**		**0.004**	**MG/L**	1	7/12/2018 14:12
SELENIUM	ND		0.006	MG/L	1	7/12/2018 14:12
SILVER	ND		0.01	MG/L	1	7/12/2018 14:12
TCLP Mercury		**SW7470**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	ND		0.002	MG/L	1	7/13/2018 09:47

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 31	**Lab ID:**	1806204-19
Legal Location:		**Matrix:**	LEACHATE
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
TCLP ICP Metals		**SW6010**		Prep Date: **7/11/2018**		PrepBy: **AJL2**
ARSENIC	**0.013**		**0.01**	**MG/L**	1	7/12/2018 14:15
BARIUM	ND		0.1	MG/L	1	7/12/2018 14:15
CADMIUM	**0.085**		**0.005**	**MG/L**	1	7/12/2018 14:15
CHROMIUM	**0.14**		**0.01**	**MG/L**	1	7/12/2018 14:15
LEAD	**0.52**		**0.004**	**MG/L**	1	7/12/2018 14:15
SELENIUM	ND		0.006	MG/L	1	7/12/2018 14:15
SILVER	ND		0.01	MG/L	1	7/12/2018 14:15
TCLP Mercury		**SW7470**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	ND		0.002	MG/L	1	7/13/2018 09:49

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 32	**Lab ID:**	1806204-20
Legal Location:		**Matrix:**	LEACHATE
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
TCLP ICP Metals		**SW6010**		Prep Date: **7/11/2018**		PrepBy: **AJL2**
ARSENIC	ND		0.01	MG/L	1	7/12/2018 14:18
BARIUM	ND		0.1	MG/L	1	7/12/2018 14:18
CADMIUM	**0.0085**		**0.005**	**MG/L**	1	7/12/2018 14:18
CHROMIUM	**0.16**		**0.01**	**MG/L**	1	7/12/2018 14:18
LEAD	**0.56**		**0.004**	**MG/L**	1	7/12/2018 14:18
SELENIUM	ND		0.006	MG/L	1	7/12/2018 14:18
SILVER	ND		0.01	MG/L	1	7/12/2018 14:18
TCLP Mercury		**SW7470**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	ND		0.002	MG/L	1	7/13/2018 09:51

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 34	**Lab ID:**	1806204-21
Legal Location:		**Matrix:**	LEACHATE
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
TCLP ICP Metals		**SW6010**		Prep Date: **7/11/2018**		PrepBy: **AJL2**
ARSENIC	**0.012**		**0.01**	**MG/L**	1	7/12/2018 14:21
BARIUM	ND		0.1	MG/L	1	7/12/2018 14:21
CADMIUM	**0.0064**		**0.005**	**MG/L**	1	7/12/2018 14:21
CHROMIUM	**1.2**		**0.01**	**MG/L**	1	7/12/2018 14:21
LEAD	**0.69**		**0.004**	**MG/L**	1	7/12/2018 14:21
SELENIUM	ND		0.006	MG/L	1	7/12/2018 14:21
SILVER	ND		0.05	MG/L	5	7/12/2018 15:01
TCLP Mercury		**SW7470**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	ND		0.002	MG/L	1	7/13/2018 09:54

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 35	**Lab ID:**	1806204-22
Legal Location:		**Matrix:**	LEACHATE
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
TCLP ICP Metals		**SW6010**		Prep Date: **7/11/2018**		PrepBy: **AJL2**
ARSENIC	**0.014**		**0.01**	**MG/L**	1	7/12/2018 14:24
BARIUM	ND		0.1	MG/L	1	7/12/2018 14:24
CADMIUM	**0.0057**		**0.005**	**MG/L**	1	7/12/2018 14:24
CHROMIUM	**0.75**		**0.01**	**MG/L**	1	7/12/2018 14:24
LEAD	**0.64**		**0.004**	**MG/L**	1	7/12/2018 14:24
SELENIUM	ND		0.006	MG/L	1	7/12/2018 14:24
SILVER	ND		0.05	MG/L	5	7/12/2018 15:10
TCLP Mercury		**SW7470**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	ND		0.002	MG/L	1	7/13/2018 09:56

SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ		**Date:**	*27-Jul-18*
Project:	NEO Silmet		**Work Order:**	1806204
Sample ID:	LOT 58		**Lab ID:**	1806204-23
Legal Location:			**Matrix:**	LEACHATE
Collection Date:	4/10/2018		**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
TCLP ICP Metals		**SW6010**		Prep Date: **7/11/2018**		PrepBy: **AJL2**
ARSENIC	ND		0.01	MG/L	1	7/12/2018 14:33
BARIUM	ND		0.1	MG/L	1	7/12/2018 14:33
CADMIUM	ND		0.005	MG/L	1	7/12/2018 14:33
CHROMIUM	**0.095**		**0.01**	**MG/L**	1	7/12/2018 14:33
LEAD	**1.1**		**0.004**	**MG/L**	1	7/12/2018 14:33
SELENIUM	ND		0.006	MG/L	1	7/12/2018 14:33
SILVER	ND		0.05	MG/L	5	7/12/2018 15:13
TCLP Mercury		**SW7470**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	ND		0.002	MG/L	1	7/13/2018 10:02

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 60	**Lab ID:**	1806204-24
Legal Location:		**Matrix:**	LEACHATE
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
TCLP ICP Metals		**SW6010**			Prep Date: **7/11/2018**	PrepBy: **AJL2**
ARSENIC	ND		0.01	MG/L	1	7/12/2018 14:36
BARIUM	ND		0.1	MG/L	1	7/12/2018 14:36
CADMIUM	ND		0.005	MG/L	1	7/12/2018 14:36
CHROMIUM	**0.044**		**0.01**	**MG/L**	1	7/12/2018 14:36
LEAD	**1.1**		**0.004**	**MG/L**	1	7/12/2018 14:36
SELENIUM	ND		0.006	MG/L	1	7/12/2018 14:36
SILVER	ND		0.01	MG/L	1	7/12/2018 14:36
TCLP Mercury		**SW7470**			Prep Date: **7/12/2018**	PrepBy: **KJM**
MERCURY	ND		0.002	MG/L	1	7/13/2018 10:04

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 64	**Lab ID:**	1806204-25
Legal Location:		**Matrix:**	LEACHATE
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
TCLP ICP Metals		**SW6010**		Prep Date: **7/11/2018**		PrepBy: **AJL2**
ARSENIC	ND		0.01	MG/L	1	7/12/2018 14:39
BARIUM	ND		0.1	MG/L	1	7/12/2018 14:39
CADMIUM	ND		0.005	MG/L	1	7/12/2018 14:39
CHROMIUM	**0.55**		**0.01**	**MG/L**	1	7/12/2018 14:39
LEAD	**1.3**		**0.004**	**MG/L**	1	7/12/2018 14:39
SELENIUM	ND		0.006	MG/L	1	7/12/2018 14:39
SILVER	ND		0.01	MG/L	1	7/12/2018 14:39
TCLP Mercury		**SW7470**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	ND		0.002	MG/L	1	7/13/2018 10:06

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 69	**Lab ID:**	1806204-26
Legal Location:		**Matrix:**	LEACHATE
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
TCLP ICP Metals		**SW6010**		Prep Date: **7/11/2018**		PrepBy: **AJL2**
ARSENIC	ND		0.01	MG/L	1	7/12/2018 14:42
BARIUM	ND		0.1	MG/L	1	7/12/2018 14:42
CADMIUM	ND		0.005	MG/L	1	7/12/2018 14:42
CHROMIUM	**0.033**		**0.01**	**MG/L**	1	7/12/2018 14:42
LEAD	**0.73**		**0.004**	**MG/L**	1	7/12/2018 14:42
SELENIUM	ND		0.006	MG/L	1	7/12/2018 14:42
SILVER	ND		0.01	MG/L	1	7/12/2018 14:42
TCLP Mercury		**SW7470**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	ND		0.002	MG/L	1	7/13/2018 10:09

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 76	**Lab ID:**	1806204-27
Legal Location:		**Matrix:**	LEACHATE
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
TCLP ICP Metals		**SW6010**		Prep Date: **7/11/2018**		PrepBy: **AJL2**
ARSENIC	ND		0.01	MG/L	1	7/12/2018 14:45
BARIUM	ND		0.1	MG/L	1	7/12/2018 14:45
CADMIUM	ND		0.005	MG/L	1	7/12/2018 14:45
CHROMIUM	**0.11**		**0.01**	**MG/L**	1	7/12/2018 14:45
LEAD	**4.3**		**0.004**	**MG/L**	1	7/12/2018 14:45
SELENIUM	ND		0.006	MG/L	1	7/12/2018 14:45
SILVER	ND		0.01	MG/L	1	7/12/2018 14:45
TCLP Mercury		**SW7470**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	ND		0.002	MG/L	1	7/13/2018 10:11

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 84	**Lab ID:**	1806204-28
Legal Location:		**Matrix:**	LEACHATE
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
TCLP ICP Metals		**SW6010**		Prep Date: **7/11/2018**		PrepBy: **AJL2**
ARSENIC	ND		0.01	MG/L	1	7/12/2018 14:48
BARIUM	ND		0.1	MG/L	1	7/12/2018 14:48
CADMIUM	ND		0.005	MG/L	1	7/12/2018 14:48
CHROMIUM	**0.063**		**0.01**	**MG/L**	1	7/12/2018 14:48
LEAD	**1.7**		**0.004**	**MG/L**	1	7/12/2018 14:48
SELENIUM	ND		0.006	MG/L	1	7/12/2018 14:48
SILVER	ND		0.01	MG/L	1	7/12/2018 14:48
TCLP Mercury		**SW7470**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	ND		0.002	MG/L	1	7/13/2018 10:13

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 85	**Lab ID:**	1806204-29
Legal Location:		**Matrix:**	LEACHATE
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
TCLP ICP Metals		**SW6010**		Prep Date: **7/11/2018**		PrepBy: **AJL2**
ARSENIC	ND		0.01	MG/L	1	7/12/2018 14:52
BARIUM	ND		0.1	MG/L	1	7/12/2018 14:52
CADMIUM	ND		0.005	MG/L	1	7/12/2018 14:52
CHROMIUM	**0.038**		**0.01**	**MG/L**	1	7/12/2018 14:52
LEAD	**1.7**		**0.004**	**MG/L**	1	7/12/2018 14:52
SELENIUM	ND		0.006	MG/L	1	7/12/2018 14:52
SILVER	ND		0.01	MG/L	1	7/12/2018 14:52
TCLP Mercury		**SW7470**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	ND		0.002	MG/L	1	7/13/2018 10:15

Client:	Neo Performance Materials Silmet OÜ	**Date:**	*27-Jul-18*
Project:	NEO Silmet	**Work Order:**	1806204
Sample ID:	LOT 86	**Lab ID:**	1806204-30
Legal Location:		**Matrix:**	LEACHATE
Collection Date:	4/10/2018	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
TCLP ICP Metals		**SW6010**		Prep Date: **7/11/2018**		PrepBy: **AJL2**
ARSENIC	ND		0.01	MG/L	1	7/12/2018 14:55
BARIUM	ND		0.1	MG/L	1	7/12/2018 14:55
CADMIUM	ND		0.005	MG/L	1	7/12/2018 14:55
CHROMIUM	**0.58**		**0.01**	**MG/L**	1	7/12/2018 14:55
LEAD	**1.2**		**0.004**	**MG/L**	1	7/12/2018 14:55
SELENIUM	ND		0.006	MG/L	1	7/12/2018 14:55
SILVER	ND		0.01	MG/L	1	7/12/2018 14:55
TCLP Mercury		**SW7470**		Prep Date: **7/12/2018**		PrepBy: **KJM**
MERCURY	ND		0.002	MG/L	1	7/13/2018 10:17

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SAMPLE SUMMARY REPORT

Client:	Neo Performance Materials Silmet OÜ		**Date:**	*27-Jul-18*
Project:	NEO Silmet		**Work Order:**	1806204
Sample ID:	LOT 86		**Lab ID:**	1806204-30
Legal Location:			**Matrix:**	LEACHATE
Collection Date:	4/10/2018		**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

- "Report Limit" is the MDC

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

LT - Result is less than requested MDC but greater than achieved MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

ALS -- Fort Collins

Client: Neo Performance Materials Silmet OÜ
Work Order: 1806204
Project: NEO Silmet

Date: *7/27/2018 4:36:*

QC BATCH REPORT

Batch ID: **AS180702-7-1** Instrument ID **AlphaSpec2** Method: **Isotopic Uranium by Alpha Spec**

DUP Sample ID: **1806204-15** Units: **pCi/g** Analysis Date: **7/16/2018 07:29**
Client ID: **LOT 86** Run ID: **AS180702-7UR** Prep Date: **7/2/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
U-234	1430 (+/- 240)	0						1210	0.7	2.1	M3
U-235	75 (+/- 16)	1						62	0.7	2.1	M3
U-238	1630 (+/- 270)	0						1320	0.9	2.1	M3
Tracer: U-232	160	3	227.7		70.1	30-110		177			

LCS Sample ID: **AS180702-7** Units: **pCi/g** Analysis Date: **7/16/2018 07:29**
Client ID: Run ID: **AS180702-7UR** Prep Date: **7/2/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
U-234	2.17 (+/- 0.38)	0.01	2.11		103	82-122					P
U-238	2.29 (+/- 0.4)	0.01	2.191		105	82-122					P
Tracer: U-232	1.94	0.03	2.323		83.3	30-110					

MB Sample ID: **AS180702-7** Units: **pCi/g** Analysis Date: **7/16/2018 07:29**
Client ID: Run ID: **AS180702-7UR** Prep Date: **7/2/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
U-234	0.015 (+/- 0.013)	0.013									B3
U-235	ND	0.007									U
U-238	ND	0.0127									U
Tracer: U-232	1.86	0.02	2.323		80.1	30-110					

The following samples were analyzed in this batch:

1806204-1	1806204-2	1806204-3
1806204-4	1806204-5	1806204-6
1806204-7	1806204-8	1806204-9
1806204-10	1806204-11	1806204-12
1806204-13	1806204-14	1806204-15

Client: Neo Performance Materials Silmet OÜ
Work Order: 1806204
Project: NEO Silmet

QC BATCH REPORT

Batch ID: **AS180702-8-1** Instrument ID **AlphaSpec2** Method: **Isotopic Thorium by Alpha Spec**

DUP Sample ID: **1806204-15** Units: **pCi/g** Analysis Date: **7/14/2018 12:07**
Client ID: **LOT 86** Run ID: **AS180702-8TH** Prep Date: **7/2/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Th-228	1120 (+/- 220)	40						1020	0.4	2.1	Y2,M3
Th-230	1300 (+/- 250)	20						1260	0.1	2.1	Y2,M3
Th-232	1390 (+/- 260)	10						1270	0.3	2.1	Y2,M3
Tracer: Th-229	49.2	1.6	451.2		10.9	30-110		377			Y2

LCS Sample ID: **AS180702-8** Units: **pCi/g** Analysis Date: **7/14/2018 12:07**
Client ID: Run ID: **AS180702-8TH** Prep Date: **7/2/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Th-230	2.52 (+/- 0.4)	0.03	2.464		102	85-121					P
Tracer: Th-229	1.84	0.01	2.301		79.9	30-110					

MB Sample ID: **AS180702-8** Units: **pCi/g** Analysis Date: **7/14/2018 12:07**
Client ID: Run ID: **AS180702-8TH** Prep Date: **7/2/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Th-228	ND	0.026									U
Th-230	ND	0.034									U
Th-232	ND	0.0079									U
Tracer: Th-229	1.78	0.01	2.301		77.3	30-110					

The following samples were analyzed in this batch:

1806204-1	1806204-2	1806204-3
1806204-4	1806204-5	1806204-6
1806204-7	1806204-8	1806204-9
1806204-10	1806204-11	1806204-12
1806204-13	1806204-14	1806204-15

QC BATCH REPORT

Batch ID: **GS180619-1-1** Instrument ID **GAMMA** Method: **Gamma Spectroscopy Results**

DUP Sample ID: **1806204-4** Units: **pCi/g** Analysis Date: **7/9/2018 08:21**
Client ID: **LOT 31** Run ID: **GS180619-1A** Prep Date: **6/18/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1020 (+/- 120)	10						1020	0.02	2.1	M3,G
Ra-228	890 (+/- 110)	10						950	0.4	2.1	M3,G

LCS Sample ID: **GS180619-1A** Units: **pCi/g** Analysis Date: **7/9/2018 09:11**
Client ID: Run ID: **GS180619-1A** Prep Date: **6/18/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Am-241	467 (+/- 57)	14	469.3		99.5	85-115					P
Co-60	200 (+/- 24)	1	197.4		102	85-115					P
Cs-137	182 (+/- 21)	1	179.4		102	85-115					P

LCS Sample ID: **GS180619-1** Units: **pCi/g** Analysis Date: **7/9/2018 09:11**
Client ID: Run ID: **GS180619-1A** Prep Date: **6/18/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	454 (+/- 53)	3	468.3		96.9	85-115					P,M3

MB Sample ID: **GS180619-1** Units: **pCi/g** Analysis Date: **7/9/2018 08:23**
Client ID: Run ID: **GS180619-1A** Prep Date: **6/18/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Cs-137	ND	0.109									U
Ra-226	ND	0.33									U
Ra-228	ND	0.4									U

The following samples were analyzed in this batch:

1806204-1	1806204-2	1806204-3
1806204-4	1806204-5	1806204-6
1806204-7	1806204-8	1806204-9
1806204-10	1806204-11	1806204-12
1806204-13	1806204-14	1806204-15

Client: Neo Performance Materials Silmet OÜ
Work Order: 1806204
Project: NEO Silmet

QC BATCH REPORT

Batch ID: **Pb180717-1-1** Instrument ID **LIQSCINT** Method: **Lead-210 by Liquid Scintilatio**

LCS Sample ID: **Pb180717-1** Units: **ug** Analysis Date: **7/19/2018 06:50**
Client ID: Run ID: **PB180717-1A** Prep Date: **7/17/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Carr: LEAD	839.3		944.4		88.9	40-110					
Pb-210	22.1 (+/- 5.4)	0.5	20.66		107	70-130					P

MB Sample ID: **Pb180717-1** Units: **ug** Analysis Date: **7/19/2018 06:01**
Client ID: Run ID: **PB180717-1A** Prep Date: **7/17/2018** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Carr: LEAD	849.6		1000		84.9	40-110					
Pb-210	ND	0.55									U

The following samples were analyzed in this batch:

1806204-1	1806204-2	1806204-3
1806204-4	1806204-5	1806204-6
1806204-7	1806204-8	1806204-9
1806204-10	1806204-11	1806204-12
1806204-13	1806204-14	1806204-15

Client:	Neo Performance Materials Silmet OÜ	
Work Order:	1806204	
Project:	NEO Silmet	

QC BATCH REPORT

Batch ID: **HG180712-1-1** Instrument ID **CETAC7500** Method: **SW7470**

LCS Sample ID: **HG180712-1** Units: **MG/L** Analysis Date: **7/13/2018 09:12**

Client ID: Run ID: **HG180713-1A1** Prep Date: **7/12/2018** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
MERCURY	0.00104	0.0002	0.001		104	80-120				20	

MB Sample ID: **HG180712-1** Units: **MG/L** Analysis Date: **7/13/2018 09:10**

Client ID: Run ID: **HG180713-1A1** Prep Date: **7/12/2018** DF: **1**

Analyte	Result	ReportLimit	Qual
MERCURY	ND	0.0002	

The following samples were analyzed in this batch:

1806204-16	1806204-17	1806204-18
1806204-19	1806204-20	1806204-21
1806204-22	1806204-23	1806204-24
1806204-25	1806204-26	1806204-27
1806204-28	1806204-29	1806204-30

Client: Neo Performance Materials Silmet OÜ
Work Order: 1806204
Project: NEO Silmet

QC BATCH REPORT

Batch ID: **HG180712-3-1** Instrument ID **CETAC7500** Method: **SW7471**

LCS Sample ID: **HG180712-3** Units: **MG/KG** Analysis Date: **7/13/2018 11:19**

Client ID: Run ID: **HG180713-2A1** Prep Date: **7/12/2018** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
MERCURY	0.18	0.0333	0.167		108	80-120				20	

MB Sample ID: **HG180712-3** Units: **MG/KG** Analysis Date: **7/13/2018 11:17**

Client ID: Run ID: **HG180713-2A1** Prep Date: **7/12/2018** DF: **1**

Analyte	Result	ReportLimit	Qual
MERCURY	ND	0.033	

The following samples were analyzed in this batch:

1806204-1	1806204-2	1806204-3
1806204-4	1806204-5	1806204-6
1806204-7	1806204-8	1806204-9
1806204-10	1806204-11	1806204-12
1806204-13	1806204-14	1806204-15

Client: Neo Performance Materials Silmet OÜ
Work Order: 1806204
Project: NEO Silmet

QC BATCH REPORT

Batch ID: **IP180711-11-1** Instrument ID **ICP6500** Method: **SW6010**

LCS Sample ID: **IP180711-11** Units: **MG/L** Analysis Date: **7/12/2018 13:45**
Client ID: Run ID: **IP180712-1A1** Prep Date: **7/11/2018** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ARSENIC	0.981	0.01	1		98	80-120				20	
BARIUM	1.02	0.1	1		102	80-120				20	
CADMIUM	0.0524	0.005	0.05		105	80-120				20	
CHROMIUM	0.204	0.01	0.2		102	80-120				20	
LEAD	0.535	0.004	0.5		107	80-120				20	
SELENIUM	1.97	0.006	2		98	80-120				20	
SILVER	0.0983	0.01	0.1		98	80-120				20	

MB Sample ID: **EX180710-4** Units: **MG/L** Analysis Date: **7/12/2018 13:39**
Client ID: Run ID: **IP180712-1A1** Prep Date: **7/11/2018** DF: **1**

Analyte	Result	ReportLimit	Qual
ARSENIC	ND	0.01	
BARIUM	ND	0.1	
CADMIUM	ND	0.005	
CHROMIUM	ND	0.01	
LEAD	ND	0.004	
SELENIUM	ND	0.006	
SILVER	ND	0.01	

MS Sample ID: **1806204-16** Units: **MG/L** Analysis Date: **7/12/2018 14:03**
Client ID: **LOT 20** Run ID: **IP180712-1A1** Prep Date: **7/11/2018** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ARSENIC	1	0.01	1	0.01	100	80-120				20	
BARIUM	1.02	0.1	1	0.1	102	80-120				20	
CADMIUM	0.0694	0.005	0.05	0.018	103	80-120				20	
CHROMIUM	0.268	0.01	0.2	0.059	104	80-120				20	
LEAD	0.902	0.004	0.5	0.39	103	80-120				20	
SELENIUM	1.99	0.006	2	0.006	100	80-120				20	
SILVER	0.0926	0.01	0.1	0.01	93	80-120				20	

Client:	Neo Performance Materials Silmet OÜ
Work Order:	1806204
Project:	NEO Silmet

QC BATCH REPORT

Batch ID: **IP180711-11-1** Instrument ID **ICP6500** Method: **SW6010**

MSD Sample ID: **1806204-16** Units: **MG/L** Analysis Date: **7/12/2018 14:06**

Client ID: **LOT 20** Run ID: **IP180712-1A1** Prep Date: **7/11/2018** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ARSENIC	1.01	0.01	1	0.01	101	80-120		1	1	20	
BARIUM	1 05	0.1	1	0.1	105	80-120		1.02	3	20	
CADMIUM	0 0706	0.005	0.05	0.018	105.4	80-120		0.0694	2	20	
CHROMIUM	0.271	0.01	0.2	0.059	106.1	80-120		0.268	1	20	
LEAD	0.911	0.004	0.5	0.39	104.9	80-120		0.902	1	20	
SELENIUM	2.04	0.006	2	0.006	102	80-120		1.99	2	20	
SILVER	0.0954	0.01	0.1	0.01	95	80-120		0.0926	3	20	

The following samples were analyzed in this batch:

1806204-16	1806204-17	1806204-18
1806204-19	1806204-20	1806204-21
1806204-22	1806204-23	1806204-24
1806204-25	1806204-26	1806204-27
1806204-28	1806204-29	1806204-30

Client:	Neo Performance Materials Silmet OÜ	
Work Order:	1806204	
Project:	NEO Silmet	

QC BATCH REPORT

Batch ID: **IP180716-4-1** Instrument ID **ICPMS2** Method: **SW6020**

LCS Sample ID: **IM180716-4** Units: **MG/KG** Analysis Date: **7/21/2018 17:06**

Client ID: Run ID: **IM180721-10A2** Prep Date: **7/16/2018** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ALUMINUM	423	10	500		85	80-120				20	
ARSENIC	8.86	0.2	10		89	80-120				20	
BARIUM	9.72	0.5	10		97	80-120				20	
BERYLLIUM	4.44	0.05	5		89	80-120				20	
CADMIUM	2.89	0.2	3		96	80-120				20	
CALCIUM	883	100	1000		88	80-120				20	
CHROMIUM	46.4	1	50		93	80-120				20	
COBALT	9.57	0.5	10		96	80-120				20	
COPPER	93.4	2	100		93	80-120				20	
IRON	483	10	500		97	80-120				20	
MAGNESIUM	902	10	1000		90	80-120				20	
MANGANESE	9.43	0.5	10		94	80-120				20	
MOLYBDENUM	9.36	0.2	10		94	80-120				20	
NICKEL	47.3	2	50		95	80-120				20	
POTASSIUM	448	100	500		90	80-120				20	
SELENIUM	9.23	1	10		92	80-120				20	
SILVER	0.993	0.05	1		99	80-120				20	
SODIUM	906	100	1000		91	80-120				20	
THALLIUM	0.194	0.01	0.2		97	80-120				20	
TIN	46.1	1	50		92	80-120				20	
VANADIUM	8.95	0.5	10		89	80-120				20	
ZINC	188	10	200		94	80-120				20	

Client:	Neo Performance Materials Silmet OÜ	
Work Order:	1806204	
Project:	NEO Silmet	

QC BATCH REPORT

Batch ID: **IP180716-4-1** Instrument ID **ICPMS2** Method: **SW6020**

LCSD Sample ID: **IM180716-4** Units: **MG/KG** Analysis Date: **7/21/2018 17:09**

Client ID: Run ID: **IM180721-10A2** Prep Date: **7/16/2018** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
ALUMINUM	430	10	500		86	80-120		423	2	20	
ARSENIC	9.03	0.2	10		90	80-120		8.86	2	20	
BARIUM	9.76	0.5	10		98	80-120		9.72	0	20	
BERYLLIUM	4.56	0.05	5		91	80-120		4.44	2	20	
CADMIUM	3	0.2	3		100	80-120		2.89	4	20	
CALCIUM	940	100	1000		94	80-120		883	6	20	
CHROMIUM	47.5	1	50		95	80-120		46.4	2	20	
COBALT	9.75	0.5	10		97	80-120		9.57	2	20	
COPPER	95.6	2	100		96	80-120		93.4	2	20	
IRON	485	10	500		97	80-120		483	1	20	
MAGNESIUM	921	10	1000		92	80-120		902	2	20	
MANGANESE	9.77	0.5	10		98	80-120		9.43	4	20	
MOLYBDENUM	9.62	0.2	10		96	80-120		9.36	3	20	
NICKEL	47.8	2	50		96	80-120		47.3	1	20	
POTASSIUM	461	100	500		92	80-120		448	3	20	
SELENIUM	9.75	1	10		98	80-120		9.23	5	20	
SILVER	0.993	0.05	1		99	80-120		0.993	0	20	
SODIUM	931	100	1000		93	80-120		906	3	20	
THALLIUM	0.197	0.01	0.2		99	80-120		0.194	2	20	
TIN	46.6	1	50		93	80-120		46.1	1	20	
VANADIUM	9.15	0.5	10		92	80-120		8.95	2	20	
ZINC	193	10	200		96	80-120		188	2	20	

Client: Neo Performance Materials Silmet OÜ
Work Order: 1806204
Project: NEO Silmet

QC BATCH REPORT

Batch ID: **IP180716-4-1** Instrument ID **ICPMS2** Method: **SW6020**

MB Sample ID: **IP180716-4** Units: **MG/KG** Analysis Date: **7/21/2018 17:03**

Client ID: Run ID: **IM180721-10A2** Prep Date: **7/16/2018** DF: **10**

Analyte	Result	ReportLimit	Qual
ALUMINUM	ND	10	
ARSENIC	ND	0.2	
BARIUM	ND	0.5	
BERYLLIUM	ND	0.05	
CADMIUM	ND	0.2	
CALCIUM	ND	100	
CHROMIUM	ND	1	
COBALT	ND	0.5	
COPPER	ND	2	
IRON	ND	10	
MAGNESIUM	ND	10	
MANGANESE	ND	0.5	
MOLYBDENUM	ND	0.2	
NICKEL	ND	2	
POTASSIUM	ND	100	
SELENIUM	ND	1	
SILVER	ND	0.05	
SODIUM	ND	100	
THALLIUM	ND	0.01	
TIN	ND	1	
VANADIUM	ND	0.5	
ZINC	ND	10	

The following samples were analyzed in this batch:

1806204-1	1806204-2	1806204-3
1806204-4	1806204-5	1806204-6
1806204-7	1806204-8	1806204-9
1806204-10	1806204-11	1806204-12
1806204-13	1806204-14	1806204-15

Client: Neo Performance Materials Silmet OÜ
Work Order: 1806204
Project: NEO Silmet

QC BATCH REPORT

Batch ID: **IP180716-4-1** Instrument ID **ICPMS2** Method: **SW6020**

LCS Sample ID: **IM180716-4** Units: **MG/KG** Analysis Date: **7/22/2018 19:42**
Client ID: Run ID: **IM180722-10A2** Prep Date: **7/16/2018** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
LEAD	5.03	0.2	5		101	80-120				20	
THORIUM	0.928	0.02	1		93	80-120				20	
URANIUM	0.958	0.01	1		96	80-120				20	

LCSD Sample ID: **IM180716-4** Units: **MG/KG** Analysis Date: **7/22/2018 19:45**
Client ID: Run ID: **IM180722-10A2** Prep Date: **7/16/2018** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
LEAD	5.16	0.2	5		103	80-120		5.03	3	20	
THORIUM	0.97	0.02	1		97	80-120		0.928	4	20	
URANIUM	1.01	0.01	1		101	80-120		0.958	5	20	

MB Sample ID: **IP180716-4** Units: **MG/KG** Analysis Date: **7/22/2018 19:39**
Client ID: Run ID: **IM180722-10A2** Prep Date: **7/16/2018** DF: **10**

Analyte	Result	ReportLimit	Qual
LEAD	ND	0.2	
THORIUM	0.021	0.02	
URANIUM	0.015	0.01	

The following samples were analyzed in this batch:

1806204-1	1806204-2	1806204-3
1806204-4	1806204-5	1806204-6
1806204-7	1806204-8	1806204-9
1806204-10	1806204-11	1806204-12
1806204-13	1806204-14	1806204-15

Batch ID: **IP180716-4-1** Instrument ID **ICPMS2** Method: **SW6020**

LCS Sample ID: **IM180716-4** Units: **MG/KG** Analysis Date: **7/27/2018 11:09**
Client ID: Run ID: **IM180727-10A2** Prep Date: **7/16/2018** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
NIOBIUM	1.11	0.1	1		111	80-120				20	
TANTALUM	0.974	0.1	1		97	80-120				20	
ZIRCONIUM	1.09	0.05	1		109	80-120				20	

LCSD Sample ID: **IM180716-4** Units: **MG/KG** Analysis Date: **7/27/2018 11:11**
Client ID: Run ID: **IM180727-10A2** Prep Date: **7/16/2018** DF: **10**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
NIOBIUM	1.09	0.1	1		109	80-120		1.11	2	20	
TANTALUM	0.989	0.1	1		99	80-120		0.974	2	20	
ZIRCONIUM	1.07	0.05	1		107	80-120		1.09	2	20	

MB Sample ID: **IP180716-4** Units: **MG/KG** Analysis Date: **7/27/2018 10:44**
Client ID: Run ID: **IM180727-10A2** Prep Date: **7/16/2018** DF: **10**

Analyte	Result	ReportLimit	Qual
NIOBIUM	ND	0.1	
TANTALUM	ND	0.1	
ZIRCONIUM	ND	0.05	

The following samples were analyzed in this batch:

1806204-1	1806204-2	1806204-3
1806204-4	1806204-5	1806204-6
1806204-7	1806204-8	1806204-9
1806204-10	1806204-11	1806204-12
1806204-13	1806204-14	1806204-15

Client: Neo Performance Materials Silmet OÜ
Work Order: 1806204
Project: NEO Silmet

QC BATCH REPORT

Batch ID: **IC180618-1-1** Instrument ID **IC3** Method: **EPA300.0**

LCS Sample ID: **IC180618-1** Units: **MG/KG** Analysis Date: **6/19/2018 02:45**
Client ID: Run ID: **IC180618-1A1** Prep Date: **6/18/2018** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
FLUORIDE	20.4	1	20		102	85-115				30	
CHLORIDE	51.4	2	50		103	85-115				30	
SULFATE	202	10	200		101	85-115				30	

LCSD Sample ID: **IC180618-1** Units: **MG/KG** Analysis Date: **6/19/2018 03:00**
Client ID: Run ID: **IC180618-1A1** Prep Date: **6/18/2018** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
FLUORIDE	20.3	1	20		102	85-115		20.4	0	30	
CHLORIDE	50.6	2	50		101	85-115		51.4	2	30	
SULFATE	202	10	200		101	85-115		202	0	30	

MB Sample ID: **IC180618-1** Units: **MG/KG** Analysis Date: **6/19/2018 02:31**
Client ID: Run ID: **IC180618-1A1** Prep Date: **6/18/2018** DF: **1**

Analyte	Result	ReportLimit	Qual
FLUORIDE	ND	1	
CHLORIDE	ND	2	
SULFATE	ND	10	

The following samples were analyzed in this batch:

1806204-1	1806204-2	1806204-3
1806204-4	1806204-5	1806204-6
1806204-7	1806204-8	1806204-9
1806204-10	1806204-11	1806204-12
1806204-13	1806204-14	1806204-15

Client:	Neo Performance Materials Silmet OÜ	
Work Order:	1806204	
Project:	NEO Silmet	

QC BATCH REPORT

Batch ID: **NH180707-2-1** Instrument ID **Lachat** Method: **EPA350.1**

LCS Sample ID: **NH180707-2** Units: **MG/KG** Analysis Date: **7/7/2018 13:28**

Client ID: Run ID: **NH180707-2A1** Prep Date: **7/7/2018** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
AMMONIA AS N	11.2	1	10		112	85-115				20	

LCSD Sample ID: **NH180707-2** Units: **MG/KG** Analysis Date: **7/7/2018 13:29**

Client ID: Run ID: **NH180707-2A1** Prep Date: **7/7/2018** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
AMMONIA AS N	11.2	1	10		112	85-115		11.2	0	20	

MB Sample ID: **NH180707-2** Units: **MG/KG** Analysis Date: **7/7/2018 13:27**

Client ID: Run ID: **NH180707-2A1** Prep Date: **7/7/2018** DF: **1**

Analyte	Result	ReportLimit	Qual
AMMONIA AS N	ND	1	

The following samples were analyzed in this batch:

1806204-1	1806204-2	1806204-3
1806204-4	1806204-5	1806204-6
1806204-7	1806204-8	1806204-9
1806204-10	1806204-11	1806204-12
1806204-13	1806204-14	1806204-15

Client: Neo Performance Materials Silmet OÜ
Work Order: 1806204
Project: NEO Silmet

QC BATCH REPORT

Batch ID: **NN180622-3-1** Instrument ID **Lachat** Method: **EPA353.2**

LCS Sample ID: **NN180622-3** Units: **MG/KG** Analysis Date: **6/23/2018 09:16**
Client ID: Run ID: **NN180623-1A1** Prep Date: **6/22/2018** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
NITRATE/NITRITE AS N	10.3	0.1	10		103	80-120				20	

LCSD Sample ID: **NN180622-3** Units: **MG/KG** Analysis Date: **6/23/2018 09:17**
Client ID: Run ID: **NN180623-1A1** Prep Date: **6/22/2018** DF: **1**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	RPD Ref	RPD	RPD Limit	Qual
NITRATE/NITRITE AS N	10.1	0.1	10		101	80-120		10.3	2	20	

MB Sample ID: **NN180622-3** Units: **MG/KG** Analysis Date: **6/23/2018 09:16**
Client ID: Run ID: **NN180623-1A1** Prep Date: **6/22/2018** DF: **1**

Analyte	Result	ReportLimit	Qual
NITRATE/NITRITE AS N	ND	0.1	

The following samples were analyzed in this batch:

1806204-1	1806204-2	1806204-3
1806204-4	1806204-5	1806204-6
1806204-7	1806204-8	1806204-9
1806204-10	1806204-11	1806204-12
1806204-13	1806204-14	1806204-15

NCR #: 14714

Ft. Collins, Colorado

CONTROLLED
NON-CONFORMANCE REPORT

Non-Conformance

Initiated By: Steven D. White on 7/12/2018

Event Type: Laboratory Incident/Error

Event Explanation: For sample 1806204-15Dup. Thorium analysis -- Low recoveries are expected. The sample cup spilled just before it was to be poured through the filter funnel to be planchetted. The sleeve of the lab coat caught the sample cup and knocked it over spilling the sample on the counter. What remained in the cup was taken through the rest of the process, but low recoveries are expected.

Action To Prevent Reccurence: Not Applicable

Corrective Action

Corrective Action:

Department Manager Approval: John C. Petrovic

Approval Date: 7/17/2018

Corrective Action Comments: The chemical yield for this sample was below the 30% lower control limit at 10.9%. The DER was in control for the sample/duplicate at 0.39 (Th-228), 0.14 (Th-230), and 0.34 (Th-232). Narrate low yield was due to spill.

Workorders Affected

Workorder -- Procedure		Approved By	Approval Date
1806204 – ThISO	No client contact information.	PENDING	

Associated Batches

The samples were originally associated with the following Batch(es):

AS180702-8 created on 7/2/2018

All rework was completed in the following Batch(es):

Not Applicable

NCR Approval

Project Manager Approval:

Department Manager Approval:

QA Manager Approval:

Date Printed: Thursday, July 19, 2018

225 Commerce Drive Ft. Collins, Colorado 80524

Phone (970) 490-1511 Fax (970) 490-1522 www.alsglobal.com

Attachment D.1 a through f

Material generation process history and description

(see "Technological Process Description for Production of NORM Containing Residue" – attached)

Generator or Contractor Initials: ____________

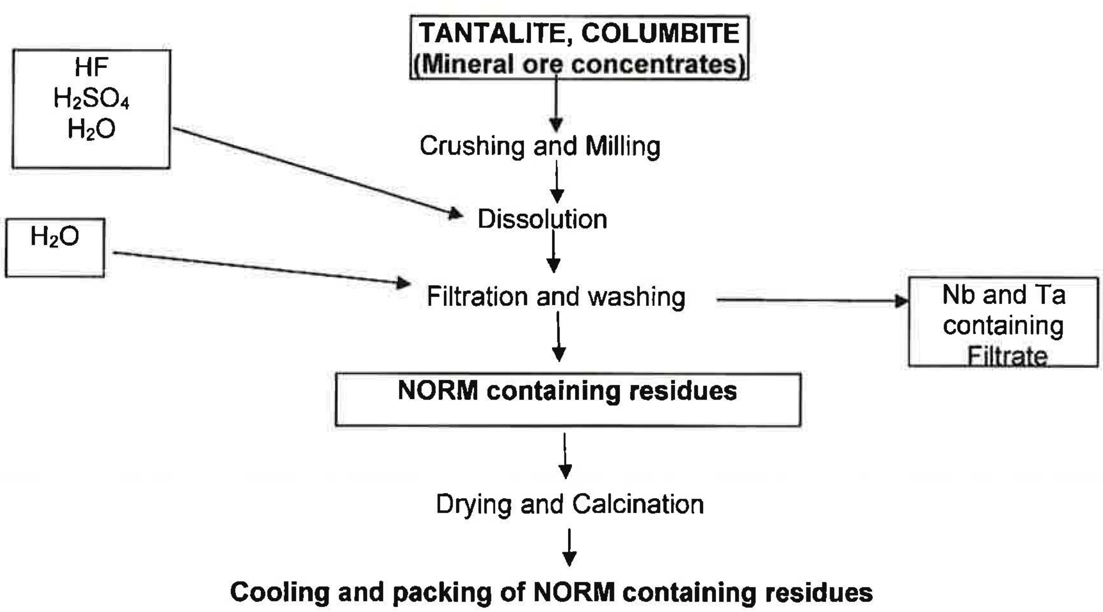
TECHNOLOGICAL PROCESS DESCRIPTION FOR PRODUCTION OF NORM CONTAINING RESIDUE

General description of the process

Columbite and tantalite - NORM (U 238 and Th 232) containing mineral ore concentrates are processed via leaching process to separate the insoluble impurities including NORM (U238 and Th232) and Nb, Ta. The process includes the following operations:

- Crushing and milling of the mineral ores Columbite and Tantalite;
- Dissolution of the mineral ores, columbite and tantalite in acid solutions (HF, H_2SO_4);
- Precipitation of insolubles from slurry and their filtration – Filter cake = NORM containing residue;
- Washing of the filter cake with water
- Filtration of the NORM containing residue
- Calcination, cooling and packing of the NORM containing residue

Figure 1. The principal flowchart of the NORM containing residue process



Raw material

Kesk 2
40231 Sillamäe, Estonia
Reg.nr. 10294959

+372 392 9100 PHONE

Raw Materials

NPM Silmet OÜ is using several types of mineral ores – Columbite and Tanatlite, which are characterized by different rare metals Nb and Ta content, but also different impurities profile included content of naturally occuring radioactive materials U 238 and Th 232 and their decay products. Typical characteristics of Columbite and Tantalite are in Table 1.
Columbite and Tantalite are dark coarse mineral materials, what will be crushed and milled by vibrating mills. Raw materials are transported to NPM Silmet OÜ in 50 kg plastic bags or 200 liter metal drums.

Table 1

	Element	Columbite	Tantalite
1	Ta_2O_5, %	4	30
2	Nb_2O_5, %	40	20
3	ThO_2, %	0,5	0,2
4	U_2O_3, %	0,1	0,2
5	LOD, %	0,1	0,1

Crushing and milling of raw material

Columbite and tantalite are crushed and milled in isolated area - milling unit, because of the formation of the radioactive dust, which is the must hazardous factor of the entire process. Raw materials are loaded by hermetic feeder screws into vibrating mills, where material is milled until to required particle size, removed from mills by hermetical discharge systems and packed into metal drums. Milling unit has isolated ventilation system with filter systems, dust particles from the filtered air is removed by cyclons and recycled in the process with raw material.

Dissolution of raw material and filtration of the solutions.

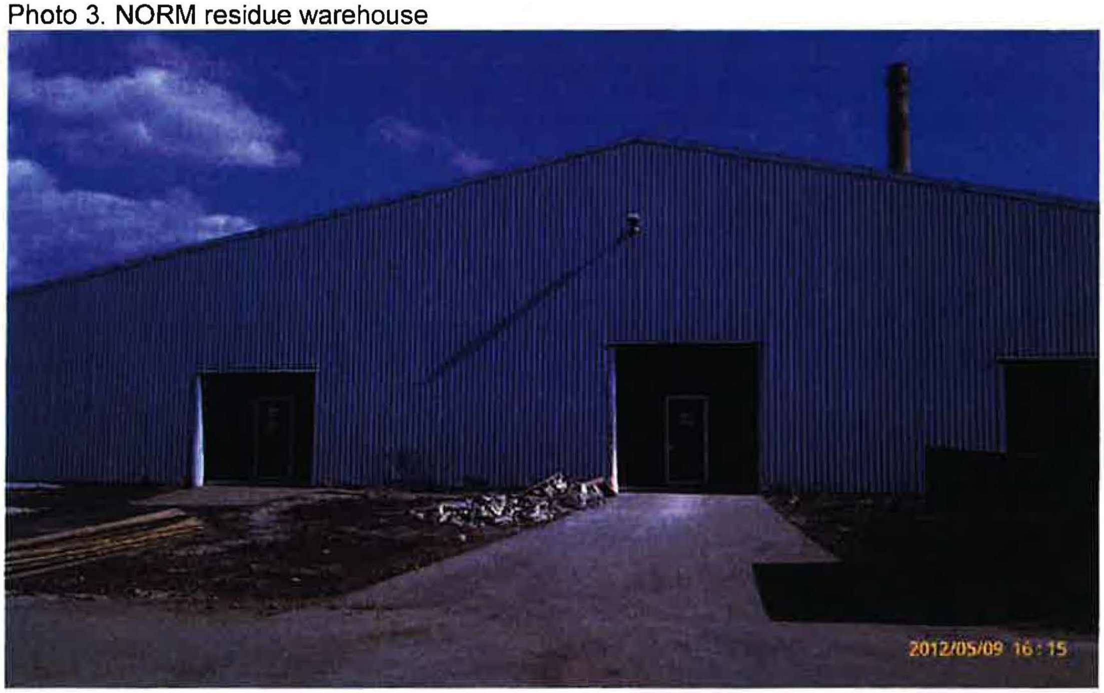
Milled columbite and tantalite is transported into dissolution unit (located in the same territory, but separate building). Drums with the milled columbite and tantalite are placed on the top of automatic feeder systems, where material is loaded into dissolution reactors into hydrofluoric acid solution. Raw material is dissolved at temperature 80-85°C in hydrofluoric acid and sulphuric acid is added to precipitate out the impurities. The slurry is filtrated to remove the insoluble impurities including U and Th. After filtration the filtercake is washed with water several times to remove all Nb and Ta from the cake. Wet NORM containing cake is packed into 1Mt plastic bags (Big-bags) and transported into calcination unit (locating in the same building).

Calcination of the NORM containing cake

NORM containing cake (NORM Residue) is loaded from big-bags into electric rotary kilns via feeder systems, and calcined at temperature 550-600 °C 1 hour. Calcined NORM residue is moving from rotary kiln into rotary coolers where material is cooled down and packed into 200 l metal drums what is insulated with triple wall PE bags. Quality Control Department with Governmental Lab Ökosil AS, are taking samples from every drum for gamma spectrometry analyze and all drums are measured for dose speed. The LOT is completed from 9 drums and transported into warehouse, photos 1,2,3.

Photos 1, 2: Packed NORM residues.

Photo 3. NORM residue warehouse



Jane paju
Director of Technology
NPM Silmet OÜ

Attachment D.2

Analytical data (including all pertinent Quality Control Data) for all yes answers

(see Attachment C.1 - ALS lab analysis results)

Generator or Contractor Initials: ________________

Attachment D.3

Analytical Data (including all pertinent Quality Control Data) for total and TCLP metals and anions

(see Attachment C.1 - ALS lab analysis results)

Generator or Contractor Initials: ____________________

AFFIDAVIT
OF
SIGNE KASK

REPUBLIC OF ESTONIA
COUNTY OF IDA-VIRU
CITY OF SILLAMÄE

I, **Signe Kask**, being duly sworn, depose and state as follows:

1. I am presently Managing Director of NPM Silmet OU ("**Silmet**"). In this capacity I am responsible for managing the business and operations at Silmet's manufacturing facility located in Sillamae, Estonia (the "**Facility**"), including its environmental compliance programs. I am familiar with the operation of Facility equipment and systems, and the implementation and oversight of decommissioning activities and related, including waste management. I have personal knowledge of the raw materials used, the production processes employed, and the waste handling procedures followed at the Facility.

2. Silmet proposes to ship to the White Mesa Mill in Blanding, Utah (which is owned by EFR White Mesa LLC, a Colorado limited liability company ("**White Mesa**"), and operated by an affiliate of White Mesa, Energy Fuels Resources (USA) Inc., a Delaware corporation), the following materials for processing as alternate feed materials: uranium and thorium-containing residues ("**Residue**"). The proposed alternate feed material is calcined residue resulting from the processing of columbite and tantalite mineral ore concentrates at the Facility and contains no RCRA-listed or hazardous materials or wastes from any other source.

3. The Residue consists of precipitated radionuclides removed from the columbite and tantalite solutions during the purification process conducted at the Facility. The Residue contains uranium, thorium, and other radionuclide impurities precipitated as a slurry. The slurry was passed through a filter press, and the filter cake washed with water. The washed filter cake was subsequently calcined in a rotary kiln, cooled, and drummed. The calcined, drummed Residue is to be shipped to the White Mesa Mill.

4. I have reviewed and am familiar with the Utah Hazardous and Solid Waste Regulations R315-2-10 and R315-2-11 and the United States Code of Federal Regulations Title 40 Sections 261.31 through 33 (the "**Regulations**"). Based on the processing steps employed at the Facility, the proposed alternate feed materials do not contain any of the listed wastes enumerated in the Regulations.

5. Based on my knowledge of waste management at the Facility, the proposed alternate feed materials have not been mixed with wastes from any other source that may have been defined as or that may have contained listed wastes enumerated in the Regulations.

6. The proposed alternate feed materials:

   a. do not contain hazardous wastes from non-specific sources (Utah RCRA F type wastes) because Silmet: (i) does not operate any processes that produce the types of wastes listed in Section 261.31 of Title 40 of the Regulations, and (ii) has never accepted, nor have the proposed alternate feed materials ever been combined with, wastes from any other source that contain Utah RCRA F type wastes as defined therein;

   b. do not contain hazardous wastes from non-specific sources (Utah RCRA K type wastes) because Silmet: (i) does not operate any processes that produce the types of wastes listed in Section 261.32 of Title 40 of the Regulations, and (ii) has never accepted, nor have the proposed alternate feed materials ever been combined with, wastes from any other source that contain Utah RCRA K type wastes as defined herein; and

   c. are not Utah RCRA P or U type wastes because (i) they are not manufactured or formulated commercially pure grade chemicals, off-specification commercial chemical products, or manufacturing chemical intermediates, are not residues from containers that held commercial chemical products or manufacturing chemical intermediates, and are not residue or contaminated soil, water, or other debris from a spill cleanup, and (ii) Silmet has never accepted, nor have the proposed alternate feed materials ever been combined with, wastes from any other source that contain Utah RCRA P or U type wastes as defined herein.

In witness whereof, I have set my hand on the 29 day of january, 2019.

Signe Kask

Registration number **108** in the Notary Journal of official acts.

In the town of Sillamäe on the twenty-ninth (29th) of January (01) in the year two thousand and nineteen (2019).

I, the undersigned Sillamäe notary Irina Kritsuk, whose office is located at 22 Kesk str., Sillamäe, Ida-Viru county, the Republic of Estonia, do hereby certify the authenticity of the signature made in my presence by **SIGNE KASK,** personal code 47107300281, residing at Tutermaa, Harku parish, Harju county, the Republic of Estonia, who was identified by her identity card AA1392759.

Upon certifying the authenticity of signatures, the notary did not verify the facts stated by the applicant in the document.

Notary fee (§ 31 part 12 of Notary Fees Law)	12,75 euros,
VAT 20%	2,55 euros,
Total	15,30 euros.

SILLAMÄE NOTAR IRINA KRITSUK

ATTACHMENT 3
EFRI/UDEQ Protocol for Determining Whether Alternate Feed Materials Are RCRA Listed hazardous Waste

State of Utah
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF SOLID AND HAZARDOUS WASTE

Michael O. Leavitt
Governor
Dianne R. Nielson, Ph.D.
Executive Director
Dennis R. Downs
Director

288 North 1460 West
P.O. Box 144880
Salt Lake City, Utah 84114-4880
(801) 538-6170
(801) 538-6715 Fax
(801) 536-4414 T.D.D.
www.deq.state.ut.us Web

December 7, 1999

M. Lindsay Ford
Parsons, Behle and Latimer
One Utah Center
201 South Main Street
Suite 1800
Post Office Box 45898
Salt Lake City, Utah 84145-0898

RE: Protocol for Determining Whether Alternate Feed Materials are Listed Hazardous Wastes

Dear Mr. Ford:

On November 22, 1999, we received the final protocol to be used by International Uranium Corporation (IUSA) in determining whether alternate feed materials proposed for processing at the White Mesa Mill are listed hazardous wastes. We appreciate the effort that went into preparing this procedure and feel that it will be a useful guide for IUSA in its alternate feed determinations.

As was discussed, please be advised that it is IUSA's responsibility to ensure that the alternate feed materials used are not listed hazardous wastes and that the use of this protocol cannot be used as a defense if listed hazardous waste is somehow processed at the White Mesa Mill.

Thank you again for your corporation. If you have any questions, please contact Don Verbica at 538-6170.

Sincerely,

Dennis R. Downs, Executive Secretary
Utah Solid and Hazardous Waste Control Board

c: Bill Sinclair, Utah Division of Radiation Control

F:\SHW\HWB\DVERBICA\WP\whitemesa.wpd

Parsons
Behle &
Latimer

A Professional
Law Corporation

One Utah Center
201 South Main Street
Suite 1800
Post Office Box 45898
Salt Lake City, Utah
84145-0898
Telephone 801 532-1234
Facsimile 801 536-6111

November 22, 1999

Don Verbica
Utah Division of Solid & Hazardous Waste
288 North 1460 West
Salt Lake City, Utah

Re: Protocol for Determining Whether Alternate Feed Materials are Listed Hazardous Wastes

Dear Don:

I am pleased to present the final protocol to be used by International Uranium (USA) Corporation ("IUSA") in determining whether alternate feed materials proposed for processing at the White Mesa Mill are listed hazardous wastes. Also attached is a red-lined version of the protocol reflecting final changes made to the document based on our last discussion with you as well as some minor editorial changes from our final read-through of the document. We appreciate the thoughtful input of you and Scott Anderson in developing this protocol. We understand the Division concurs that materials determined not to be listed wastes pursuant to this protocol are not listed hazardous wastes.

We also recognize the protocol does not address the situation where, after a material has been determined not to be a listed hazardous waste under the protocol, new unrefutable information comes to light that indicates the material is a listed hazardous waste. Should such an eventuality arise, we understand an appropriate response, if any, would need to be worked out on a case-by-case basis.

Thank you again for your cooperation on this matter. Please call me if you have any questions.

Very truly yours,

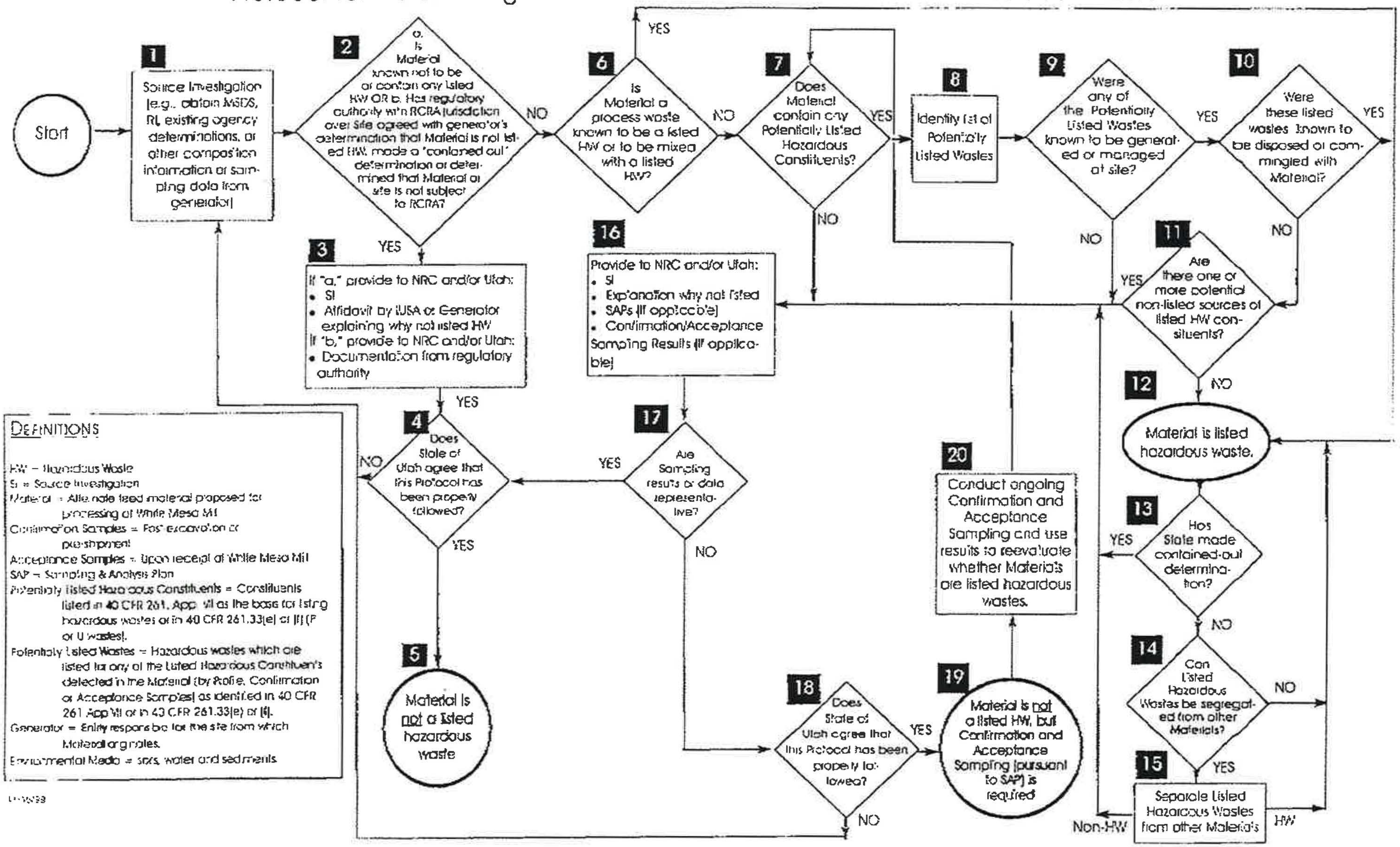
Parsons Behle & Latimer

Lindsay Ford

M. Lindsay Ford

cc: (with copy of final protocol only)
Dianne Nielson
Fred Nelson
Brent Bradford
Don Ostler
Loren Morton
Bill Sinclair
David Frydenlund
David Bird
Tony Thompson

Protocol for Determining if Alternate Feed Material is a Listed Hazardous Waste



DEFINITIONS

HW = Hazardous Waste
SI = Source Investigation
Material = Alternate feed material proposed for processing at White Mesa Mill
Confirmation Samples = Post excavation or preshipment
Acceptance Samples = Upon receipt at White Mesa Mill
SAP = Sampling & Analysis Plan
Potentially Listed Hazardous Constituents = Constituents listed in 40 CFR 261, App. VII as the basis for listing hazardous wastes or in 40 CFR 261.33(e) or (f) (P or U wastes).
Potentially Listed Wastes = Hazardous wastes which are listed for any of the Listed Hazardous Constituents detected in the Material (by Profile, Confirmation or Acceptance Samples) as identified in 40 CFR 261 App VII or in 40 CFR 261.33(e) or (f).
Generator = Entity responsible for the site from which Material originates.
Environmental Media = soils, water and sediments

1-1-99

Protocol for Determining Whether Alternate Feed Materials Are Listed Hazardous Wastes[1]

November 16, 1999

1. SOURCE INVESTIGATION.

Perform a good faith investigation (a "Source Investigation" or "SI")[2] regarding whether any listed hazardous wastes[3] are located at the site from which alternate feed material[4] ("Material") originates (the "Site"). This investigation will be conducted in conformance with EPA guidance[5] and the extent of information required will vary with the circumstances of each case. Following are examples of investigations that would be considered satisfactory under EPA guidance and this Protocol for some selected situations:

- Where the Material is or has been generated from a known process under the control of the generator: (a) an affidavit, certificate, profile record or similar document from the Generator or Site Manager, to that effect, together with (b) a Material Safety Data Sheet ("MSDS") for the Material, limited profile sampling, or a material composition determined by the generator/operator based on a process material balance.

---

1 This Protocol reflects the procedures that will be followed by International Uranium (USA) Corporation ("IUSA") for determining whether alternate feed materials proposed for processing at the White Mesa Mill are (or contain) listed hazardous wastes. It is based on current Utah and EPA rules and EPA guidance under the Resource Conservation and Recovery Act ("RCRA"), 42 U.S.C. §§ 6901 et seq. This Protocol will be changed as necessary to reflect any pertinent changes to RCRA rules or EPA guidance.

2 This investigation will be performed by IUSA, by the entity responsible for the site from which the Material originates (the "Generator"), or by a combination of the two.

3 Attachment 1 to this Protocol provides a summary of the different classifications of RCRA listed hazardous wastes.

4 Alternate feed materials that are primary or intermediate products of the generator of the material (*e.g.*, "green" or "black" salts) are not RCRA "secondary materials" or "solid wastes," as defined in 40 CFR 261, and are not covered by this Protocol.

5 EPA guidance identifies the following sources of site- and waste-specific information that may, depending on the circumstances, be considered in such an investigation: hazardous waste manifests, vouchers, bills of lading, sales and inventory records, material safety data sheets, storage records, sampling and analysis reports, accident reports, site investigation reports, interviews with employees/former employees and former owners/operators, spill reports, inspection reports and logs, permits, and enforcement orders. *See e.g.*, 61 Fed. Reg. 18805 (April 29, 1996).

- Where specific information exists about the generation process and management of the Material: (a) an affidavit, certificate, profile record or similar document from the Generator or Site Manager, to that effect, together with (b) an MSDS for the Material, limited profile sampling data or a preexisting investigation performed at the Site pursuant to CERCLA, RCRA or other state or federal environmental laws or programs.
- Where potentially listed processes are known to have been conducted at a Site, an investigation considering the following sources of information: site investigation reports prepared under CERCLA, RCRA or other state or federal environmental laws or programs (*e.g.*, an RI/FS, ROD, RFI/CMS, hazardous waste inspection report); interviews with persons possessing knowledge about the Material and/or Site; and review of publicly available documents concerning process activities or the history of waste generation and management at the Site.
- If material from the same source is being or has been accepted for direct disposal as 11e.(2) byproduct material in an NRC-regulated facility in the State of Utah with the consent or acquiescence of the State of Utah, the Source Investigation performed by such facility.

Proceed to Step 2.

2. SPECIFIC INFORMATION OR AGREEMENT/DETERMINATION BY RCRA REGULATORY AUTHORITY THAT MATERIAL IS <u>NOT</u> A LISTED HAZARDOUS WASTE?

a. Determine whether specific information from the Source Investigation exists about the generation and management of the Material to support a conclusion that the Material is not (and does not contain) any listed hazardous waste. For example, if specific information exists that the Material was not generated by a listed waste source and that the Material has not been mixed with any listed wastes, the Material would not be a listed hazardous waste.

b. Alternatively, determine whether the appropriate state or federal authority with RCRA jurisdiction over the Site agrees in writing with the generator's determination that the Material is not a listed hazardous waste, has made a "contained-out" determination[6] with respect to the Material or has concluded the Material or Site is not subject to RCRA.

---

[6] EPA explains the "contained-out" (also referred to as "contained-in") principle as follows:

> In practice, EPA has applied the contained-in principle to refer to a process where a site-specific determination is made that concentrations of hazardous constituents in any given

(footnote continued on next page)

If yes to either question, proceed to Step 3.

If no to both questions, proceed to Step 6.

3. PROVIDE INFORMATION TO NRC AND UTAH.

a. If specific information exists to support a conclusion that the Material is not, and does not contain, any listed hazardous waste, IUSA will provide a description of the Source Investigation to NRC and/or the State of Utah Department of Environmental Quality, Division of Solid and Hazardous Waste (the "State"), together with an affidavit explaining why the Material is not a listed hazardous waste.

b. Alternatively, if the appropriate regulatory authority with RCRA jurisdiction over the Site agrees in writing with the generator's determination that the Material is not a listed hazardous waste, makes a contained-out determination or determines the Material or Site is not subject to RCRA, IUSA will provide documentation of the regulatory authority's determination to NRC and the State. IUSA may rely on such determination provided that the State agrees the conclusions of the regulatory authority were reasonable and made in good faith.

Proceed to Step 4.

4. DOES STATE OF UTAH AGREE THAT ALL PREVIOUS STEPS HAVE BEEN PERFORMED IN ACCORDANCE WITH THIS PROTOCOL?

Determine whether the State agrees that this Protocol has been properly followed (including that proper decisions were made at each decision point). The State shall review the information provided by IUSA in Step 3 or 16 with reasonable speed and advise IUSA if it believes IUSA has not properly followed this Protocol in determining

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(footnote continued from previous page)

> volume of environmental media are low enough to determine that the media does not "contain" hazardous waste. Typically, these so-called "contained-in" [or "contained-out"] determinations do not mean that no hazardous constituents are present in environmental media but simply that the concentrations of hazardous constituents present do not warrant management of the media as hazardous waste. ...
>
> EPA has not, to date, issued definitive guidance to establish the concentrations at which contained-in determinations may be made. As noted above, decisions that media do not or no longer contain hazardous waste are typically made on a case-by-case basis considering the risks posed by the contaminated media.

63 Fed. Reg. 28619, 28621-22 (May 26, 1998) (Phase IV LDR preamble).

that the Material is not listed hazardous waste, specifying the particular areas of deficiency.

If this Protocol has not been properly followed by IUSA in making its determination that the Material is not a listed hazardous waste, then IUSA shall redo its analysis in accordance with this Protocol and, if justified, resubmit the information described in Step 3 or 16 explaining why the Material is not a listed hazardous waste. The State shall notify IUSA with reasonable speed if the State still believes this Protocol has not been followed.

If yes, proceed to Step 5.

If no, proceed to Step 1.

5. MATERIAL IS NOT A LISTED HAZARDOUS WASTE.

The Material is not a listed hazardous waste and no further sampling or evaluation is necessary in the following circumstances:

- Where the Material is determined not to be a listed hazardous waste based on specific information about the generation/management of the Material OR the appropriate RCRA regulatory authority with jurisdiction over the Site agrees with the generator's determination that the Material is not a listed HW, makes a contained-out determination, or concludes the Material or Site is not subject to RCRA (and the State agrees the conclusions of the regulatory authority were reasonable and made in good faith) (Step 2); or
- Where the Material is determined not to be a listed hazardous waste (in Steps 6 through 11, 13 or 15) and Confirmation/Acceptance Sampling are determined not to be necessary (under Step 17).

6. IS MATERIAL A PROCESS WASTE KNOWN TO BE A LISTED HAZARDOUS WASTE OR TO BE MIXED WITH A LISTED HAZARDOUS WASTE?

Based on the Source Investigation, determine whether the Material is a process waste known to be a listed hazardous waste or to be mixed with a listed hazardous waste. If the Material is a process waste and is from a listed hazardous waste source, it is a listed hazardous waste. Similarly, if the Material is a process waste and has been mixed with a listed hazardous waste, it is a listed hazardous waste under the RCRA "mixture rule." If the Material is an Environmental Medium,[7] it cannot be a listed hazardous waste by direct listing or under the RCRA "mixture rule."[8] If the Material is a process waste but is not known to be from a listed source or to be mixed with a listed waste, or if the Material is an Environmental Medium, proceed to Steps 7 through 11 to determine whether it is a listed hazardous waste.

If yes, proceed to Step 12.

If no, proceed to Step 7.

7. DOES MATERIAL CONTAIN ANY POTENTIALLY LISTED HAZARDOUS CONSTITUENTS?

Based on the Source Investigation (and, if applicable, Confirmation and Acceptance Sampling), determine whether the Material contains any hazardous constituents listed in the then most recent version of 40 CFR 261, Appendix VII (which identifies hazardous constituents for which F- and K-listed wastes were listed) or 40 CFR 261.33(e) or (f) (the P and U listed wastes) (collectively "Potentially Listed Hazardous Constituents"). If the Material contains such constituents, a source evaluation is necessary (pursuant to Steps 8 through 11). If the Material does not contain any Potentially Listed Hazardous Constituents, it is not a listed hazardous waste. The Material also is not a listed hazardous waste if, where applicable, Confirmation and Acceptance Sampling results do not reveal the presence of any "new" Potentially Listed Hazardous Constituents (*i.e.*, constituents other than those that have already been identified by the Source Investigation (or previous Confirmation/Acceptance Sampling) and determined not to originate from a listed source).

If yes, proceed to Step 8.

If no, proceed to Step 16.

8. IDENTIFY POTENTIALLY LISTED WASTES.

Identify potentially listed hazardous wastes ("Potentially Listed Wastes") based on Potentially Listed Hazardous Constituents detected in the Material, *i.e.*, wastes which are listed for any of the Potentially Listed Hazardous Constituents detected in the Material, as

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7 The term "Environmental Media" means soils, ground or surface water and sediments.

8 The "mixture rule" applies only to mixtures of listed hazardous wastes and other "solid wastes." *See* 40 CFR § 261.3(a)(2)(iv). The mixture rule does not apply to mixtures of listed wastes and Environmental Media, because Environmental Media are not "solid wastes" under RCRA. *See* 63 Fed. Reg. 28556, 28621 (May 26, 1998).

identified in the then most current version of 40 CFR 261 Appendix VII or 40 CFR 261.33(c) or (f).[9] With respect to Potentially Listed Hazardous Constituents identified through Confirmation and/or Acceptance Sampling, a source evaluation (pursuant to Steps 8 through 11) is necessary only for "new" Potentially Listed Hazardous Constituents (*i.e.*, constituents other than those that have already been identified by the Source Investigation (or previous Confirmation/Acceptance Sampling) and determined not to originate from a listed source).

Proceed to Step 9.

9. WERE ANY OF THE POTENTIALLY LISTED WASTES KNOWN TO BE GENERATED OR MANAGED AT SITE?

Based on information from the Source Investigation, determine whether any of the Potentially Listed Wastes identified in Step 8 are known to have been generated or managed at the Site. This determination involves identifying whether any of the specific or non-specific sources identified in the K- or F-lists has ever been conducted or located at the Site, whether any waste from such processes has been managed at the Site, and whether any of the P- or U-listed commercial chemical products has ever been used, spilled or managed there. In particular, this determination should be based on the following EPA criteria:

Solvent Listings (F001-F005)

Under EPA guidance, "to determine if solvent constituents contaminating a waste are RCRA spent solvent F001-F005 wastes, the [site manager] must know if:

- The solvents are *spent* and *cannot be reused without reclamation* or cleaning.
- The solvents were *used exclusively for their solvent properties.*
- The solvents are spent *mixtures and blends that contained, before use, a total of 10 percent or more (by volume) of the solvents* listed in F001, F002, F004, and F005.

If the solvents contained in the [wastes] are RCRA listed wastes, the [wastes] are RCRA hazardous waste. When the [site manager] does not have guidance information on the use of the solvents and their characteristics before use, the [wastes] cannot be classified as containing a

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9 For example, if the Material contains tetrachloroethylene, the following would be Potentially Listed Wastes: F001, F002, F024, K019, K020, K150, K151 or U210. *See* 40 CFR 261 App. VII.

listed spent solvent."[10] The person performing the Source Investigation will make a good faith effort to obtain information on any solvent use at the Site. If solvents were used at the Site, general industry standards for solvent use in effect at the time of use will be considered in determining whether those solvents contained 10 percent or more of the solvents listed in F001, F002, F004 or F005.

K-Listed Wastes and F-Listed Wastes Other Than F001-F005

Under EPA guidance, to determine whether K wastes and F wastes other than F001-F005 are RCRA listed wastes, the generator "must know the *generation process information* (about each waste contained in the RCRA waste) described in the listing. For example, for [wastes] to be identified as containing K001 wastes that are described as 'bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol,' the [site manager] must know the manufacturing process that generated the wastes (treatment of wastewaters from wood preserving process), feedstocks used in the process (creosote and pentachlorophenol), and the process identification of the wastes (bottom sediment sludge)."[11]

P- and U-Listed Wastes

EPA guidance provides that "P and U wastes cover only unused and unmixed commercial chemical products, particularly spilled or off-spec products. Not every waste containing a P or U chemical is a hazardous waste. To determine whether a [waste] contains a P or U waste, the [site manager] must have direct evidence of product use. In particular, the [site manager] should ascertain, if possible, whether the chemicals are:

- Discarded (as described in 40 CFR 261.2(a)(2)).
- Either off-spec commercial products or a commercially sold grade.
- Not used (soil contaminated with spilled unused wastes is a P or U waste).

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10 Management of Investigation-Derived Wastes During Site Inspections, EPA/540/G-91/009, May 1991 (emphasis added).

11 Management of Investigation-Derived Wastes During Site Inspections, EPA/540/G-91/009, May 1991 (emphasis added).

- The sole active ingredient in a formulation."[12]

If Potentially Listed Wastes were known to be generated or managed at the Site, further evaluation is necessary to determine whether these wastes were disposed of or commingled with the Material (Steps 10 and possibly 11). If Potentially Listed Wastes were not known to be generated or managed at the Site, then information concerning the source of Potentially Listed Hazardous Constituents in the Material will be considered "unavailable or inconclusive" and, under EPA guidance,[13] the Material will be assumed not to be a listed hazardous waste.

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12 Management of Investigation-Derived Wastes During Site Inspections, EPA/540/G-91/009, May 1991.

13 EPA guidance consistently provides that, where information concerning the origin of a waste is unavailable or inconclusive, the waste may be assumed not to be a listed hazardous waste. *See e.g.*, Memorandum from Timothy Fields (Acting Assistant Administrator for Solid Waste & Emergency Response) to RCRA/CERCLA Senior Policy Managers regarding "Management of Remediation Waste Under RCRA," dated October 14, 1998 ("Where a facility owner/operator makes a good faith effort to determine if a material is a listed hazardous waste but cannot make such a determination because documentation regarding a source of contamination, contaminant, or waste is *unavailable or inconclusive*, EPA has stated that one may assume the source, contaminant, or waste is not listed hazardous waste"); NCP Preamble, 55 Fed. Reg. 8758 (March 8, 1990) (Noting that "it is often necessary to know the origin of the waste to determine whether it is a listed waste and that, *if such documentation is lacking, the lead agency may assume it is not a listed waste*); Preamble to proposed Hazardous Waste Identification Rule, 61 Fed. Reg. 18805 (April 29, 1996) ("Facility owner/operators should make a good faith effort to determine whether media were contaminated by hazardous wastes and ascertain the dates of placement. The Agency believes that by using available site- and waste-specific information ... facility owner/operators would typically be able to make these determinations. However, as discussed earlier in the preamble of today's proposal, *if information is not available or inconclusive, facility owner/operators may generally assume that the material contaminating the media were not hazardous wastes.*"); Preamble to LDR Phase IV Rule, 63 Fed. Reg. 28619 (May 26, 1998) ("As discussed in the April 29, 1996 proposal, the Agency continues to believe that, *if information is not available or inconclusive, it is generally reasonable to assume that contaminated soils do not contain untreated hazardous wastes ...*"); and Memorandum from John H. Skinner (Director, EPA Office of Solid Waste) to David Wagoner (Director, EPA Air and Waste Management Division, Region VII) regarding "Soils from Missouri Dioxin Sites," dated January 6, 1984 ("The analyses indicate the presence of a number of toxic compounds in many of the soil samples taken from various sites. However, the presence of these toxicants in the soil does not automatically make the soil a RCRA hazardous waste. The origin of the toxicants must be known in order to determine that they are derived from a listed hazardous waste(s). *If the exact origin of the toxicants is not known, the soils cannot be*
(footnote continued on next page)

If yes, proceed to Step 10.

If no, proceed to Step 16.

10. WERE LISTED WASTES KNOWN TO BE DISPOSED OF OR COMMINGLED WITH MATERIAL?

If listed wastes identified in Step 9 were known to be generated at the Site, determine whether they were known to be disposed of or commingled with the Material?

If yes, proceed to Step 12.

If no, proceed to Step 11.

11. ARE THERE ONE OR MORE POTENTIAL NON-LISTED SOURCES OF LISTED HAZARDOUS WASTE CONSTITUENTS?

In a situation where Potentially Listed Wastes were known to have been generated/managed at the Site, but the wastes were not known to have been disposed of or commingled with the Material, determine whether there are potential non-listed sources of Potentially Listed Hazardous Constituents in the Material. If not, unless the State agrees otherwise, the constituents will be assumed to be from listed sources (proceed to Step 12). If so, the Material will be assumed not to be a listed hazardous waste (proceed to Step 16). Notwithstanding the existence of potential non-listed sources at a Site, the Potentially Listed Hazardous Constituents in the Material will be considered to be from the listed source(s) if, based on the relative proximity of the Material to the listed and non-listed source(s) and/or information concerning waste management at the Site, the evidence is compelling that the listed source(s) is the source of Potentially Listed Hazardous Constituents in the Material.

If yes, proceed to Step 16.

If no, proceed to Step 12.

12. MATERIAL IS A LISTED HAZARDOUS WASTE.

The Material is a listed hazardous waste under the following circumstances:

(footnote continued from previous page)

considered RCRA hazardous wastes unless they exhibit one or more of the characteristics of hazardous waste …").

- If the Material is a process waste and is known to be a listed hazardous waste or to be mixed with a listed hazardous waste (Step 6),
- If Potentially Listed Wastes were known to be generated/managed at the Site and to be disposed of/commingled with the Material (Step 10) (subject to a "contained-out" determination in Step 13), or
- If Potentially Listed Wastes were known to be generated/managed at the Site, were not known to be disposed of/commingled with the Material but there are not any potential non-listed sources of the Potentially Listed Hazardous Constituents detected in the Material (Step 11) (subject to a "contained-out" determination in Step 13).

Proceed to Step 13.

13. HAS STATE OF UTAH MADE A CONTAINED-OUT DETERMINATION.

If the Material is an Environmental Medium, and:

- the level of any listed waste constituents in the Material is "de minimis" ; or
- all of the listed waste constituents or classes thereof are already present in the White Mesa Mill's tailings ponds as a result of processing conventional ores or other alternate feed materials in concentrations at least as high as found in the Materials

the State of Utah will consider whether it is appropriate to make a contained-out determination with respect to the Material.

If the State makes a contained-out determination, proceed to Step 16.

If the State does not make a contained-out determination, proceed to Step 14.

14. IS IT POSSIBLE TO SEGREGATE LISTED HAZARDOUS WASTES FROM OTHER MATERIALS?

Determine whether there is a reasonable way to segregate material that is a listed hazardous waste from alternate feed materials that are not listed hazardous wastes that will be sent to IUSA's White Mesa Mill. For example, it may be possible to isolate material from a certain area of a remediation site and exclude that material from Materials that will be sent to the White Mesa Mill. Alternatively, it may be possible to increase sampling frequency and exclude materials with respect to which the increased sampling identifies constituents which have been attributed to listed hazardous waste.

If yes, proceed to Step 15.

If no, proceed to Step 12.

15. SEPARATE LISTED HAZARDOUS WASTES FROM MATERIALS.

Based on the method of segregation determined under Step 14, materials that are listed hazardous wastes are separated from Materials that will be sent to the White Mesa Mill.

For materials that are listed hazardous wastes, proceed to Step 12.

For Materials to be sent to the White Mesa Mill, proceed to Step 16.

16. PROVIDE INFORMATION TO NRC AND UTAH.

If the Material does not contain any Potentially Listed Hazardous Constituents (as determined in Step 7), where information concerning the source of Potentially Listed Hazardous Constituents in the Material is "unavailable or inconclusive" (as determined in Steps 8 through 11), or where the State of Utah has made a contained-out determination with respect to the Material (Step 13), the Material will be assumed not to be (or contain) a listed hazardous waste. In such circumstances, IUSA will submit the following documentation to NRC and the State:

- A description of the Source Investigation;
- An explanation of why the Material is not a listed hazardous waste.
- Where applicable, an explanation of why Confirmation/Acceptance Sampling has been determined not to be necessary in Step 17.
- If Confirmation/Acceptance Sampling has been determined necessary in Step 17 , a copy of IUSA's and the Generator's Sampling and Analysis Plans.
- A copy of Confirmation and Acceptance Sampling results, if applicable. IUSA will submit these results only if they identify the presence of "new" Potentially Listed Hazardous Constituents (as defined in Steps 7 and 8).

Proceed to Step 17.

17. ARE SAMPLING RESULTS OR DATA REPRESENTATIVE?

Determine whether the sampling results or data from the Source Investigation (or, where applicable, Confirmation/Acceptance Sampling results) are representative. The purpose of this step) is to determine whether Confirmation and Acceptance Sampling (or continued Confirmation and Acceptance Sampling) are necessary. If the sampling results or data are representative of all Material destined for the White Mesa Mill, based on the extent of sampling conducted, the nature of the Material and/or the nature of the Site (*e.g.*, whether chemical operations or waste disposal were known to be conducted at the Site), future Confirmation/Acceptance Sampling will not be necessary. If the sampling results are not representative of all Material destined for the White Mesa Mill, then additional Confirmation/Acceptance sampling may be appropriate. Confirmation and Acceptance Sampling will be required only where it is reasonable to expect that additional sampling will detect additional contaminants not already detected. For example:

- Where the Material is segregated from Environmental Media, *e.g.*, the Material is containerized, there is a high probability the sampling results or data from the Source Investigation are representative of the Material and Confirmation/Acceptance Sampling would not be required.
- Where IUSA will be accepting Material from a discrete portion of a Site, *e.g.*, a storage pile or other defined area; and adequate sampling characterized the area of concern for radioactive and chemical contaminants, the sampling for that area would be considered representative and Confirmation/Acceptance sampling would not be required.
- Where Material will be received from a wide area of a Site and the Site has been carefully characterized for radioactive contaminants, but not chemical contaminants, Confirmation/Acceptance sampling would be required.
- Where the Site was not used for industrial activity or disposal before or after uranium material disposal, and the Site has been adequately characterized for radioactive and chemical contaminants, the existing sampling would be considered sufficient and Confirmation/Acceptance sampling would not be required.
- Where listed wastes were known to be disposed of on the Site and the limits of the area where listed wastes were managed is not known, Confirmation/Acceptance sampling would be required to ensure that listed wastes are not shipped to IUSA (see Step 14).

If yes, proceed to Step 4.

If no, proceed to Step 18.

18. DOES STATE OF UTAH AGREE THAT ALL PREVIOUS STEPS HAVE BEEN PERFORMED IN ACCORDANCE WITH THIS PROTOCOL?

Determine whether the State agrees that this Protocol has been properly followed (including that proper decisions were made at each decision point). The State shall review the information provided by IUSA in Step 16 with reasonable speed and advise IUSA if it believes IUSA has not properly followed this Protocol in determining that the Material is not listed hazardous waste, specifying the particular areas of deficiency.

If this Protocol has not been properly followed by IUSA in making its determination that the Material is not a listed hazardous waste, then IUSA shall redo its analysis in accordance with this Protocol and, if justified, resubmit the information described in Step 16 explaining why the Material is not a listed hazardous waste. The State shall notify IUSA with reasonable speed if the State still believes this Protocol has not been followed.

If yes, proceed to Step 19.

If no, proceed to Step 1.

19. MATERIAL IS NOT A LISTED HAZARDOUS WASTE, BUT CONFIRMATION AND ACCEPTANCE SAMPLING ARE REQUIRED.

The Material is not a listed hazardous waste, but Confirmation and Acceptance Sampling are required, as determined necessary under Step 17.

Proceed to Step 20.

20. CONDUCT ONGOING CONFIRMATION AND ACCEPTANCE SAMPLING.

Confirmation and Acceptance Sampling will continue until determined no longer necessary under Step 17. Such sampling will be conducted pursuant to a Sampling and Analysis Plan ("SAP") that specifies the frequency and type of sampling required. If such sampling does not reveal any "new" Potentially Listed Hazardous Constituents (as defined in Steps 7 and 8), further evaluation is not necessary (as indicated in Step 7). If such sampling reveals the presence of "new" constituents, Potentially Listed Wastes must be identified (Step 8) and evaluated (Steps 9 through 11) to determine whether the new constituent is from a listed hazardous waste source. Generally, in each case, the SAP will specify sampling comparable to the level and frequency of sampling performed by other facilities in the State of Utah that dispose of 11e.(2) byproduct material, either directly or that results from processing alternate feed materials.

Proceed to Step 7.

Attachment 1

Summary of RCRA Listed Hazardous Wastes

There are three different categories of listed hazardous waste under RCRA:

- *F-listed wastes from non-specific sources (40 CFR § 261.31(a))*: These wastes include spent solvents (F001-F005), specified wastes from electroplating operations (F006-F009), specified wastes from metal heat treating operations (F010-F012), specified wastes from chemical conversion coating of aluminum (F019), wastes from the production/manufacturing of specified chlorophenols, chlorobenzenes, and chlorinated aliphatic hydrocarbons (F019-F028), specified wastes from wood preserving processes (F032-F035), specified wastes from petroleum refinery primary and secondary oil/water/solids separation sludge (F037-F038), and leachate resulting from the disposal of more than one listed hazardous waste (F039).
- *K-listed wastes from specific sources (40 CFR § 261.32)*: These include specified wastes from wood preservation, inorganic pigment production, organic chemical production, chlorine production, pesticide production, petroleum refining, iron and steel production, copper production, primary and secondary lead smelting, primary zinc production, primary aluminum reduction, ferroalloy production, veterinary pharmaceutical production, ink formulation and coking.
- *P- and U-listed commercial chemical products (40 CFR § 261.33)*: These include commercial chemical products, or manufacturing chemical intermediates having the generic name listed in the "P" or "U" list of wastes, container residues, and residues in soil or debris resulting from a spill of these materials.[1] "The phrase 'commercial chemical product or manufacturing chemical intermediate ...' refers to a chemical substance which is manufactured or formulated for commercial or manufacturing use which consists of the commercially pure grade of the chemical, any technical grades of the chemical that are produced or marketed, and all formulations in which the chemical is the sole active ingredient. It does not refer to a material, such as a manufacturing process waste, that contains any of the [P- or U-listed substances]."[2]

Appendix VII to 40 CFR part 261 identifies the hazardous constituents for which the F- and K-listed wastes were listed.

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[1] P-listed wastes are identified as "acutely hazardous wastes" and are subject to additional management controls under RCRA. 40 CFR § 261.33(e) (1997). U-listed wastes are identified as "toxic wastes." Id. § 261.33(f).

[2] 40 CFR § 261.33(d) note (1997).

State of Utah

DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF SOLID AND HAZARDOUS WASTE

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December 7, 1999

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Post Office Box 45898
Salt Lake City, Utah 84145-0898

RE: Protocol for Determining Whether Alternate Feed Materials are Listed Hazardous Wastes

Dear Mr. Ford:

On November 22, 1999, we received the final protocol to be used by International Uranium Corporation (IUSA) in determining whether alternate feed materials proposed for processing at the White Mesa Mill are listed hazardous wastes. We appreciate the effort that went into preparing this procedure and feel that it will be a useful guide for IUSA in its alternate feed determinations.

As was discussed, please be advised that it is IUSA's responsibility to ensure that the alternate feed materials used are not listed hazardous wastes and that the use of this protocol cannot be used as a defense if listed hazardous waste is somehow processed at the White Mesa Mill.

Thank you again for your corporation. If you have any questions, please contact Don Verbica at 538-6170.

Sincerely,

Dennis R. Downs, Executive Secretary
Utah Solid and Hazardous Waste Control Board

c: Bill Sinclair, Utah Division of Radiation Control

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PROTOCOL FOR DETERMINING WHETHER ALTERNATE FEED MATERIALS ARE LISTED HAZARDOUS WASTES[1]

NOVEMBER 16, 1999

1. SOURCE INVESTIGATION.

Perform a good faith investigation (a "Source Investigation" or "SI")[2] regarding whether any listed hazardous wastes[3] are located at the site from which alternate feed material[4] ("Material") originates (the "Site"). This investigation will be conducted in conformance with EPA guidance[5] and the extent of information required will vary with the circumstances of each case. Following are examples of investigations that would be considered satisfactory under EPA guidance and this Protocol for some selected situations:

- Where the Material is or has been generated from a known process under the control of the generator: (a) an affidavit, certificate, profile record or similar document from the Generator or Site Manager, to that effect, together with (b) a Material Safety Data Sheet ("MSDS") for the Material, limited profile

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1 This Protocol reflects the procedures that will be followed by ~~an understanding between the Utah Division of Solid and Hazardous Waste, Department of Environmental Quality ("DEQ" or the "State") and~~ International Uranium (USA) Corporation ("IUSA") for determining whether alternate feed materials proposed for processing at the White Mesa Mill are (or contain) listed hazardous wastes. It is based on current Utah and EPA rules and EPA guidance under the Resource Conservation and Recovery Act ("RCRA"), 42 U.S.C. §§ 6901 et seq. This Protocol will be changed as necessary to reflect any pertinent changes to RCRA rules or EPA guidance.

2 This investigation will be performed by IUSA, by the entity responsible for the site from which the Material originates (the "Generator"), or by a combination of the two.

3 Attachment 1 to this Protocol provides a summary of the different classifications of RCRA listed hazardous wastes.

4 Alternate feed materials that are primary or intermediate products of the generator of the material (*e.g.*, "green" or "black" salts) are not RCRA "secondary materials" or "solid wastes," as defined in 40 CFR 261, and are not covered by this Protocol.

5 EPA guidance identifies the following sources of site- and waste-specific information that may, depending on the circumstances, be considered in such an investigation: hazardous waste manifests, vouchers, bills of lading, sales and inventory records, material safety data sheets, storage records, sampling and analysis reports, accident reports, site investigation reports, interviews with employees/former employees and former owners/operators, spill reports, inspection reports and logs, permits, and enforcement orders. *See e.g.*, 61 Fed. Reg. 18805 (April 29, 1996).

sampling, or a material composition determined by the generator/operator based on a process material balance.

- Where specific information exists about the generation process and management of the Material: (a) an affidavit, certificate, profile record or similar document from the Generator or Site Manager, to that effect, together with (b) an MSDS for the Material, limited profile sampling data or a preexisting investigation performed at the Site pursuant to CERCLA, RCRA or other state or federal environmental laws or programs.
- Where potentially listed processes are known to have been conducted at a Site, an investigation considering the following sources of information: site investigation reports prepared under CERCLA, RCRA or other state or federal environmental laws or programs (*e.g.*, an RI/FS, ROD, RFI/CMS, hazardous waste inspection report); interviews with persons possessing knowledge about the Material and/or Site; and review of publicly available documents concerning process activities or the history of waste generation and management at the Site.
- If material from the same source is being or has been accepted for direct disposal as 11e.(2) byproduct material in an NRC-regulated facility in the State of Utah with the consent or acquiescence of the State of Utah, the Source Investigation performed by such facility.

Proceed to Step 2.

2. SPECIFIC INFORMATION OR AGREEMENT/DETERMINATION BY RCRA REGULATORY AUTHORITY THAT MATERIAL IS NOT A LISTED HAZARDOUS WASTE?

a. Determine whether specific information from the Source Investigation exists about the generation and management of the Material to support a conclusion that the Material is not (and does not contain) any listed hazardous waste. For example, if specific information exists that the Material was not generated by a listed waste source and that the Material has not been mixed with any listed wastes, the Material would not be a listed hazardous waste.

b. Alternatively, determine whether the appropriate state or federal authority with RCRA jurisdiction over the Site agrees in writing with the generator's determination that the

Material is not a listed hazardous waste, has made a "contained-out" determination[6] with respect to the Material or has concluded the Material or Site is not subject to RCRA.

If yes to either question, proceed to Step 3.

If no to both questions, proceed to Step 6.

3. PROVIDE INFORMATION TO NRC AND UTAH.

a. If specific information exists to support a conclusion that the Material is not, and does not contain, any listed hazardous waste, ~~International Uranium (USA) Corporation ("IUSA")~~ will provide a description of the Source Investigation to NRC and/or the State of Utah Department of Environmental Quality, Division of Solid and Hazardous Waste (the "State"), together with an affidavit explaining why the Material is not a listed hazardous waste.

b. Alternatively, if the appropriate regulatory authority with RCRA jurisdiction over the Site agrees in writing with the generator's determination that the Material is not a listed hazardous waste, makes a contained-out determination or determines the Material or Site is not subject to RCRA, IUSA will provide documentation of the regulatory authority's determination to NRC and the State. IUSA may rely on such determination provided that the State agrees the conclusions of the regulatory authority were reasonable and made in good faith.

Proceed to Step 4.

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6 EPA explains the "contained-out" (also referred to as "contained-in") principle as follows:

> In practice, EPA has applied the contained-in principle to refer to a process where a site-specific determination is made that concentrations of hazardous constituents in any given volume of environmental media are low enough to determine that the media does not "contain" hazardous waste. Typically, these so-called "contained-in" [or "contained-out"] determinations do not mean that no hazardous constituents are present in environmental media but simply that the concentrations of hazardous constituents present do not warrant management of the media as hazardous waste. ...
>
> EPA has not, to date, issued definitive guidance to establish the concentrations at which contained-in determinations may be made. As noted above, decisions that media do not or no longer contain hazardous waste are typically made on a case-by-case basis considering the risks posed by the contaminated media.

63 Fed. Reg. 28619, 28621-22 (May 26, 1998) (Phase IV LDR preamble).

4. DOES STATE OF UTAH AGREE THAT ALL PREVIOUS STEPS HAVE BEEN PERFORMED IN ACCORDANCE WITH THIS PROTOCOL?

Determine whether the State agrees that this Protocol has been properly followed (including that proper decisions were made at each decision point). The State shall review the information provided by IUSA in Step 3 or 16 ~~promptly~~ with reasonable speed and advise IUSA if it believes IUSA has not properly followed this Protocol in determining that the Material is not listed hazardous waste, specifying the particular areas of deficiency.

If this Protocol has not been properly followed by IUSA in making its determination that the Material is not a listed hazardous waste, then IUSA shall redo its analysis in accordance with this Protocol and, if justified, resubmit the information described in Step 3 or 16 explaining why the Material is not a listed hazardous waste. The State shall notify IUSA ~~promptly~~ with reasonable speed if the State still believes this Protocol has not been followed.

If yes, proceed to Step 5.

If no, proceed to Step 1.

5. MATERIAL IS NOT A LISTED HAZARDOUS WASTE.

The Material is not a listed hazardous waste and no further sampling or evaluation is necessary in the following circumstances:

- Where the Material is determined not to be a listed hazardous waste based on specific information about the generation/management of the Material OR the appropriate RCRA regulatory authority with jurisdiction over the Site agrees with the generator's determination that the Material is not a listed HW, makes a contained-out determination, or concludes the Material or Site is not subject to RCRA (and the State agrees the conclusions of the regulatory authority were reasonable and made in good faith) (Step 2); or
- Where the Material is determined not to be a listed hazardous waste (in Steps 6 through 11, 13 or 15) and Confirmation/Acceptance Sampling are determined not to be necessary (under Step 17).

6. IS MATERIAL A PROCESS WASTE KNOWN TO BE A LISTED HAZARDOUS WASTE OR TO BE MIXED WITH A LISTED HAZARDOUS WASTE?

Based on the Source Investigation, determine whether the Material is a process waste known to be a listed hazardous waste or to be mixed with a listed hazardous waste. If the Material is a process waste and is from a listed hazardous waste source, it is a listed hazardous waste. Similarly, if the Material is a process waste and has been mixed with a listed hazardous waste, it is a listed hazardous waste under the RCRA "mixture rule." If the Material is an Environmental Medium,[7] it cannot be a listed hazardous waste by direct listing or under the RCRA "mixture rule."[8] If the Material is a process waste but is not known to be from a listed source or to be mixed with a listed waste, or if the Material is an Environmental Medium, proceed to Steps 7 through 11 to determine whether it is a listed hazardous waste.

If yes, proceed to Step 12.

If no, proceed to Step 7.

7. DOES MATERIAL CONTAIN ANY POTENTIALLY LISTED HAZARDOUS CONSTITUENTS?

Based on the Source Investigation (and, if applicable, Confirmation and Acceptance Sampling), determine whether the Material contains any hazardous constituents listed in the then most recent version of 40 CFR 261, Appendix VII (which identifies hazardous constituents for which F- and K-listed wastes were listed) or 40 CFR 261.33(e) or (f) (the P and U listed wastes) (collectively "Potentially Listed Hazardous Constituents"). If the Material contains such constituents, a source evaluation is necessary (pursuant to Steps 8 through 11). If the Material does <u>not</u> contain any Potentially Listed Hazardous Constituents, it is not a listed hazardous waste. The Material also is not a listed hazardous waste if, where applicable, Confirmation and Acceptance Sampling results do not reveal the presence of any "new" Potentially Listed Hazardous Constituents (*i.e.*, constituents <u>other than those</u> that have ~~not~~ already been identified by the Source Investigation (or previous Confirmation/Acceptance Sampling) and determined not to originate from a listed source).

If yes, proceed to Step 8.

If no, proceed to Step 16.

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7 The term "Environmental Media" means soils, ground or surface water and sediments.

8 The "mixture rule" applies only to mixtures of listed hazardous wastes and other "solid wastes." *See* 40 CFR § 261.3(a)(2)(iv). The mixture rule does not apply to mixtures of listed wastes and Environmental Media, because Environmental Media are not "solid wastes" under RCRA. *See* 63 Fed. Reg. 28556, 28621 (May 26, 1998).

8. IDENTIFY POTENTIALLY LISTED WASTES.

Identify potentially listed hazardous wastes ("Potentially Listed Wastes") based on Potentially Listed Hazardous Constituents detected in the Material, *i.e.*, wastes which are listed for any of the Potentially Listed Hazardous Constituents detected in the Material, as identified in the then most current version of 40 CFR 261 Appendix VII or 40 CFR 261.33(e) or (f).[9] With respect to Potentially Listed Hazardous Constituents identified through Confirmation and/or Acceptance Sampling, a source evaluation (pursuant to Steps 8 through 11) is necessary only for "new" Potentially Listed Hazardous Constituents (*i.e.*, constituents other than those that have ~~not~~ already been identified by the Source Investigation (or previous Confirmation/Acceptance Sampling) and determined not to originate from a listed source).

Proceed to Step 9.

9. WERE ANY OF THE POTENTIALLY LISTED WASTES KNOWN TO BE GENERATED OR MANAGED AT SITE?

Based on information from the Source Investigation, determine whether any of the Potentially Listed Wastes identified in Step 8 are known to have been generated or managed at the Site. This determination involves identifying whether any of the specific or non-specific sources identified in the K- or F-lists has ever been conducted or located at the Site, whether any waste from such processes has been managed at the Site, and whether any of the P- or U-listed commercial chemical products has ever been used, spilled or managed there. In particular, this determination should be based on the following EPA criteria:

Solvent Listings (F001-F005)

Under EPA guidance, "to determine if solvent constituents contaminating a waste are RCRA spent solvent F001-F005 wastes, the [site manager] must know if:

- The solvents are *spent* and *cannot be reused without reclamation* or cleaning.
- The solvents were *used exclusively for their solvent properties*.
- The solvents are spent *mixtures and blends that contained, before use, a total of 10 percent or more (by volume) of the solvents* listed in F001, F002, F004, and F005.

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9 For example, if the Material contains tetrachloroethylene, the following would be Potentially Listed Wastes: F001, F002, F024, K019, K020, K150, K151 or U210. *See* 40 CFR 261 App. VII.

> If the solvents contained in the [wastes] are RCRA listed wastes, the [wastes] are RCRA hazardous waste. When the [site manager] does not have guidance information on the use of the solvents and their characteristics before use, the [wastes] cannot be classified as containing a listed spent solvent."[10] The person performing the Source Investigation will make a good faith effort to obtain information on any solvent use at the Site. <u>If solvents were used at the Site, general industry standards for solvent use in effect at the time of use will be considered in determining whether those solvents contained 10 percent or more of the solvents listed in F001, F002, F004 or F005</u>.

<u>K-Listed Wastes and F-Listed Wastes Other Than F001-F005</u>

> Under EPA guidance, to determine whether K wastes and F wastes other than F001-F005 are RCRA listed wastes, the generator "must know the *generation process information* (about each waste contained in the RCRA waste) described in the listing. For example, for [wastes] to be identified as containing K001 wastes that are described as 'bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol,' the [site manager] must know the manufacturing process that generated the wastes (treatment of wastewaters from wood preserving process), feedstocks used in the process (creosote and pentachlorophenol), and the process identification of the wastes (bottom sediment sludge)."[11]

<u>P- and U-Listed Wastes</u>

> EPA guidance provides that "P and U wastes cover only unused and unmixed commercial chemical products, particularly spilled or off-spec products. Not every waste containing a P or U chemical is a hazardous waste. To determine whether a [waste] contains a P or U waste, the [site manager] must have direct evidence of product use. In particular, the [site manager] should ascertain, if possible, whether the chemicals are:
>
> - Discarded (as described in 40 CFR 261.2(a)(2)).
> - Either off-spec commercial products or a commercially sold grade.

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10 Management of Investigation-Derived Wastes During Site Inspections, EPA/540/G-91/009, May 1991 (emphasis added).

11 Management of Investigation-Derived Wastes During Site Inspections, EPA/540/G-91/009, May 1991 (emphasis added).

- Not used (soil contaminated with spilled unused wastes is a P or U waste).
- The sole active ingredient in a formulation."[12]

~~If the answer to the question in this step is yes,~~ If Potentially Listed Wastes were known to be generated or managed at the Site, further evaluation is necessary to determine whether these wastes were disposed of or commingled with the Material (Steps 10 and possibly 11). ~~If the answer is no,~~ If Potentially Listed Wastes were not known to be generated or managed at the Site, then information concerning the source of Potentially Listed Hazardous Constituents in the Material will be considered "unavailable or inconclusive" and, under EPA guidance,[13] the Material will be assumed not to be a listed hazardous waste.

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12 Management of Investigation-Derived Wastes During Site Inspections, EPA/540/G-91/009, May 1991.

13 EPA guidance consistently provides that, where information concerning the origin of a waste is ~~not~~ unavailable or inconclusive, the waste may be assumed not to be a listed hazardous waste. *See e.g.*, Memorandum from Timothy Fields (Acting Assistant Administrator for Solid Waste & Emergency Response) to RCRA/CERCLA Senior Policy Managers regarding "Management of Remediation Waste Under RCRA," dated October 14, 1998 ("Where a facility owner/operator makes a good faith effort to determine if a material is a listed hazardous waste but cannot make such a determination because documentation regarding a source of contamination, contaminant, or waste is *unavailable or inconclusive*, EPA has stated that one may assume the source, contaminant, or waste is not listed hazardous waste"); NCP Preamble, 55 Fed. Reg. 8758 (March 8, 1990) (Noting that "it is often necessary to know the origin of the waste to determine whether it is a listed waste and that, *if such documentation is lacking, the lead agency may assume it is not a listed waste*); Preamble to proposed Hazardous Waste Identification Rule, 61 Fed. Reg. 18805 (April 29, 1996) ("Facility owner/operators should make a good faith effort to determine whether media were contaminated by hazardous wastes and ascertain the dates of placement. The Agency believes that by using available site- and waste-specific information ... facility owner/operators would typically be able to make these determinations. However, as discussed earlier in the preamble of today's proposal, *if information is not available or inconclusive, facility owner/operators may generally assume that the material contaminating the media were not hazardous wastes.*"); Preamble to LDR Phase IV Rule, 63 Fed. Reg. 28619 (May 26, 1998) ("As discussed in the April 29, 1996 proposal, the Agency continues to believe that, *if information is not available or inconclusive, it is generally reasonable to assume that contaminated soils do not contain untreated hazardous wastes ...*"); and Memorandum from John H. Skinner (Director, EPA Office of Solid Waste) to David Wagoner (Director, EPA Air and Waste Management Division, Region VII) regarding "Soils from Missouri Dioxin Sites," dated January 6, 1984 ("The analyses indicate the presence of a number of toxic compounds in many of the soil samples taken from various sites. However, the presence of these toxicants in the soil does not automatically make the soil a RCRA
(footnote continued on next page)

If yes, proceed to Step 10.

If no, proceed to Step 16.

10. WERE LISTED WASTES KNOWN TO BE DISPOSED OF OR COMMINGLED WITH MATERIAL?

If listed wastes identified in Step 9 were known to be generated at the Site, determine whether they were known to be disposed of or commingled with the Material?

If yes, proceed to Step 12.

If no, proceed to Step 11.

11. ARE THERE ONE OR MORE POTENTIAL NON-LISTED SOURCES OF LISTED HAZARDOUS WASTE CONSTITUENTS?

In a situation where Potentially Listed Wastes were known to have been generated/managed at the Site, but the wastes were not known to have been disposed of or commingled with the Material, determine whether there are potential non-listed sources of Potentially Listed Hazardous Constituents in the Material. If not, unless the State agrees otherwise, the constituents will be assumed to be from listed sources (proceed to Step 12). If so, the Material will be assumed not to be a listed hazardous waste (proceed to Step 16). Notwithstanding the existence of potential non-listed sources at a Site, the Potentially Listed Hazardous Constituents in the Material will be considered to be from the listed source(s) if, based on the relative proximity of the Material to the listed and non-listed source(s) and/or information concerning waste management at the Site, the evidence is compelling that the listed source(s) is the source of Potentially Listed Hazardous Constituents in the Material.

If yes, proceed to Step 16.

If no, proceed to Step 12.

12. MATERIAL IS A LISTED HAZARDOUS WASTE.

The Material is a listed hazardous waste under the following circumstances:

(footnote continued from previous page)

hazardous waste. The origin of the toxicants must be known in order to determine that they are derived from a listed hazardous waste(s). *If the exact origin of the toxicants is not known, the soils cannot be considered RCRA hazardous wastes* unless they exhibit one or more of the characteristics of hazardous waste ...").

- If the Material is a process waste and is known to be a listed hazardous waste or to be mixed with a listed hazardous waste (Step 6),
- If Potentially Listed Wastes were known to be ~~actually~~ generated/managed at the Site and to be disposed of/commingled with the Material (Step 10) (subject to a "contained-out" determination in Step 13), or
- If Potentially Listed Wastes were known to be ~~actually~~ generated/managed at the Site, were not known to be disposed of/commingled with the Material but there are not any potential non-listed sources of the Potentially Listed Hazardous Constituents detected in the Material (Step 11) (subject to a "contained-out" determination in Step 13).

Proceed to Step 13.

13. HAS STATE OF UTAH MADE A CONTAINED-OUT DETERMINATION.

If the Material is an Environmental Medium, and:

- the level of any listed waste constituents in the Material is "de minimis" ; or
- all of the listed waste constituents or classes thereof are already present in the White Mesa Mill's tailings ponds as a result of processing conventional ores or other alternate feed materials in concentrations at least as high as found in the Materials

the State of Utah will consider whether it is appropriate to make a contained-out determination with respect to the Material.

If the State makes a contained-out determination, proceed to Step 16.

If the State does not make a contained-out determination, proceed to Step 14.

14. IS IT POSSIBLE TO SEGREGATE LISTED HAZARDOUS WASTES FROM OTHER MATERIALS?

Determine whether there is a reasonable way to segregate material that is a listed hazardous waste from alternate feed materials that are not listed hazardous wastes that will be sent to IUSA's White Mesa Mill. For example, it may be possible to isolate material from a certain area of a remediation site and exclude that material from Materials that will be sent to the White Mesa Mill. Alternatively, it may be possible to increase sampling frequency and exclude materials with respect to which the increased sampling identifies constituents which have been attributed to listed hazardous waste.

If yes, proceed to Step 15.

If no, proceed to Step 12.

15. SEPARATE LISTED HAZARDOUS WASTES FROM MATERIALS.

Based on the method of segregation determined under Step 14, materials that are listed hazardous wastes are separated from Materials that will be sent to the White Mesa Mill.

For materials that are listed hazardous wastes, proceed to Step 12.

For Materials to be sent to the White Mesa Mill, proceed to Step 16.

16. PROVIDE INFORMATION TO NRC AND UTAH.

If the Material does not contain any Potentially Listed Hazardous Constituents (as determined in Step 7), where information concerning the source of Potentially Listed Hazardous Constituents in the Material is "unavailable or inconclusive" (as determined in Steps 8 through 11), or where the State of Utah has made a contained-out determination with respect to the Material (Step 13), the Material will be assumed not to be (or contain) a listed hazardous waste. In such circumstances, IUSA will submit the following documentation to NRC and the State:

- A description of the Source Investigation;
- An explanation of why the Material is not a listed hazardous waste.
- Where applicable, an explanation of why Confirmation/Acceptance Sampling has been determined not to be necessary in Step 17.
- If Confirmation/Acceptance Sampling has been determined necessary in Step 17 , a copy of IUSA's and the Generator's Sampling and Analysis Plans.
- A copy of Confirmation and Acceptance Sampling results, if applicable. IUSA will submit these results only if they identify the presence of "new" Potentially Listed Hazardous Constituents (as defined in Steps 7 and 8).

Proceed to Step 17.

17. ARE SAMPLING RESULTS OR DATA REPRESENTATIVE?

Determine whether the sampling results or data from the Source Investigation (or, where applicable, Confirmation/Acceptance Sampling results) are representative. The purpose of this step) is to determine whether Confirmation and Acceptance Sampling (or continued Confirmation and Acceptance Sampling) are necessary. If the sampling results or data are representative of all Material destined for the White Mesa Mill, based on the extent of sampling conducted, the nature of the Material and/or the nature of the Site (*e.g.*, whether chemical operations or waste disposal were known to be conducted at the Site), future Confirmation/Acceptance Sampling will not be necessary. If the sampling results are not representative of all Material destined for the White Mesa Mill, then additional Confirmation/Acceptance sampling may be appropriate. Confirmation and Acceptance Sampling will be required only where it is reasonable to expect that additional sampling will detect additional contaminants not already detected. For example:

- Where the Material is segregated from Environmental Media, *e.g.*, the Material is containerized, there is a high probability the sampling results or data from the Source Investigation are representative of the Material and Confirmation/Acceptance Sampling would not be required.
- Where IUSA will be accepting Material from a discrete portion of a Site, *e.g.*, a storage pile or other defined area, and adequate sampling characterized the area of concern for radioactive and chemical contaminants, the sampling for that area would be considered representative and Confirmation/Acceptance sampling would not be required.
- Where Material will be received from a wide area of a Site and the Site has been carefully characterized for radioactive contaminants, but not chemical contaminants, Confirmation/Acceptance sampling would be required.
- Where the Site was not used for industrial activity or disposal before or after uranium material disposal, and the Site has been adequately characterized for radioactive and chemical contaminants, the existing sampling would be considered sufficient and Confirmation/Acceptance sampling would not be required.
- Where listed wastes were known to be disposed of on the Site and the limits of the area where listed wastes were managed is not known, Confirmation/Acceptance sampling would be required to ensure that listed wastes are not shipped to IUSA (see Step 14).

If yes, proceed to Step 4.

If no, proceed to Step 18.

18. DOES STATE OF UTAH AGREE THAT ALL PREVIOUS STEPS HAVE BEEN PERFORMED IN ACCORDANCE WITH THIS PROTOCOL?

Determine whether the State agrees that this Protocol has been properly followed (including that proper decisions were made at each decision point). The State shall review the information provided by IUSA in Step 16 ~~promptly~~ with reasonable speed and advise IUSA if it believes IUSA has not properly followed this Protocol in determining that the Material is not listed hazardous waste, specifying the particular areas of deficiency.

If this Protocol has not been properly followed by IUSA in making its determination that the Material is not a listed hazardous waste, then IUSA shall redo its analysis in accordance with this Protocol and, if justified, resubmit the information described in Step 16 explaining why the Material is not a listed hazardous waste. The State shall notify IUSA ~~promptly~~ with reasonable speed if the State still believes this Protocol has not been followed.

If yes, proceed to Step 19.

If no, proceed to Step 1.

19. MATERIAL IS NOT A LISTED HAZARDOUS WASTE, BUT CONFIRMATION AND ACCEPTANCE SAMPLING ARE REQUIRED.

The Material is not a listed hazardous waste, but Confirmation and Acceptance Sampling are required, as determined necessary under Step 17.

Proceed to Step 20.

20. CONDUCT ONGOING CONFIRMATION AND ACCEPTANCE SAMPLING.

Confirmation and Acceptance Sampling will continue until determined no longer necessary under Step 17. Such sampling will be conducted pursuant to a Sampling and Analysis Plan ("SAP") that specifies the frequency and type of sampling required. If such sampling does not reveal any "new" Potentially Listed Hazardous Constituents (as defined in Steps 7 and 8), further evaluation is not necessary (as indicated in Step 7). If such sampling reveals the presence of "new" constituents, Potentially Listed Wastes must be identified (Step 8) and evaluated (Steps 9 through 11) to determine whether the new constituent is from a listed hazardous waste source. Generally, in each case, the SAP will specify sampling comparable to the level and frequency of sampling performed by other facilities in the State of Utah that dispose of 11e.(2) byproduct material, either directly or that results from processing alternate feed materials.

Proceed to Step 7.

Attachment 1

Summary of RCRA Listed Hazardous Wastes

There are three different categories of listed hazardous waste under RCRA:

- *F-listed wastes from non-specific sources (40 CFR § 261.31(a))*: These wastes include spent solvents (F001-F005), specified wastes from electroplating operations (F006-F009), specified wastes from metal heat treating operations (F010-F012), specified wastes from chemical conversion coating of aluminum (F019), wastes from the production/manufacturing of specified chlorophenols, chlorobenzenes, and chlorinated aliphatic hydrocarbons (F019-F028), specified wastes from wood preserving processes (F032-F035), specified wastes from petroleum refinery primary and secondary oil/water/solids separation sludge (F037-F038), and leachate resulting from the disposal of more than one listed hazardous waste (F039).
- *K-listed wastes from specific sources (40 CFR § 261.32)*: These include specified wastes from wood preservation, inorganic pigment production, organic chemical production, chlorine production, pesticide production, petroleum refining, iron and steel production, copper production, primary and secondary lead smelting, primary zinc production, primary aluminum reduction, ferroalloy production, veterinary pharmaceutical production, ink formulation and coking.
- *P- and U-listed commercial chemical products (40 CFR § 261.33)*: These include commercial chemical products, or manufacturing chemical intermediates having the generic name listed in the "P" or "U" list of wastes, container residues, and residues in soil or debris resulting from a spill of these materials.[1] "The phrase 'commercial chemical product or manufacturing chemical intermediate ...' refers to a chemical substance which is manufactured or formulated for commercial or manufacturing use which consists of the commercially pure grade of the chemical, any technical grades of the chemical that are produced or marketed, and all formulations in which the chemical is the sole active ingredient. It does not refer to a material, such as a manufacturing process waste, that contains any of the [P- or U-listed substances]."[2]

Appendix VII to 40 CFR part 261 identifies the hazardous constituents for which the F- and K-listed wastes were listed.

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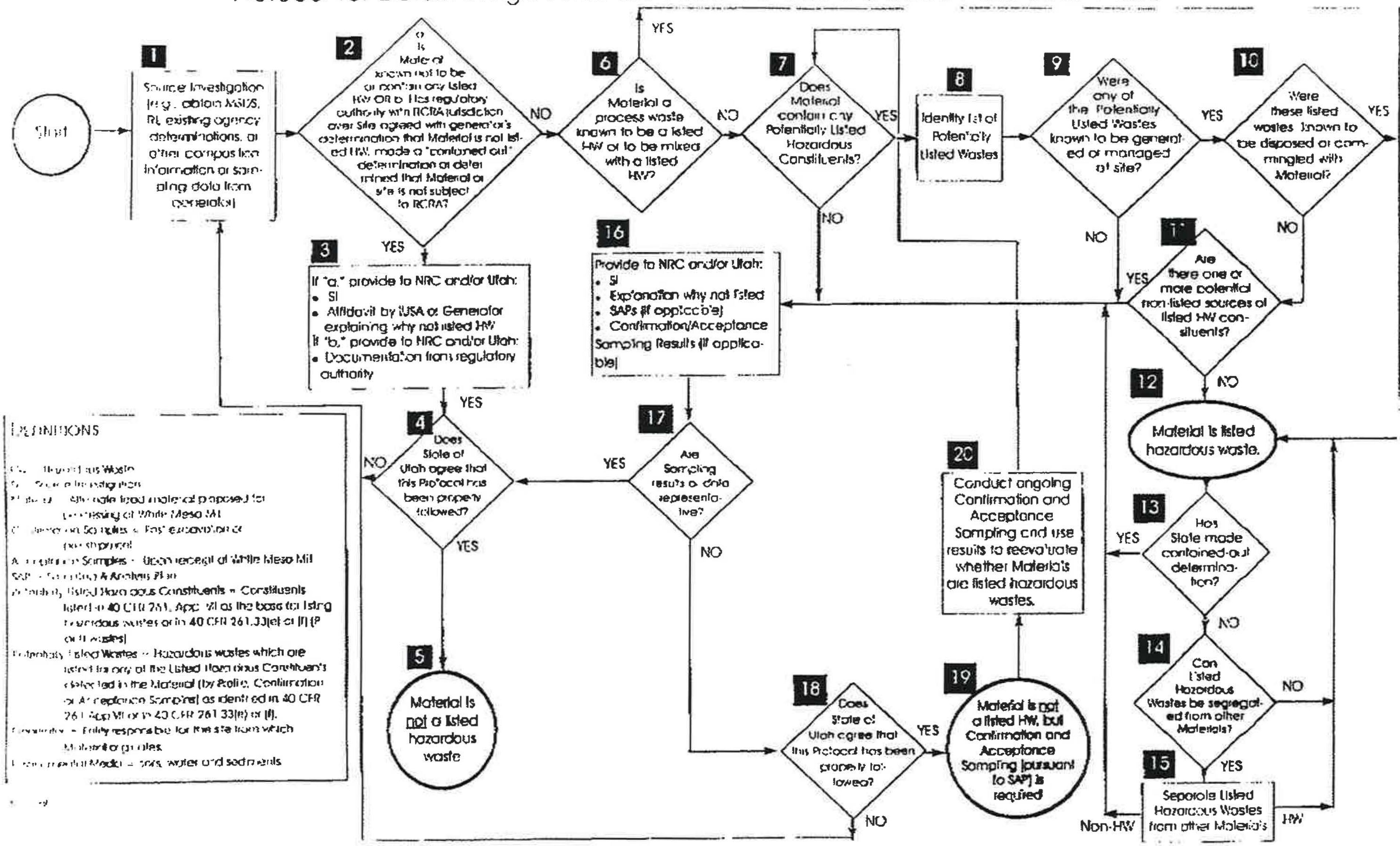
1 P-listed wastes are identified as "acutely hazardous wastes" and are subject to additional management controls under RCRA. 40 CFR § 261.33(e) (1997). U-listed wastes are identified as "toxic wastes." Id. § 261.33(f).

2 40 CFR § 261.33(d) note (1997).

Protocol for Determining if Alternate Feed Material is a Listed Hazardous Waste



ATTACHMENT 4
Review of Chemical Constituents in Silmet Uranium Material to Determine the Potential Presence of
RCRA Characteristic or RCRA Listed Hazardous Waste

Technical Memorandum

To:	David C. Frydenlund	**From:**	Jo Ann Tischler JAT
Company:	Energy Fuels Resources (USA), Inc.	**Date:**	April 18, 2019
Re:	Review of Chemical Constituents in Silmet Uranium Material to Determine the Potential Presence of RCRA Characteristic or RCRA Listed Hazardous Waste		
CC:			

1.0 Introduction

This report summarizes the characterization of the NPM Silmet OÜ's ("Silmet") Uranium Material (the "Uranium Material"), also referred to as the residue or Naturally-Occurring Radioactive Material ("NORM") residue, to be transported from the Sillamäe, Estonia facility, to determine whether or not the Uranium Material is or contains any listed or characteristic hazardous waste as defined by the Resource Conservation and Recovery Act ("RCRA"). The results of this characterization will provide information for Energy Fuels Resources (USA), Inc. ("EFRI") to determine the requirements necessary for an amendment to its White Mesa Uranium Mill ("the Mill") State of Utah Radioactive Materials License No. UT1900479 ("RML") to permit the processing of the Uranium Material as an alternate feed material at the Mill.

In accordance with the definitions in the Atomic Energy Act, as amended, and 10 Code of Federal Regulations ("CFR") 40.4, ores with natural uranium content of 0.05 weight percent or higher are classified as source material and, as per 40 CFR Part 261.4, are exempt from regulation under RCRA. As summarized in the Radioactive Material Profile Record ("RMPR"), the Uranium Material has a uranium content of approximately 0.14 to 0.35 dry weight percent natural uranium (0.17 to 0.41 dry weight percent U_3O_8). This Uranium Material is, therefore, source material and is categorically exempt from RCRA.

Although the Uranium Material is exempt from regulation under RCRA, EFRI nonetheless requires a due diligence evaluation of potential materials to be processed, to assess:

1. Whether the material is, or contains, any hazardous constituents that would be regulated as RCRA listed hazardous waste, if the Uranium Material were not categorically exempt from RCRA as a uranium ore or 11e.(2) byproduct material or a categorically exempt solid waste.

2. Whether the material contains any constituents that could generate a worker safety or environmental hazard under the conditions under which it will be processed at the Mill.

3. Whether the material contains any constituents that would be incompatible with the Mill's tailings management system.

This memorandum provides the evaluation of the regulatory status of the Uranium Material relative to RCRA. Evaluation of potential safety and environmental hazards, and compatibility with the Mill's tailings system are provided in a separate memorandum.

2.0 Site History and Background

The Silmet Sillamäe, Estonia facility (the "Facility") currently operates a niobium and tantalum production plant. The Facility is located on a property that formerly contained a shale oil production plant from 1927 to 1940. A uranium production pilot plant was constructed on the site in 1944, following the Soviet Union's occupation of Estonia. The Facility produced uranium oxides from local shale ores from 1944 through 1952. The Facility subsequently began receiving other uranium-containing ores in 1952 and continued to produce uranium oxides until uranium production ceased in 1990. In 1970, concurrent with the uranium operations, the plant began receiving loparite ores and began the recovery of niobium and tantalum in one process area, and rare earths in a separate process area. After 1990, the plant no longer received loparite ores, and began to process columbite and tantalite ore residue concentrates for niobium and tantalum production. No other processing activities, other than the current niobium and tantalum recovery operations, have occurred at the site since 2000. Niobium and tantalum, recovery continues to the present time. A chronology of the site history is listed below.

1927-1940	A. Nobel established a Shale Oil production factory, which was destroyed during the Second World War
1944	The Soviet Union occupied Estonia and began restoration of facilities, with the aim of producing uranium from local shale ore
1946-1952	Pilot production of uranium from local shale ore
1952-1970	Processing of various uranium-containing ores to produce uranium oxide
1970	Start of loparite ore processing to produce niobium (Nb), tantalum (Ta) and rare earth element concentrates ('REE')
1970-1990	Processing of loparite to produce niobium and tantalum1982-1988 Production of reactor grade enriched uranium products
1988-1990	Soviet occupation in Estonia ended and uranium production stopped
1990-1997	Facility reorganization as State owned company
1990-present	Processing of columbite and tantalite concentrates to produce niobium and tantalum
1997	Private Company established for Nb, Ta and REE production
1999-2009	Decommissioning of the former radioactive tailings pond. (Material from this pond is NOT included in the Uranium Material.)
2000 to present	Silmet begins accumulating Uranium Material in warehouse
2000 to present	Niobium and tantalum recovery is the only operation on site.

The Uranium Material results specifically from the plant area and process operation which recovers niobium and tantalum, as discussed below. It does not include residuals from oil shale production, from uranium production or enrichment, rare earth recovery, or from other current or previous operations at the Facility. The Uranium Material does not include any material from the former radioactive tailings pond or from the decommissioning of the former pond, which has been conducted by entities other than Silmet. The Uranium Material is comprised only of residuals from the current Silmet niobium and tantalum recovery unit, which were directly calcined, dried, and drummed after generation. This closed process is described in further detail in Section 2.1, below.

NRC's Alternate Feed Guidance currently provides that if a proposed feed material contains hazardous waste, listed under Section 261.30-33, Subpart D, of 40 CFR (or comparable RCRA authorized State regulations), it would be subject to EPA (or State) regulation under RCRA. However, the Guidance provides that if the licensee can show that the proposed feed material does not consist of a listed hazardous waste, this issue is resolved. NRC guidance further states that feed material exhibiting only a characteristic of hazardous waste (ignitability, corrosivity, reactivity, toxicity) that is being recycled, would not be regulated as hazardous waste and could therefore be approved for extraction of source material. The Alternate Feed Guidance concludes that if the feed material contains a listed hazardous waste, the licensee can process it only if it obtains EPA (or State) approval and provides the necessary documentation to that effect. The Alternate Feed Guidance also states that NRC staff may consult with EPA (or the State) before making a determination on whether the feed material contains listed hazardous waste.

Subsequent to the date of publication of the Alternate Feed Guidance, NRC recognized that, because alternate feed materials that meet the requirements specified in the Alternate Feed Guidance must be ores, any alternate feed materials that contain greater than 0.05% source material are considered source material under the definition of source material in 10 CFR 40.4 and hence exempt from the requirements of RCRA under 40 CFR 261.4(a)(4). See Technical Evaluation Report Request to Receive and Process Molycorp Site Material issued by the NRC on December 3, 2001 (the "Molycorp TER"). As a result, any such alternate feed ores are exempt from RCRA, regardless of whether they would otherwise have been considered to contain listed or characteristic hazardous· wastes. Since the Uranium Material contains greater than 0.05% source material, it is exempt from RCRA, regardless of its process history or constituents, and no further RCRA analysis is required.

Nevertheless, because the Alternate Feed Guidance has not yet been revised to reflect this position recognized by NRC in the Molycorp TER, the remainder of this memorandum will demonstrate that, even if the Uranium Material were not considered source material or 11e.(2) byproduct material, and as such exempt from RCRA, the Uranium Material would not, in any event, contain any RCRA listed hazardous wastes, as required under the Alternate Feed Guidance as currently worded.

2.1 Description of Process which Generated the Uranium Material

The Uranium Material consists of the residuals from niobium and tantalum recovery from columbite and tantalite ores, as described below.

Columbite and tantalite-containing mineral ore concentrates are crushed and milled in an isolated area to control the formation of radioactive dust. Raw materials are loaded by hermetic feeder screws into vibrating mills, where the material is milled to the required particle size, removed from the mills by a hermetically contained discharge systems, and packed into metal drums. The milling unit has an isolated ventilation system with particle filter system. Dust particles from the filtered air are removed by cyclones and recycled to the process with raw material.

Milled columbite and tantalite is transported to the dissolution unit, located in a separate building in the same plant area. Drums with the milled columbite and tantalite are placed on the top of automatic feeder systems, where material is loaded into dissolution reactors containing hydrofluoric acid solution. Raw material is dissolved at temperatures from 80-85°C (176 to 185 °F) in hydrofluoric acid, and sulfuric acid is added to precipitate out the impurities. The slurry is filtered to remove the insoluble impurities including U and Th. After filtration, the filter cake is washed with water several times to remove all Nb and Ta from the cake. Wet residue cake is packed into 1-metric tonne plastic bags ("Big-Bags") and transported to the calcination unit (located in the same building).

The residue is loaded from Big-Bags into electric rotary kilns via feeder systems and calcined at temperatures from 550-600°C (1022-1112°F) for 1 hour. Calcined residue is transferred from the rotary kilns into rotary coolers where the material is cooled down and packed into 200-liter (approximately 55 gallon) metal drums which are lined with triple-walled polyethylene bag liners. The Quality Control Department and the Governmental Lab Ökosil AS, take samples from every drum for gamma spectrometry analysis, and all drums are measured for dose speed. Each nine drums comprise a lot, which is transported into the warehouse.

The process which generated the Uranium Material is isolated from the remainder of site operations. As described above, columbite and tantalite ores are processed in a separate milling area, for which the feed, grinding and discharge steps are controlled by hermetically sealed equipment. Dissolution, washing, filtration, electric rotary calcining, rotary cooling and packaging are all conducted in automated closed systems. Hence, the Uranium Material is isolated from other materials on site from feed source through drum packaging.

Per the process description for residue production provided by Silmet, the chemical reagents used in the above processes included:

- hydrogen fluoride (as hydrofluoric acid solution)
- sulfuric acid

The presence of residuals or reaction byproducts from these compounds would be expected in the Uranium Material, as discussed in the sections below.

A schematic flow sheet depicting the process which produced the Uranium Material is provided in Figure 1.

3.0 Basis and Limitations of this Evaluation

The Uranium Material to be processed at the EFRI White Mesa Mill consists solely of the calcined residues from tantalum and niobium recovery, currently stored on site at the Facility.

Physical and chemical properties of the residues have been measured at different times to confirm radiological content and support evaluation of disposal or recovery alternatives. Over several years of niobium and tantalum recovery operations from 2015 to 2017, Silmet's internal quality control laboratory periodically analyzed samples of the Uranium Material to assess mineral content of the oxidized product. During the same time period, Estonia's national environmental control laboratory at the Ökosil Keskkonnalabor ("Ökosil Environmental Center") sampled and analyzed composites of drummed material for radionuclide content. In 2018, Silmet composited grab samples representing all the drums into 15 composites for total constituent analyses of total metals, inorganic anions, isotopic uranium, thorium, radium, Toxicity Characteristic Leaching Procedure ("TCLP") metals analysis of eight RCRA metals, pH, ignitability, ammonia nitrogen and nitrate as nitrogen. The evaluations are summarized in the table below.

Summary of Silmet Analyses

Sample Name/Laboratory	Sampling/Analysis Date(s)	Analyses	Number of Composite Samples
Quality Certificates (NPM Silmet OÜ internal laboratory)	2015 through 2017	Uranium oxides, thorium oxides, rare earth oxides, metal oxides	15 (every drum was sampled; composites were made from 9 samples)
Ökosil Keskkonnalabor Katseprotokoll ("Ökosil Environmental Center Test Report")	2015 through 2017	Radionuclides	19 (every drum was sampled; composites were made from 9 samples)
ALS Laboratory	2018	Ignitability, TCLP, inorganic ions, total metals, ammonia and nitrate N, radionuclides	15 (composited by the same method as earlier samples)

As discussed in Section 2.0, above, the Uranium Material contains greater than 0.05% source material, and is exempt from RCRA, regardless of its process history or chemical composition, and no further RCRA analysis is required. The following evaluation of characterization data is provided to demonstrate that even if the Uranium Material were not categorically exempt from RCRA, it is not and does not contain RCRA listed hazardous waste.

The sampling was representative of a continuous process stream under the control of the generator from a process which did not vary appreciably over time. Analyses provided with the RMPR were performed by laboratories possessing State of Utah and/or National Environmental Laboratory Accreditation Conference ("NELAC") certification for the analyses performed. As a result, these studies provide sufficiently representative characterization to assess the regulatory status, worker safety environmental hazards, and chemical and processing properties of the Uranium Material.

The following RCRA evaluation is based on information from the following sources:

1. Current and historic Silmet Uranium Material analytical data.
2. Material Safety Information Sheet for Insoluble Mineral Fraction provided by Silmet 2019
3. Process description and historical overview of the site provided by Silmet 2018
4. Sample collection procedure provided by Silmet 2018
5. Communications with Silmet personnel throughout 2018 and 2019.
6. EFRI Protocol for Determining Whether Alternate Feed Materials Are Listed Hazardous Wastes (EFRI, November 1999).
7. RMPR for the Silmet Uranium Material (February 2019).
8. Basis of Hazardous Material and Waste Determinations from the RMPR (February 2019)
9. Affidavit of Signe Kask, Managing Director of NPM Silmet OÜ (January 2019).

EFRI has developed a "Protocol for Determining Whether Alternate Feed Materials are Listed Hazardous Wastes" (November 22, 1999) ("the Protocol"). The Protocol has been developed in conjunction with, and accepted by, the State of Utah Department of Environmental Quality ("UDEQ") (Letter of December 7, 1999). Copies of the Protocol and UDEQ letter are provided in Attachment 2 of this Report. The RCRA evaluation and recommendations in this Report were developed in accordance with the Protocol.

4.0 Application of Protocol to Uranium Material

4.1 Source Investigation

Several of the information sources enumerated above were used to perform the Source Investigation indicated in Box 1 of the flow diagram (the "Protocol Diagram") that forms part of the Protocol.

The following sections describe the status of the Uranium Material relative to RCRA Characteristic and RCRA Listed Hazardous Waste regulations, and relative to the specific parameters identified in the EFRI/UDEQ Hazardous Waste Protocol. Although alternate feed materials are being recycled to recover uranium and hence are permitted to contain constituents that may be considered RCRA characteristic wastes in other circumstances, for completeness, this Report also determines whether or not the Uranium Material contains any such constituents.

4.2 Determination Methods in the EFRI / UDEQ Protocol

4.2.1 Regulatory History of the Silmet Uranium Material

NPM Silmet OÜ Radiation Activity License 14 010, approved on January 30, 2014, authorized Silmet to collect and store up to a licensed limit of 615.5 metric tonnes of calcined Uranium Material generated from the tantalum/niobium circuit. Silmet's Radiation Activity License expired on January 30, 2019. The quantity collected on site prior to expiration of the Radiation Activity License, 600 metric tonnes (660 tons), approached the licensed limit.

Although the license limit has not been reached, Silmet and the Ministry of Environment of the Republic of Estonia have agreed that Silmet will cease further production of Uranium Material, and renewal of the Radioactivity License will be delayed until such time as Silmet demonstrates they have confirmed an appropriately-licensed off-site destination for the material. Silmet has suspended niobium/tantalum processing, the only source of the Uranium Material, pending renewal of the Radioactivity License.

The Uranium Material, which has materially not changed in form or content since first being produced in approximately 1997, remains definitional source material as per 40 CFR Part 261.4, and is explicitly exempt from regulation under RCRA. However, for the sake of completeness, EFRI has required the following evaluation to confirm that even if the Uranium Material were not exempt from RCRA, it is not and does not contain, what would otherwise be considered a RCRA-listed waste, or a RCRA characteristic waste.

The Uranium Material has not been classified or treated as listed hazardous waste nor has it been in contact with any listed hazardous wastes.

4.2.2 Evaluation of Potential RCRA Listings Associated with Specific Constituents

For potential alternate feed materials that are not exempt from RCRA, the Protocol describes additional steps EFRI will take to assess whether constituents associated with any potential RCRA waste listings are present, and the likelihood that they resulted from RCRA listed hazardous wastes or RCRA listed processes. These steps include tabulation of all potential listings associated with each known chemical constituents in the material, and the review of chemical process and material handling history at the generator location to assess whether the known chemical constituents in the material resulted from listed or non-listed sources. This evaluation is described in Box 8 and Decision Diamonds 9 through 11 in the Protocol Diagram.

If the results of the evaluation indicate that the contaminants are not listed waste, the Protocol specifies an additional assessment of whether the data on which this determination was made is sufficiently representative, or whether an ongoing acceptance sampling program should be implemented, and a similar evaluation performed on any new constituents identified during acceptance sampling.

In the case of the Uranium Material, Steps 9 through 11 are not required as indicated by the statements provided in the Affidavit of Signe Kask. However, for the sake of a thorough due diligence evaluation, Steps 9 through 11 were completed, and the results are presented below.

5.0 RCRA Review of Chemical Constituents

Determination of whether the Uranium Material is, or contained, potential RCRA-listed waste included consideration of the written source history provided by Silmet, and through interviews with Silmet personnel from January 2018 to date, as well as the analytical efforts summarized in Section 3.0 above.

5.1 Overview

The Uranium Material does not contain any "P" or "U" listed wastes as it contains no discarded commercial chemical products, off-specification species, container residues, and spill residues thereof. Any chemicals used in the tantalum and niobium recovery process which generated the Uranium Material were used for their intended purpose and are not waste materials.

There were no processes conducted at the site which fall under the category of "F" listed hazardous wastes from non-specific sources as designated in the following seven categories:

- Spent solvent wastes (F001-F005)
- Wastes from electroplating and other metal finishing operations (F006-F012, F019)
- Dioxin-bearing wastes (F020-F023 and F026-F028)
- Wastes from the production of certain chlorinated aliphatic hydrocarbons (F024, F025)
- Wastes from wood preserving (F032, F034, and F035)
- Petroleum refinery wastewater treatment sludges (F037 and F038)
- Multi-source leachate (F039)

There were no processes conducted at the site which fall under the category of "K" listed hazardous wastes from specific sources designated in the following 13 categories:

- Wood preservation (K001)
- Inorganic pigment manufacturing (K002 –K008)
- Organic chemicals manufacturing (K009-K030, K083, K085, K093-K096, K103-K105, K107-K118, K136, K149-K151, K156-K159, K161, K174-K175, K181)
- Inorganic chemicals manufacturing (K071, K073, K106, K176-178)
- Pesticides manufacturing (K031-K043, K097-K099, K123-K126, K131-K132)
- Explosives manufacturing (K044-K047)
- Petroleum refining (K048-52, K170-K172)
- Iron and steel production (K061-K062)
- Primary aluminum production (K088)
- Secondary lead production (K069, K100)
- Veterinary pharmaceuticals manufacturing (K084, K101-K102)
- Ink formulation (K086)
- Coking (K060, K087, K141-K145, K147-K148)

Evaluation of RCRA listings associated with the inorganic ions and metals analyzed in the Uranium Material is provided in attached Tables 1 and 2 respectively.

5.2 Volatile Organic Compounds

The Uranium Material consists of acid digestion residuals from inorganic mineral ores, which have subsequently been oxidized in a calcining rotary kiln at temperatures above 1000°F. The only constituents remaining in the material following calcining are metals and inorganic ionic species in their highest oxidation states. No volatile organic constituents can reasonably be expected to be present in the Uranium Material.

5.3 Semi-Volatile Organic Compounds

The Uranium Material consists of acid digestion residuals from inorganic mineral ores, which have subsequently been oxidized in a calcining rotary kiln at temperatures above 1000°F. The only constituents remaining in the material following calcining are metals and inorganic ionic species in their highest oxidation states. No semi-volatile organic constituents can reasonably be expected to be present in the Uranium Material.

5.4 Non-Metal Inorganic Compounds

Analytical results indicate that low levels of ammonia nitrogen, chloride, fluoride, and sulfate are present in the Uranium Material. Evaluation of potential RCRA listings associated with the analyzed inorganics, and why they are not applicable to the Uranium Material, is provided in detail in the attached Table 1.

Inorganic nitrate/nitrite and inorganic ammonia nitrogen have also been analyzed in ALS samples in 2018. The residues that form the Uranium Material were calcined at elevated temperature in rotary kilns. At elevated temperatures tantalum and niobium, in addition to reacting with oxygen to form oxides, are capable of absorbing atmospheric hydrogen and nitrogen into their metal lattices. Other accessory metals in the ores and concentrates also absorb hydrogen and nitrogen.

Nitrogen is expected to be present at trace to low levels in both the reduced (ammonia N) and/or oxidized (nitrate/nitrite) forms.

Inorganic nitrate/nitrite compounds and inorganic ammonia nitrogen are not associated with any RCRA hazardous waste listings. These analytes have not been included in Table 1.

5.5 Metals

Analytical results indicate that the metals aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, lead, lithium, magnesium, manganese, molybdenum, nickel, potassium, sodium, silver, thallium, vanadium, zinc, and zirconium, were present in the Uranium Material. Evaluation of potential RCRA listings associated with the analyzed metals, and why they are not applicable to the Uranium Material, is provided in detail in the attached Table 2.

Additionally, the following metals were identified either in Silmet's internal mineral analysis, ALS' 2018 analysis, or both. Cerium, cobalt, dysprosium, gadolinium, hafnium, iron, lanthanum, molybdenum, neodymium, niobium, rubidium, samarium, scandium, tantalum, thorium, tin, titanium, yttrium, ytterbium, and zirconium are not associated with any RCRA hazardous waste listings. Each of these metals is commonly found at greater or lesser levels in rare earth, columbite, tantalite and lanthanide ores and concentrates, and is expected to be present in the concentrates processed for niobium and tantalum recovery at the Silmet Facility. These metals have not been included in Table 2.

5.6 Summary of RCRA Listed Waste Findings

Based on the information presented above, none of the constituents in the Uranium Material would be indicative of RCRA listed hazardous waste, even if the Uranium Material were not already exempt from RCRA as source material. Review of the analytical data, the, process history, and minerology literature confirms that all of the constituents in the material are consistent with those expected to result from columbite and tantalite ores and the niobium and tantalum recovery process described by the generator

6.0 RCRA Characteristics

The Uranium Material is an oxidized/calcined product of precipitated and washed filter cake. As a result, it would not be ignitable, corrosive, or reactive per the RCRA definitions of these characteristics. Fifteen Uranium Material samples collected during 2018 were analyzed for eight RCRA TCLP metals. No analyzed constituent exceeded its respective TCLP threshold for RCRA toxicity characteristic as defined in Table 1 of 40 CFR Part 261.24(b). Therefore, the test results confirm that that the Uranium Material does not have the RCRA characteristic of toxicity. These results are summarized in the attached Table 3.

Fifteen Uranium Material samples collected during 2018 were tested for corrosivity. No samples exhibited a pH of 2.0 or lower, or a pH of 12.5 or higher. These results confirm that the Uranium Material does not have the RCRA characteristic of corrosivity.

The Uranium is not an oxidizer, an ignitable compressed gas, a solid that can cause a fire and sustain combustion. In addition, one of the samples of Uranium Material collected during 2018 was tested for flash point. The sample did not exhibit a flash point of <140°F. These results confirm that the Uranium Material does not have the RCRA characteristic of ignitability.

The Affidavit from Signe Kask of Silmet affirms that the Uranium Material has never been classified for shipment or off-site management as a RCRA characteristic waste. This is consistent with the source of the constituents and the treatment process used to develop the Uranium Material.

As discussed in the introduction to this report, the Uranium Material is exempt from regulation under RCRA; however, even if it were classified as a characteristic hazardous waste, alternate feed materials are permitted to contain RCRA characteristic wastes under NRC's Alternate Feed Guidance (10 CFR 40, Appendix A).

Based on all of the above information, the Uranium Material is not a RCRA characteristic hazardous waste.

7.0 Conclusions and Recommendations

In summary, the following conclusions can be drawn from the RCRA analysis of the analytical data and Facility information presented above:

1. The Uranium Material is not a RCRA listed hazardous waste because it is an ore that has a natural uranium content of greater than 0.05 weight percent, is therefore source material and, as a result, is exempt from regulation under RCRA.

2. Even if the Uranium Material were not source material, it would not be a RCRA listed hazardous waste for the following additional reasons:

    a) It was generated from a known process under the control of the generator, who has provided the Affidavit declaring that the Uranium Material is not and does not contain RCRA listed hazardous waste. This determination is consistent with Boxes I and 2 and Decision Diamonds 1 and 2 in the EFRI/UDEQ Protocol Diagram;

    b) No volatile organic compounds are used in the inorganic mineral process for niobium and tantalum recovery, and no volatile organic compounds can be expected to be present in the Uranium Material.

    c) No semi-volatile organic compounds are used in the inorganic mineral process for niobium and tantalum recovery, and no semi-volatile organic compounds can be expected to be present in the Uranium Material.

    d) None of the metals in the Uranium Material samples came from RCRA listed hazardous waste sources. This determination is consistent with Box 8 and Decision Diamonds 9 through 11 in the EFRI/UDEQ Protocol Diagram.

3. The Uranium Material does not exhibit any of the RCRA characteristics of ignitability, corrosivity, reactivity, or toxicity for any constituent.

8.0 References

- Austin, G.T. *Shreve's Chemical Process Industries, Fifth Edition.* McGraw Hill. New York 1984.

- Title 10 Code of Federal Regulations; Chapter I – *Nuclear Regulatory Commission, Part 40 – Domestic Licensing of Source Material: 40.4 – Definitions* (10 CFR 40.4)

- Title 40 Code of Federal Regulations; Protection of the Environment, Part 261 – *Identification and Listing of Hazardous Waste: Subpart A, 261.4 – Exclusions: Subpart B – Criteria for Identifying the Characteristics of Hazardous Waste and for Listing Hazardous Waste.*

- Hudson Institute of Mineralogy *Columbite Mineral Data* accessed at https://www.mindat.org/min-8667.html on 2/13/19

- Hudson Institute of Mineralogy *Tantalite Mineral Data* accessed at https://www.mindat.org/min-3882.html on 2/13/19

- NPM Silmet OÜ *Documented Procedure - Selection and Preparation of Samples of Naturally Occurring Radioactive Material* 2018

- NPM Silmet OÜ *Technological Description for Production of NORM Containing Residue* 2018

- Sax, N. Irving and Lewis, Richard L. Sr. *Hawley's Condensed Chemical Dictionary, 11th Edition.* Van Nostrand Reinhold. New York 1987.

FIGURE 1

FLOW SCHEMATIC OF PRODUCTION OF URANIUM MATERIAL (RESIDUES)

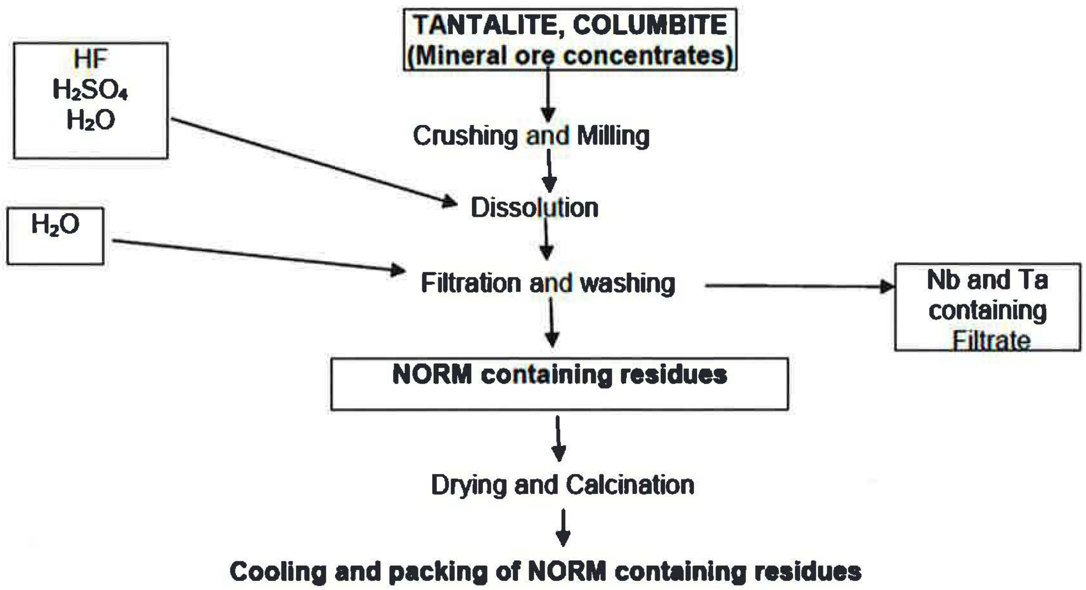


TABLE 1 (Rev. 0): SUMMARY OF POTENTIAL RCRA LISTINGS IN 40 CFR 261 and APPENDIX VII ASSOCIATED WITH NON-METALS IN URANIUM MATERIAL

INORGANIC CHLORIDES[1]

Commercial Chemicals Acutely Toxic U List	Commercial Chemicals Acutely Hazardous P List	Non-Specific Sources F List	Specific Sources K List	Industrial Uses and Sources of U or P Listed Element or Compound	Is This Listing Applicable to Uranium Material?
U216 Thallium chloride				Chlorination catalyst, sun lamp monitors.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P033 Cyanogen chloride			Organic synthesis, tear gas, warning agent in fumigant gases.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P095 Carbonic dichloride (phosgene)			Used in organic synthesis for production of urethanes, plastics and pesticides. Formerly used as choking agent in combat gas.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
		NONE			No F Listings
			NONE		No K Listings

FLUORIDE

Commercial Chemicals Acutely Toxic U List	Commercial Chemicals Acutely Hazardous P List	Non-Specific Sources F List	Specific Sources K List	Industrial Uses and Sources of U or P Listed Element or Compound	Is This Listing Applicable to Uranium Material?
U033 Carbonic difluoride, Carbon oxyfluoride, Carbonyl fluoride				Used in organic synthesis for addition of carbon groups to other structures.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
U075 Dichlorodifluoro methane				Used as refrigerant in air conditioners, and direct contact freezing. Used in plastics manufacture, and as solvent and blowing agent.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
U134 Hydrogen fluoride				Catalyst in refinery alkylation, isomerization, condensation, dehydration, and polymerization processes. Used for organic and inorganic flourination reactions, production of fluorine gas and aluminum fluoride, some uranium leaching processes, and as additive to solid rocket propellant.	No. Fluorides are present in residual fluoride compounds from the acid digestion of niobium and tantalum ore concentrates for removal of uranium and thorium.
	P043 Diisoproplyfluorophosp hate			Insecticide	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P056 Fluorine			Production of metallic fluorides and fluorocarbons, fluoridation compounds for toothpaste and water treatment.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P057 2-fluoroacetamide			Primarily as a rodenticide.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P058 Fluoroacetic acid sodium salt			Primarily as a rodenticide.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
		NONE			No F Listings
			NONE		No K Listings

TABLE 1 (Rev. 0): SUMMARY OF POTENTIAL RCRA LISTINGS IN 40 CFR 261 and APPENDIX VII ASSOCIATED WITH NON-METALS IN URANIUM MATERIAL

PHOSPHORUS

Commercial Chemicals Acutely Toxic U List	**Commercial Chemicals Acutely Hazardous P List**	**Non-Specific Sources F List**	**Specific Sources K List**	**Industrial Uses and Sources of U or P Listed Element or Compound**	**Is This Listing Applicable to Uranium Material?**
U087 O,O-diethyl S-methyl dithiophosphate				Synthesis of pesticides, chemical warfare agents.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
U145 Lead phosphate				Used as a stabilizing agent additive in plastic formulation.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
U189 Phosphorus sulfide, Phosphorus trisulfide				Synthesis of pesticides, chemical warfare agents.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
U249 Zinc phosphide				Synthesis of pesticides, chemical warfare agents, used as rodenticide.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P006 Aluminum phosphide			Synthesis of pesticides, chemical warfare agents, insecticide, fumigant, semiconductor technology.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P039 Phosphorodithioic acid O,O diethyl S-[2-e(thylthio) ethyl diethyl] ester (malathion)			Fruit fly insecticide.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P040 O,O-diethyl O-pyrazinyl phosphate			Synthesis of thionazin insecticide, fungicide, nemtatocide, chemical warfare agents.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P041 Diethyl-p-nitrophenyl phosphate (parathion)			Synthesis of pesticides, chemical warfare agents. Insecticide and acaicide.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P043 Diisopropylfluorophosp hate (DFP)			Synthesis of pesticides, chemical warfare agents.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P062 Hexaethyl tetraphosphate (HETP)			Synthesis of pesticides, chemical warfare agents; contact insecticide	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P085 Octamethy diphosphoramide (schradan)			Synthesis of pesticides, chemical warfare agents. Systemic insecticide toxic to plant-chewing insects.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P096 Hydrogen phosphide (phosphine)			Organic chemical synthesis, doping agent for semiconductors, polymerization initiator, condensation polymerization catalyst.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P094 Phosphorodithioic acid O,O diethyl S-etheylthio) ethyl diethyl] ester			Synthesis of pesticides, chemical warfare agents, thion pesticides.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P109 Tetraethyl			Insecticides, chemical warfare agents.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.

TABLE 1 (Rev. 0): SUMMARY OF POTENTIAL RCRA LISTINGS IN 40 CFR 261 and APPENDIX VII ASSOCIATED WITH NON-METALS IN URANIUM MATERIAL

	dithiopyrphosphate (TEDP or sulfotepp)				
	P111 Diphosphoric acid tetraethyl ester			Synthesis of pesticides, chemical warfare agents, incendiary weapons, stabilizer for organic peroxides.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P122 Zinc phosphide			Synthesis of pesticides, chemical warfare agents, used as rodenticide.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
		NONE			No F Listings
			K037	Wastewater treatment sludges from the production of disulfoton.	No. Uranium Material is not from this industry.
			K038	Wastewater from the washing and stripping of phorate	No. Uranium Material is not from this industry.
			K039	Filter cake from the filtration of diethylphosphorodithioic acid in the production of phorate	No. Uranium Material is not from this industry.
			K040	Wastewater treatment sludges from the production of phorate	No. Uranium Material is not from this industry.

SULFATES

Commercial Chemicals Acutely Toxic U List	**Commercial Chemicals Acutely Hazardous P List**	**Non-Specific Sources F List**	**Specific Sources K List**	**Industrial Uses and Sources of U or P Listed Element or Compound**	**Is This Listing Applicable to Uranium Material?**
NONE					No U Listings
	NONE				No P Listings
		NONE			No F Listings
			K131 Dimethyl sulfate in wastewater from the reactor and spent sulfuric acid from the acid dryer from the production of methyl bromide		No. Uranium Material is not from this industry. Sulfates are present in residual sulfate compounds from the acid digestion of niobium and tantalum ore concentrates for removal of uranium and thorium.

TABLE 2 (Rev. 0): SUMMARY OF POTENTIAL RCRA LISTINGS IN 40 CFR 261 and APPENDIX VII ASSOCIATED WITH METALS IN URANIUM MATERIAL

ALUMINUM

Commercial Chemicals Acutely Toxic U List	Commercial Chemicals Acutely Hazardous P List	Non-Specific Sources F List	Specific Sources K List	Industrial Uses and Sources of U or P Listed Element or Compound	Is This Listing Applicable to Uranium Material?
NONE				---	No U Listings
	P006 Aluminum phosphide			Insecticide, fumigant, semiconductor manufacturing.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
		NONE		---	No F Listings
			NONE	---	No K Listings

ARSENIC

Commercial Chemicals Acutely Toxic U List	Commercial Chemicals Acutely Hazardous P List	Non-Specific Sources F List	Specific Sources K List	Industrial Uses and Sources of U or P Listed Element or Compound	Is This Listing Applicable to Uranium Material?
U136 Dimethyl arsenic acid (cacodylic acid)				Used as herbicide for Johnson grass on cotton, in timber thinning, as a soil sterilizing agent, and as a chemical warfare agent.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P011 Arsenic trioxide			Used in production of pigments, aniline colors, ceramic enamels, and decolorizing glass, insecticides, herbicides, rodenticides, wood and hide preservatives, and sheep dip.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P012 Arsenic Pentoxide			Used in production of arsenates, insecticides, dyeing and printing, weed killers, and colorization of glass. Also used in metal adhesives.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
		F032 Wastewater from wood preserving processes using creosote and pentachlorophenol			No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
		F034 Wastewater from wood preserving processes using creosote and pentachlorophenol			No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
		F035 Wastewaters from wood preserving processes using inorganic preservatives			No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
		F039 Leachates from land disposal of wastes F20 to F22 and F26 to F28		---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.

TABLE 2 (Rev. 0): SUMMARY OF POTENTIAL RCRA LISTINGS IN 40 CFR 261 and APPENDIX VII ASSOCIATED WITH METALS IN URANIUM MATERIAL

			K021 Spent catalyst from fluoromethane production	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K031 Byproduct salts from MSMA and cacodylic acid production	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K060 Ammonia still lime sludge from coking	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K084 Wastewater sludge from veterinary pharmaceutical production	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K101 Distillation tar residues from veterinary pharmaceutical production	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K102 Residue from decolorization of veterinary pharmaceuticals	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K161 Purification solids, baghouse dust and floor sweepings from dithiocarbamate acids production	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K171 Spent hydrotreating catalyst from petroleum refining	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K172 Spent hydrorefining catalyst from petroleum refining	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K176 Baghouse filters from the production of antimony oxide, and intermediate metals.		No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K177 Slag from production or speculative accumulation of antimony or antimony oxides	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.

TABLE 2 (Rev. 0): SUMMARY OF POTENTIAL RCRA LISTINGS IN 40 CFR 261 and APPENDIX VII ASSOCIATED WITH METALS IN URANIUM MATERIAL

BARIUM

Commercial Chemicals Acutely Toxic U List	**Commercial Chemicals Acutely Hazardous P List**	**Non-Specific Sources F List**	**Specific Sources K List**	**Industrial Uses and Sources of U or P Listed Element or Compound**	**Is This Listing Applicable to Uranium Material?**
NONE				---	No U Listings
	P013 Barium Cyanide			Used in metallurgy and electroplating.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
		NONE		---	No F Listings
			NONE	---	No K Listings

BERYLLIUM

Commercial Chemicals Acutely Toxic U List	**Commercial Chemicals Acutely Hazardous P List**	**Non-Specific Sources F List**	**Specific Sources K List**	**Industrial Uses and Sources of U or P Listed Element or Compound**	**Is This Listing Applicable to Uranium Material?**
NONE				---	No U Listings
Beryllium	---	P015 Beryllium powder		Beryllium powder is used in the aerospace industry, as a neutron reflector in nuclear reactor shielding, solid rocket fuel, and in X-ray tubes. Also used in alloys and parts in gyroscopes, guidance system components, instrumentation and controls such as solenoids, relays, and switches.	No. There would be no reason for powdered beryllium to be present as pure product, byproduct or off-spec product on site.
		NONE		---	No F Listings
			NONE	---	No K Listings

COPPER

Commercial Chemicals Acutely Toxic U List	**Commercial Chemicals Acutely Hazardous P List**	**Non-Specific Sources F List**	**Specific Sources K List**	**Industrial Uses and Sources of U or P Listed Element or Compound**	**Is This Listing Applicable to Uranium Material?**
NONE				---	No U Listings
	P029 Cuprous or Cupric Cyanide			Used in metallurgy and electroplating, insecticides, anti-foulants in paints, catalysts in organic synthesis..	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
		NONE		---	No F Listings
			NONE	---	No K Listings

TABLE 2 (Rev. 0): SUMMARY OF POTENTIAL RCRA LISTINGS IN 40 CFR 261 and APPENDIX VII ASSOCIATED WITH METALS IN URANIUM MATERIAL

CADMIUM

Commercial Chemicals Acutely Toxic U List	**Commercial Chemicals Acutely Hazardous P List**	**Non-Specific Sources F List**	**Specific Sources K List**	**Industrial Uses and Sources of U or P Listed Element or Compound**	**Is This Listing Applicable to Uranium Material?**
NONE				---	No U Listings
	NONE			---	No P Listings
		F006 Wastewater sludge from electroplating		---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
		F039 Leachates from land disposal of wastes F20 to F22 and F26 to F28		---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K061 Steel electric furnace emission control dust/sludge	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K064 Acid plant blowdown thickener slurry/sludge from primary copper production blowdown	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K069 Emission control dust/sludge from secondary lead smelting	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K177 Slag from production or speculative accumulation of antimony or antimony oxides		No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.

CALCIUM

Commercial Chemicals Acutely Toxic U List	**Commercial Chemicals Acutely Hazardous P List**	**Non-Specific Sources F List**	**Specific Sources K List**	**Industrial Uses and Sources of U or P Listed Element or Compound**	**Is This Listing Applicable to Uranium Material?**
U032 Calcium chromate				Used as a pigment, corrosion inhibitor, oxidizing agent, battery depolarizer, coatin g for light metal alloys.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P021 Calcium cyanide			Rodenticide, fumigant for greenhouses, flour mills, grain, seed, and citrus trees, gold leaching, and synthesis of other cyanides.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
		NONE		---	No F Listings.
			NONE	---	No K Listings.

TABLE 2 (Rev. 0): SUMMARY OF POTENTIAL RCRA LISTINGS IN 40 CFR 261 and APPENDIX VII ASSOCIATED WITH METALS IN URANIUM MATERIAL

CHROMIUM

Commercial Chemicals Acutely Toxic U List	Commercial Chemicals Acutely Hazardous P List	Non-Specific Sources F List	Specific Sources K List	Industrial Uses and Sources of U or P Listed Element or Compound	Is This Listing Applicable to Uranium Material?
U032 Chromic acid or calcium salt of chromic acid				Used in manufacture of pigments, oxidizers, catalysts, medicines, ceramic glazes, colored glass, inks, paints, plating, anodizing, engraving, plastic etching, and textile dyeing, and metal cleaning.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	NONE				No P Listings
		F006 Wastewater treatment sludge from electroplating		---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
		F019 Wastewater treatment sludge from chemical coating of aluminum		---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
		F035 Wood treating wastewater		---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
		F037 Refinery oil/water separator solids		---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
		F038 Refinery secondary oil/water separator solids		---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
		F039 Leachates from land disposal of wastes F20 to F22 and F26 to F28		---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K002 Wastewater treatment sludge from production of chrome yellow pigment	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K003 Wastewater treatment sludge from production of chrome molybdate orange pigment	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K004 Wastewater treatment sludge from production of zinc yellow pigment	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K005 Wastewater treatment sludge from production of chrome green	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed

TABLE 2 (Rev. 0): SUMMARY OF POTENTIAL RCRA LISTINGS IN 40 CFR 261 and APPENDIX VII ASSOCIATED WITH METALS IN URANIUM MATERIAL

			pigment		waste sources.
			K006 Wastewater treatment sludge from production of chrome oxide green pigments	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K007 Wastewater treatment sludge from production of iron blue pigments.	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K008 Oven residue from production of chrome oxide green pigments	--	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K048 Petroleum refining dissolved air flotation ("DAF") solids	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K049 Petroleum refining slop oil emulsion solids	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K050 Heat exchanger bundle cleaning sludge form petroleum refining	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K051 Petroleum refining API separator solids	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K061 Steel electric furnace emission control dust/sludge	---	No. Uranium Material is not from this industry Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K062 Iron and steel manufacturing pickle liquor	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K069 Emission control dust/sludge from secondary lead smelting	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K086 Solvent, caustic and water wash sludges from ink formulation	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K090 Emission control dust or sludge from ferrochromium silicon production	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.

TABLE 2 (Rev. 0): SUMMARY OF POTENTIAL RCRA LISTINGS IN 40 CFR 261 and APPENDIX VII ASSOCIATED WITH METALS IN URANIUM MATERIAL

LEAD

Commercial Chemicals Acutely Toxic U List	Commercial Chemicals Acutely Hazardous P List	Non-Specific Sources F List	Specific Sources K List	Industrial Uses and Sources of U or P Listed Element or Compound	Is This Listing Applicable to Uranium Material?
U 144 lead acetate				Textile dyeing, chrome pigments, gold cyanide leaching, lab reagent, hair dye. May be present as antifoulant in paints, waterproofing, varnishes.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
U 145 lead phosphate				Stabilizing agent added to plastic resins.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
U146 lead subacetate				Decolorizing agent added to sugar solutions in food products.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P110 Tetraethyl lead			Synthesized solely as a gasoline anti-knock additive.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
		F035 Wood treating wastewater		---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
		F037 Refinery oil/water separator solids		---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
		F038 Refinery secondary oil/water separator solids		---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
		F039 Leachates from land disposal of wastes F20 to F22 and F26 to F28		---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K002 Wastewater treatment sludge from production of chrome yellow pigment	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K003 Wastewater treatment sludge from production of chrome molybdate orange pigment	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K005 Wastewater treatment sludge from production of chrome green pigment	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K046 Wastewater treatment sludge from production of lead based explosive initiators	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.

TABLE 2 (Rev. 0): SUMMARY OF POTENTIAL RCRA LISTINGS
IN 40 CFR 261 and APPENDIX VII
ASSOCIATED WITH METALS IN URANIUM MATERIAL

			K048 Petroleum refining dissolved air flotation ("DAF") solids	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K049 Petroleum refining slop oil emulsion solids	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K051 Petroleum refining API separator solids	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K052 Petroleum refining leaded tank bottoms	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K061 Steel electric furnace emission control dust/sludge	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K062 Iron and steel manufacturing pickle liquor	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K064 Acid plant blowdown thickener slurry/sludge from primary copper production blowdown	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K069 Emission control dust/sludge from secondary lead smelting	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K086 Solvent, caustic and water wash sludges from ink formulation	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K100 Waste solution from acid leaching of emission control dust/sludge from secondary lead smelting	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K176 Baghouse filters from the production of antimony oxide, and intermediate metals.		No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.

MANGANESE

Commercial Chemicals Acutely Toxic U List	**Commercial Chemicals Acutely Hazardous**	**Non-Specific Sources F List**	**Specific Sources K List**	**Industrial Uses and Sources of U or P Listed Element or Compound**	**Is This Listing Applicable to Uranium Material?**

TABLE 2 (Rev. 0): SUMMARY OF POTENTIAL RCRA LISTINGS IN 40 CFR 261 and APPENDIX VII ASSOCIATED WITH METALS IN URANIUM MATERIAL

	P List				
NONE				---	No U Listings
	P196 Manganese dimethyldithio carbamate			Primarily as a pesticide.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
		NONE		---	No F Listings
			NONE	---	No K Listings

MERCURY

Commercial Chemicals Acutely Toxic U List	Commercial Chemicals Acutely Hazardous P List	Non-Specific Sources F List	Specific Sources K List	Industrial Uses and Sources of U or P Listed Element or Compound	Is This Listing Applicable to Uranium Material?
U151 Mercury metal Hg				Dental amalgams, organic and inorganic reaction catalyst, cathodes for chlorine/ caustic production cells, mirror coating, vapor and arc lamps, nuclear power reactors, boiler fluids. Also present in instruments and used in extractive metallurgy.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P065 Mercury Fulminate			Due to relatively high detonation velocity, used primarily as an explosive initiator in military explosives. Too unstable for most other uses.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P092 Acetato-O-phenyl mercury or phenyl mercuric acetate			Used as a fungicide, anti-mildew agent, and as a topical spermicide	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
		NONE		---	No F Listings
			K071 Brine purification muds from mercury cell chlorine production	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.
			K106 Wastewater treatment sludge from mercury cell chlorine production	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.

NICKEL

Commercial Chemicals Acutely Toxic U List	Commercial Chemicals Acutely Hazardous	Non-Specific Sources F List	Specific Sources K List	Industrial Uses and Sources of U or P Listed Element or Compound	Is This Listing Applicable to Uranium Material?

TABLE 2 (Rev. 0): SUMMARY OF POTENTIAL RCRA LISTINGS IN 40 CFR 261 and APPENDIX VII ASSOCIATED WITH METALS IN URANIUM MATERIAL

	P List				
NONE				---	No U Listings
	P073 Nickel carbonyl			Electroplated nickel coatings, reagent chemical	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P074 Nickel Cyanide			Metallurgy, electroplating	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
		F006 Wastewater treatment sludge from electroplating		---	No. Uranium Material is not from this industry.
			NONE	---	No K Listings

POTASSIUM

Commercial Chemicals Acutely Toxic U List	**Commercial Chemicals Acutely Hazardous P List**	**Non-Specific Sources F List**	**Specific Sources K List**	**Industrial Uses and Sources of U or P Listed Element or Compound**	**Is This Listing Applicable to Uranium Material?**
NONE				---	No U Listings
	P098 Potassium cyanide			Extraction of gold and silver from ores, reagent in analytical chemistry, insecticide, fumigant, electroplating.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P099 Potassium silver cyanide			Silver plating, bactericide, antiseptic.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
		NONE			No F Listings
			K161 Metam-sodium Purification solids, baghouse dust and sweepings form dithiocarbamate production.	Dithiocarbamate production	No K Listings

TABLE 2 (Rev. 0): SUMMARY OF POTENTIAL RCRA LISTINGS IN 40 CFR 261 and APPENDIX VII ASSOCIATED WITH METALS IN URANIUM MATERIAL

SELENIUM

Commercial Chemicals Acutely Toxic U List	Commercial Chemicals Acutely Hazardous P List	Non-Specific Sources F List	Specific Sources K List	Industrial Uses and Sources of U or P Listed Element or Compound	Is This Listing Applicable to Uranium Material??
U204 Selenious acid or selenium dioxide				Selenious acid and its salts are used for cold blackening of metal parts for model building and decorative finishes.	No. There would be no reason for this compound to be present as pure product or byproduct on site.
U205 Selenium sulfide or selenium disulfide				Preparation of topical dermal and scalp medications.	No. There would be no reason for this compound to be present as pure product or byproduct on site.
	P103 Selenourea			Production of dimethyl selenourea for safety glass coatings	No. There would be no reason for this compound to be present as pure product or byproduct on site.
	P114 Selenious acid dithallium salt, Selenious acid dithallium salt, Thallium selenide, Thallium selenite, Ancimidol			Selenious acid and its salts are used for cold blackening of metal parts for model building and decorative finishes.	No. There would be no reason for this compound to be present as pure product or byproduct on site.
		NONE		---	No F Listings
			NONE	---	No K Listings

SILVER

Commercial Chemicals Acutely Toxic U List	Commercial Chemicals Acutely Hazardous P List	Non-Specific Sources F List	Specific Sources K List	Industrial Uses and Sources of U or P Listed Element or Compound	Is This Listing Applicable to Uranium Material?
NONE				---	No U Listings
	P099 Potassium bis (cyano-c) (1) argentate Silver potassium cyanide			Silver plating, bactericide, antiseptic	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P104 Silver cyanide			Used in silver plating.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
		NONE		---	No F Listings
			NONE	---	No K Listings

TABLE 2 (Rev. 0): SUMMARY OF POTENTIAL RCRA LISTINGS IN 40 CFR 261 and APPENDIX VII ASSOCIATED WITH METALS IN URANIUM MATERIAL

SODIUM

Commercial Chemicals Acutely Toxic U List	**Commercial Chemicals Acutely Hazardous P List**	**Non-Specific Sources F List**	**Specific Sources K List**	**Industrial Uses and Sources of U or P Listed Element or Compound**	**Is This Listing Applicable to Uranium Material?**
U236 3,3'-[(3,3'-dimethyl[1,1'-biphenyl]-4,4'-diyl)bis(azo)bis[5-amino-4-hydroxy]-,tetrasodium salt				---	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P058 Fluoroacetic acid sodium salt			Rodenticide	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P105 Sodium azide			Air bag inflator, intermediate in explosive manufacture, preservative in diagnostic medicines.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P106 Sodium Cyanide			Manufacture of dyes, pigments, nylon, chelating compounds, insecticides, fumigants. Extraction of gold and silver from ores, electroplating, metal cleaning, heat treatment, ore flotation.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
		NONE			No F Listings
			K161 Metam-sodium Purification solids, baghouse dust and sweepings form dithiocarbamate production.	Dithiocarbamate production	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.

TABLE 2 (Rev. 0): SUMMARY OF POTENTIAL RCRA LISTINGS IN 40 CFR 261 and APPENDIX VII ASSOCIATED WITH METALS IN URANIUM MATERIAL

THALLIUM

Commercial Chemicals Acutely Toxic U List	Commercial Chemicals Acutely Hazardous P List	Non-Specific Sources F List	Specific Sources K List	Industrial Uses and Sources of U or P Listed Element or Compound	Is This Listing Applicable to Uranium Material?
U214 Thallium (I) acetate				High specific gravity solutions for ore flotation.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
U215 Thallium (I) Carbonate				Laboratory standard for analysis for carbon disulfide, synthesis of artificial diamonds.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
U216 Thallium chloride				Chlorination catalyst, sun lamp monitors.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
U217 Thallium (I) nitrate				Analytical standard, green-fire pyrotechnics.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P114 Selenious acid dithallium salt, Thallium selenide, Thallium selenite, Ancimidol			Selenious acid and its salts are used for cold blackening of metal parts for model building and decorative finishes.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P115 Sulfuric acid dithallium salt			Pesticide, ant-killer	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
		NONE		---	No F Listings
			K178 Residues from manufacturing and storage of ferric chloride from acids from titanium dioxide production	---	No. Uranium Material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.

VANADIUM

Commercial Chemicals Acutely Toxic U List	Commercial Chemicals Acutely Hazardous P List	Non-Specific Sources F List	Specific Sources K List	Industrial Uses and Sources of U or P Listed Element or Compound	Is This Listing Applicable to Uranium Material?
NONE				---	No U Listings
	P119 Ammonium vanadate			Intermediate in production of vanadium oxide. Used in DeNOx catalysts for emissions controls, and to produce ceramic colorants.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P120			Used in steel ceramics industries. Used in	No. There would be no reason for this compound to be

	Vanadium pentoxide			inorganic and organic synthesis in dye, paint, varnish, glass, pesticides, and ink manufacture.	present as pure product, byproduct, or off-spec product on site. Vanadium and its oxides are naturally-occurring in 80 different mineral ores, including tantalum and niobium ores.
		NONE			No F Listings
			NONE		No K Listings

ZINC

Commercial Chemicals Acutely Toxic U List	Commercial Chemicals Acutely Hazardous P List	Non-Specific Sources F List	Specific Sources K List	Industrial Uses and Sources of U or P Listed Element or Compound	Is This Listing Applicable to Uranium Material?
U249 Zinc phosphide (10 wt. % or less)				Rodenticide	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P121 Zinc cyanide			Metal plating, chemical reagent, insecticide.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P122 Zinc phosphide (greater than10 wt. %)			Rodenticide	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
	P205 Zinc dimethyl dithiocarbamate, Ziram			Fungicide, accelerator in rubber synthesis.	No. There would be no reason for this compound to be present as pure product, byproduct, or off-spec product on site.
		NONE		---	No F Listings
			K161 Ziram pesticides	Rodenticide	No. Uranium material is not from this industry. Also it is present primarily as an accessory metal in tantalum and niobium ores and concentrates, which are not listed waste sources.

ATTACHMENT 5
Review of Chemical Constituents in Silmet Uranium Material to Determine Worker Safety and Environmental Issues and Chemical Compatibility at the EFRI White Mesa Mill

TECHNICAL MEMORANDUM

To:	David C. Frydenlund, Kathy Weinel	**From:**	Jo Ann Tischler JAT
Company:	Energy Fuels Resources (USA) Inc.	**Date:**	April 18, 2019
Re:	Review of Chemical Constituents in Silmet Uranium Material to Determine Worker Safety and Environmental Issues and Chemical Compatibility at the White Mesa Mill		

1.0 Introduction

This report summarizes the characterization of the NPM Silmet OÜ's ("Silmet") Uranium Material (the "Uranium Material"), also referred to as the residue or Naturally-Occurring Radioactive Material ("NORM") residue, to be transported from the Sillamäe, Estonia facility, to determine whether processing the Uranium Material at the Energy Fuels Resources (USA), Inc. ("EFRI") White Mesa Mill (the "Mill") may pose any worker safety or environmental hazards, or may be incompatible with the Mill's existing tailings management system. The results will provide information to EFRI to determine the requirements, if any, for changes to worker safety practices, or potential incompatibilities to the Mill for the processing of Uranium Material as an alternate feed material. This report will also provide comparison of constituents of the Uranium Material and the EFRI groundwater ("GW") monitoring program to identify any constituents which are not covered under the EFRI GW monitoring program and whether these additional parameters need to be added to the sampling requirements.

The following questions were considered for the evaluation of potential safety and environmental hazards and compatibility with the Mill's tailings system and GW monitoring requirements:

1) Will any constituents of the Uranium Material volatilize at the known conditions on the Mill site or in the Mill circuits? If so, will they create any potential environmental, worker health, or safety impacts?
2) Will the Uranium Material or any of its constituents create a dust or off-gas hazard at the known conditions on the Mill site or in the Mill circuit? If so, will they create any potential environmental, worker health, or safety impacts?
3) Will any constituents of the Uranium Material react with other materials in the Mill circuits?
4) Will any constituents of the Uranium Material create any impacts on the tailings system?
5) Does the Uranium Material contain any constituents that are not present in the current Mill GW monitoring program and not sufficiently represented by the Mill's groundwater monitoring analyte list and need to be added to the analyte list?
6) What, if any, limitations on feed acceptance criteria or added operational controls are recommended in connection with processing the Uranium Material at the Mill?

An evaluation of the regulatory status of the Uranium Material relative to the Resource Conservation and Recovery Act ("RCRA") regulations is provided in a separate technical memorandum.

2.0 Basis and Limitations of This Evaluation

The Uranium Material to be processed at the Mill consists solely of the calcined residues from tantalum and niobium recovery, currently stored on site at the Facility.

The evaluation in this memorandum is based on information from the following sources:

1. Current and historic Silmet Uranium Material analytical data.
2. Material Safety Information Sheet for Insoluble Mineral Fraction provided by Silmet 2019
3. Process description and historical overview of the site provided by Silmet 2018
4. Sample collection procedure provided by Silmet 2018
5. Communications with Silmet personnel throughout 2018 and 2019.
6. Radioactive Material Profile Record ("RMPR") for the Silmet Uranium Material (February 2019).
7. Basis of Hazardous Material and Waste Determinations from the RMPR (February 2019)
8. Affidavit of Signe Kask, Managing Director of NPM Silmet OÜ (January 2019).
9. Basis of Hazardous Material and Waste Determinations from the RMPR (February 2010)
10. Current technical literature from the internet and other sources on performance of liner materials

3.0 Site History and Background

The Silmet Sillamäe, Estonia facility (the "Facility") currently operates a niobium, and tantalum recovery plant. The Facility is located on a property which formerly contained a shale oil production plant from 1927 to 1940. A uranium production pilot plant was constructed on the site in 1944, following the Soviet Union's occupation of Estonia. The Facility produced uranium oxides from local shale ores from 1944 through 1952. The Facility subsequently began receiving other uranium-containing ores in 1952, and continued to produce uranium oxides until uranium production ceased in 1990. In 1970, concurrent with the uranium operations, the plant began receiving loparite ores and began the recovery of niobium and tantalum in one process area, and rare earths in a separate process area. After 1990, the plant no longer received loparite ores, and began to process columbite and tantalite ore residue concentrates for niobium and tantalum production. Niobium and tantalum, continues to the present time. A chronology of the site history is listed below.

1927-1940	A. Nobel established a Shale Oil production factory, which was destroyed during Second World War
1944	The Soviet Union occupied Estonia and began restoration of facilities, with the aim of producing uranium from local shale ore
1946-1952	Pilot production of uranium from local shale ore
1952-1970	Processing of various uranium-containing ores to produce uranium oxide
1970	Start of loparite ore processing to produce niobium (Nb), tantalum (Ta) and rare earth element concentrates ("REE")
1970-1990	Processing of loparite to produce niobium and tantalum
1982-1988	Production of reactor grade enriched uranium products
1988-1990	Soviet occupation in Estonia ended and uranium production stopped
1990-1997	Facility reorganization as State owned company
1990-present	Processing of columbite and tantalite concentrates to produce niobium and tantalum
1997	Private Company established for Nb, Ta and REE production
1999-2009	Decommissioning of the former radioactive tailings pond. (Material from this pond is NOT included in the Uranium Material.)
2000 to present	Silmet begins accumulating Uranium Material in warehouse
2000 to present	Niobium and tantalum recovery is the only operation on site.

The Uranium Material results specifically from the plant area and process operation which recovers niobium and tantalum, as discussed below. It does not include residuals from oil shale production, from uranium production or enrichment, rare earth recovery, or from other previous operations at the Facility. The Uranium Material does not include any material from the former radioactive tailings pond or from the decommissioning of the former pond, which has been conducted by entities other than Silmet. No other processing activities, other than the current niobium and tantalum recovery operations, have occurred at the site since 2000.The Uranium Material is comprised only of residuals from the current Silmet niobium and tantalum recovery unit, which were directly calcined, dried, and drummed after generation. This closed process is described in further detail in Section 3.1 below.

3.1 Description of Process which Generated the Uranium Material

The Uranium Material consists of the residuals from niobium and tantalum recovery from columbite and tantalite ore concentrates, as described below.

Columbite and tantalite-containing mineral ore concentrates are crushed and milled in an isolated area to control the formation of radioactive dust. Raw materials are loaded by hermetic feeder screws into vibrating mills, where the material is milled to the required particle size, removed from the mills by a hermetically contained discharge systems, and packed into metal drums. The milling unit has isolated ventilation system with particle filter system. Dust particles from the filtered air are removed by cyclones and recycled to the process with raw material.

Milled columbite and tantalite is transported to the dissolution unit, located in a separate building in the same plant area. Drums with the milled columbite and tantalite are placed on the top of automatic feeder systems, where material is loaded into dissolution reactors containing hydrofluoric acid solution. Raw material is dissolved at temperatures from 80-85ºC (176 to 185 ºF) in hydrofluoric acid, and sulfuric acid is added to precipitate out the impurities. The slurry is filtered to remove the insoluble impurities including U and Th. After filtration, the filter cake is washed with water several times to remove all Nb and Ta from the cake. Wet residue cake is packed into 1-metric tonne plastic bags (Big-Bags) and transported to the calcination unit (located in the same building).

The residue is loaded from Big-Bags into electric rotary kilns via feeder systems, and calcined at temperatures from 550-600°C (1022-1112°F) for 1 hour. Calcined residue is transferred from the rotary kilns into rotary coolers where the material is cooled down and packed into 200 liter (approximately 55 gallon) metal drums which are lined with triple wall polyethylene bags. The Quality Control Department and the Governmental Lab Ökosil AS, take samples from every drum for gamma spectrometry analysis and all drums are measured for dose speed. Each nine drums comprises a lot, which is transported into the warehouse.

The process which generated the Uranium Material is isolated from the remainder of site operations. As escribed above, columbite and tantalite ores are processed in a separate milling area, for which the feed, grinding and discharge steps are controlled by hermetically sealed equipment. Dissolution, washing, filtration, electric rotary calcining, rotary cooling and packaging are all conducted in automated closed systems. Hence, the Uranium Material is isolated from other materials on site from feed source through drum packaging.

Per the process description for residue production provided by Silmet, the chemical reagents used in the above processes included:

- hydrogen fluoride (as hydrofluoric acid solution)
- sulfuric acid

The presence of residuals or reaction byproducts from these compounds would be expected in the Uranium Material, as discussed in the sections below.

A schematic flow sheet depicting the process which produced the Uranium Material is provided in Figure 1.

4.0 Assumptions Regarding White Mesa Mill Processing of the Uranium Material

This evaluation was based on the following process assumptions:

1. The Mill will process the Uranium Material in either the main circuit or alternate feed circuit alone or in combination with natural ores or other alternate feed materials.
2. The Uranium Material will be delivered to the Mill by truck in 200 liter (55 gallon) drums lined with triple-walled polyethylene bag liners. The drums will be shipped in closed cargo containers, such as Container Express ("Conex"), Sea Box, Intermodal Containers ("IMCs") or the equivalent.
3. The drums will be unloaded from the trucks onto the ore pad for temporary storage until the material is scheduled for processing.
4. The Uranium Material will be added to the circuit in a manner similar to that used for the normal processing of conventional ores and other alternate feed materials.
5. Because the material is in a dry, powdered state, the drum contents will be managed, if required, to minimize dust generation upon emptying. Dust management may include emptying the drums within an enclosure with water sprays, wetting the drum contents before emptying, or emptying the drums submerged, as determined to be appropriate based on the material condition after receipt.
6. The Mill does not anticipate any significant modifications to the leaching circuit or recovery process areas for the processing of the Uranium Material.
7. Cell 3 and Cell 4A are currently the active tailings cells at the Mill and either could receive tailings from the Uranium Material. However, because filling of Cell 3 is nearing completion, tailings from the uranium Material will more likely be placed in Cell 4A. The evaluations in this attachment are therefore based on placement of tailings in Cell 4A. For purposes of comparison, calculations of concentration changes in the tailings management system have been prepared both for Cell 3 and Cell 4A.

5.0 Chemical Composition of the Uranium Material and Potential Effects in the Mill Process

5.1 Composition

Physical and chemical properties of the residues have been measured at different times to confirm radiological content and support evaluation of disposal or recovery alternatives. Over several years of niobium and tantalum recovery operations from 2015 to 2017, Silmet's internal quality control laboratory periodically analyzed samples of the Uranium Material to assess mineral content of the oxidized/calcined product. During the same time period, Estonia's national environmental control laboratory at the Ökosil Keskkonnalabor ("Ökosil Environmental Center") sampled and analyzed composites of drummed material for radionuclide content. In 2018, Silmet composited grab samples representing all the drums into 15 composites, for total constituent analyses of total metals, inorganic anions, isotopic uranium, thorium, radium, Toxicity Characteristic Leaching Procedure ("TCLP") metals analysis of eight RCRA metals, pH, ignitability, ammonia nitrogen and nitrogen as nitrate. The evaluations are summarized in the table below.

Table 1
Summary of Silmet Analyses

Sample Name/Laboratory	Sampling/Analysis Date(s)	Analyses	Number of Composite Samples
Quality Certificates (NPM Silmet OÜ internal laboratory)	2015 through 2017	Uranium oxides, thorium oxides, rare earth oxides, metal oxides	15 (every drum was sampled; composites were made from 9 samples)
Ökosil Keskkonnalabor Katseprotokoll ("Ökosil Environmental Center Test Report")	2015 through 2017	Radionuclides	19 (every drum was sampled; composites were made from 9 samples)
ALS Laboratory	2018	Ignitability, TCLP, inorganic ions, total metals, ammonia and nitrate N, radionuclides	15 (composited by the same method as earlier samples)

As discussed in Section 2.0, above, the Uranium Material contains greater than 0.05% source material, and is exempt from RCRA, regardless of its process history or chemical composition, and no further RCRA analysis is required. The following evaluation of characterization data is provided to demonstrate that even if the Uranium Material were not categorically exempt from RCRA, it is not and does not contain RCRA listed hazardous waste.

The sampling was representative of a continuous process stream under the control of the generator, from a process which did not vary appreciably over time. Analyses provided with the RMPR were performed by laboratories possessing State of Utah and/or National Environmental Laboratory Accreditation Conference ("NELAC") certification for the analyses performed. As a result, these studies provide sufficiently representative characterization to assess the regulatory status, worker safety environmental hazards, and chemical and processing properties of the Uranium Material.

As a result, these studies provide sufficiently representative characterization to assess the regulatory status, worker safety, environmental hazards, and chemical and processing properties of the Uranium Material.

The Uranium Material is a calcined product of insoluble minerals precipitated from hydrofluoric acid digestion of niobium and tantalum ores. In general, based on Silmet's mineral assays, the compounds aluminum oxide (Al_2O_3) zirconium oxide (ZrO_2), and tin oxide (SnO_2) together comprise up to 50 percent of the material, and all other compounds are present at trace levels from mg/kg up to 1 to 2%. The Uranium Material exhibits a relatively low pH, from approximately pH 2.5 to 3, due to residual fluoride from the hydrofluoric digestion of tantalum and niobium, and from fluoride present in some of the ore minerals themselves.

The drums, containing powdered calcined product, will be opened and fed to the Mill process in an appropriate manner to minimize dust, both for the purposes of worker safety and environmental protection. The concentrations of these constituents will be further reduced by introduction into the leach circuit, where they will be present at fractional ppm levels, or lower, after the solid mass is diluted to a level of 50 percent or less, with acid solutions, in the leach tanks. These constituents will be processed in the same manner as natural uranium ores or other alternate feed materials are processed at the Mill, and will be discharged to the Mill tailings management system in the same way as the non-uranium constituents from ores and other alternate feed materials.

The majority of the soluble mineral salts will be converted to sulfate salt forms in the leach system. This includes the three oxides that comprise up to half of the material, which are insoluble in water, but will react with sulfuric acid to form soluble sulfate salts. The soluble sulfate forms are stable and non-reactive and will be removed from the circuit in post-leach steps and discharged to the Mill's tailings management system.

All the non-uranium components of the material will eventually be discharged to the tailings management system. Components that are removed as tailings solids will be discharged to Cell 4A or Cell 3, as discussed above. Process solutions will be discharged to whichever of the basins are being used for evaporation of Mill solutions at the time of processing.

All the known Uranium Material components in their anticipated mineral states are compatible with, or will be converted by reaction with, aqueous sulfuric acid, which will be used for leaching the Uranium Material, and with any other chemicals and materials to which they may be exposed in the Mill following the leach circuit.

It should be noted that he Mill has previously processed thousands of tons of alternate feed materials comprised of residuals from tantalum, niobium and rare earth recovery operations similar to the Silmet Facility, including:

- Cabot alternate feed (tantalum and niobium)
- Fansteel alternate feed (tantalum and niobium)

Each of these alternate feed materials contained a comparable, or even broader, spectrum of columbite, tantalite or other rare earth element constituents as the Silmet Uranium Material.

Individual components in the Uranium Material have been grouped into classes of constituents, and discussed below.

5.2 Organic Constituents

5.2.1 Volatile Organic Compounds

The Uranium Material consists of acid digestion residuals from inorganic mineral ores, which have subsequently been oxidized in a calcining rotary kiln at temperatures above 1000°F. The only constituents remaining in the material following calcining are metals and inorganic ionic species in their highest oxidation states. No volatile organic constituents can reasonably be expected to be present in the Uranium Material.

5.2.2 Semi-Volatile Organic Compounds

The Uranium Material consists of acid digestion residuals from inorganic mineral ores, which have subsequently been oxidized in a calcining rotary kiln at temperatures above 1000°F. The only constituents remaining in the material following calcining are metals and inorganic ionic species in their highest oxidation states. No semi-volatile organic constituents can reasonably be expected to be present in the Uranium Material.

5.3 Inorganic Constituents

Analyses of inorganic constituents is provided in the analytical reports included with the RMPR and summarized in Attachments D.1 of the RMPR.

5.3.1 Non-Metal Inorganic Compounds

As discussed above, the residues that form the Uranium Material were calcined at elevated temperature in rotary kilns. At elevated temperatures tantalum and niobium, in addition to reacting with oxygen to form oxides, are capable of absorbing atmospheric hydrogen and nitrogen into their metal lattices. Other accessory metals in the ores and concentrates also absorb hydrogen and nitrogen. Nitrogen is expected to be present at trace to low levels in both the reduced (ammonia N) and/or oxidized (nitrate/nitrite) forms.

Ammonia as N

Ammonia nitrogen was present at very trace levels, averaging 66 mg/kg in the ALS analyses.

Anhydrous ammonia gas or high concentrations of ammonium hydroxide solutions are incompatible with strong oxidizers, halogen gases, acids, and salts of silver and zinc. The very low levels of ammonia nitrogen will not be present as anhydrous ammonia gas or ammonium hydroxide and will not contact halogen gases at any time in the Mill process. If traces of ammonia are present in the reactive form (ammonium hydroxide) it will be at concentrations too low to react with the silver and zinc already present in the Mill tailings management system, or with the moderate oxidizer that may be added in the Mill acid leach circuit.

Nitrate/Nitrite as N

Nitrate is extremely soluble in nearly all mineral forms. In the Uranium Material nitrate/nitrite nitrogen was present at minute levels, averaging 0.1 mg/kg in the ALS analyses. It was not analyzed in the Silmet mineral assays.

Nitrate nitrogen has been introduced into the Mill's circuit with natural ores and alternate feed materials at levels as high as 350,000 mg/kg. The Mill has handled these compounds in the Mill circuit and tailings management system with no adverse process, environmental, or safety issues. The extremely low levels identified of nitrate/nitrite nitrogen identified in the ALS reports are inconsequential in comparison.

Phosphorus

Phosphorus is naturally present as a component of several of the accessory minerals commonly co-present in the tantalum and niobium ores.

The trace levels in the insolubles from the niobium and tantalum digestion were converted in the calciner to trace levels of the oxide P_2O_5, averaging approximately 0.6 percent in the Uranium Material. These low levels will react to form soluble ions in the sulfuric acid.

Fluorides

Fluoride is present as a residual of the hydrofluoric acid used at the Facility in digestion of tantalum and niobium ores. It is also a component of several of the accessory minerals commonly co-present in the tantalum and niobium ores. The average fluoride level analyzed in the Uranium Material was 4,923 mg/kg. This level is well within the level present in other alternate feed materials already approved for processing at the Mill, such as the Fansteel alternate feed material, which contained concentrations ranging up to 396,000 mg/kg.

Fluorides have been introduced into the Mill's circuit with natural ores and alternate feed materials at levels as high as 460,000 mg/kg. The Mill has handled fluoride compounds in the Mill circuit and tailings management system with no adverse process, environmental, or safety issues.

Chlorides

Chloride is a component of several of the accessory minerals commonly co-present in the tantalum and niobium ores. The average chloride level analyzed in the Uranium Material was less than 16 mg/kg. Chloride has been introduced into the Mill with other alternate feed materials, at concentrations ranging up to 89,900 mg/kg. The Mill has handled chloride compounds in the Mill circuit and tailings system with no adverse process, environmental, or safety issues.

In conclusion, all of the anions in the Uranium Material have been introduced into the Mill at levels greater than those identified in the analytical data and assay data. A summary of the anion content of previous alternate feed materials, and the source of the feed information, has been tabulated in the attached Table 5.

5.3.2 Metals

As mentioned above, chemical form (mineral oxide) data for the calcined residues was available from Silmet's internal quality control laboratory. Additional metals, ions and RCRA parameter data was produced in 2019. Data from both these sources was used to tabulate the types of inorganic constituents in the Uranium Material. These constituents can be categorized based on their elemental characteristics and chemical properties as indicated in Table 2.

Table 2: Classes of Metals in Silmet Uranium Material

Class	Component of the Uranium Material
Alkali Metals	Sodium, Potassium
Alkaline Earths	Barium, Beryllium, Calcium, Magnesium
Transition Metals	Cadmium, Chromium, Cobalt, Copper, Iron, Manganese, Mercury, Molybdenum, Nickel, Silver, Thallium, Vanadium, Zinc, Zirconium
Other Metals	Aluminum, Lead, Tin
Metalloids	Arsenic, Selenium
Rare Earth Elements	Cerium, dysprosium, gadolinium, lanthanum, neodymium, samarium, scandium, ytterbium, yttrium

All species listed in Table 2, above, are natural constituents in tantalum and niobium ores, are expected to be present in the concentrates processed, and the calcined residues produced, at the Facility.

As discussed above, in addition to the elemental analyses performed by ALS, Silmet routinely analyzed samples of the Uranium Material for their actual mineral composition, that is, the compound form(s) in which each constituent is present. Sufficient data and process knowledge of the Facility exists to reasonably assess the chemical forms for each constituent, as discussed under each class of constituents, below.

None of the incompatibilities described below or in Table 3 are applicable to the components as they will be present in the Uranium Material. None of the components will be present in pure or concentrated reduced metal form or as pure or concentrated metal oxides. None of the fluoridated, sulfite, or cyanide, compound or hydroxylated (caustic) forms in Table 3 of the alkali metals or alkaline earths are expected to be present. None of the components will be exposed to any of the incompatible agents identified in the table.

Alkali Metals

The alkaline earth metals, sodium, and potassium are components of many of the accessory minerals commonly co-present in the tantalum and niobium ores. All are expected to be present in the concentrates processed, and the calcined residues produced, at the Facility. The two oxide forms identified by Silmet, K_2O and Na_2O, comprise together, on average, less than 3 percent of the mass of material. Both will be converted to soluble sulfates in the leach acid.

Alkaline Earths

The alkali metals, barium, beryllium, calcium, and magnesium are components of many of the accessory minerals commonly co-present in the tantalum and niobium ores. All are expected to be present in the concentrates processed, and the calcined residues produced, at the Facility. Barium, calcium and magnesium were identified in their oxide mineral forms in the calcined Uranium Material. Barium, calcium and magnesium together comprise approximately 5 percent of the mass of Uranium Material. Beryllium, analyzed in metal form in the ALS reports, can be assumed to be in its oxide form as well. In the ALS data, beryllium ranged from 200 to 2,000 times lower in concentration than any of other alkali metals, and was likely too low to be quantifiable in the mineral assays.

Although in some circumstances, the introduction of oxides of the alkaline earths in sufficient quantities into an acid leach circuit has the potential to result in unwanted excess chemical reactivity, this situation will not occur from the processing of the Uranium Material at the Mill. As described above, none of the alkaline earths will be present as pure metals. Although they have been oxidized in the calcining process at the Facility and are in the oxide state, they are present at low concentrations, will be diluted either during drum emptying, leaching, or both, and none will be present at pure or high levels anywhere in the Mill's circuit. Hazards associated with pure metals and pure oxides are not applicable and will not be discussed further.

All other compound and complex forms of the alkaline earths anticipated in the Uranium Material are compatible with either acid or alkaline leach solutions and any other process chemicals to which they may be exposed in the Mill circuit. They will be removed as sulfates or other insoluble salts, and discharged to the tailings management system. They do not pose any incompatibility hazards in the Mill process.

Data from a recent sample of Cell 4A indicates that barium has been introduced into the Mill process and to Cell 4A tailings. Barium concentrations as high as 43,000 ppm, or 10 times higher than the levels in the Uranium Material, have been processed at the Mill with no adverse process effects, environmental impacts, or safety issues. Incompatible materials listed for barium sulfate include phosphorous and aluminum. The barium will not be exposed to these materials, and the addition of sulfuric acid at the Mill will not create any additional worker safety or environmental hazards from contact with barium.

Transition Metals

The transition metals, cadmium, chromium, cobalt, copper, iron, manganese, mercury, molybdenum, nickel, silver, thallium, vanadium, zinc and zirconium are components of many of the accessory minerals commonly co-present in the tantalum and niobium ores. All are expected to be present in the concentrates processed, and the calcined residues produced, at the Facility. Based on the Silmet mineral assay data, all of these components are present in oxide forms as a result of the calcining step at the Facility. However, none of their oxides were present at greater than 0.5% in the Silmet assay, oxides of mercury, cadmium, silver, thallium, vanadium, were below the detection limit of 0.02% (200 ppm) in the assay results. This is generally consistent with the low levels detected in the ALS data.

Although in some circumstances, the introduction of oxides of the transition metals in sufficient quantities into an acid leach circuit has the potential to result in unwanted excess chemical reactivity, this situation will not occur from the processing of the Uranium Material at the Mill. As described above, none of the transition metals will be present as pure metals, or at pure or high concentrations in the highest oxidation state (oxide) form. Hazards associated with pure metals and high concentration oxides are not applicable and will not be discussed further.

All other compound and complex forms of the transition metals anticipated in the Uranium Material are compatible with acid leach solutions, and any other process chemicals to which they may be exposed in the Mill circuit. Their very low levels will be removed as sulfates or other insoluble salts, and discharged to the tailings management system. They do not pose any incompatibility hazards in the Mill process.

Other Metals

The other metals, aluminum, lead, and tin, are components of many of the accessory minerals commonly co-present in the tantalum and niobium ores. All are expected to be present in the concentrates processed, and the calcined residues produced, at the Facility. As indicated by the Silmet assay data, these metals are present in their oxide forms, as a result of the calcining step at the Facility.

Both the ALS data and Silmet assays show lead present at comparable levels, on average 0.4 percent in the ALS data, and 0.5 percent lead oxide (0.46 percent lead) in the assay data.

Aluminum averaged 12.7 percent aluminum oxide (6.7 percent aluminum average, 9 percent maximum) in the assay data. The ALS data averaged lower, at 0.44 percent average aluminum and 1.1 percent maximum).

Tin averaged 15.6 percent tin oxide 12.2 percent tin average, 21 percent maximum) in the assay data. The ALS data averaged much lower, at 0.001 percent average tin and 0.01 percent maximum).

Manufacturers' Safety Data Sheets ("SDSs") and National Institute of Occupational Safety and Health ("NIOSH") safety hazard information indicate that the metals aluminum lead and tin, and their lower oxides, are incompatible with strong oxidizers, halogen gases, and some acids.

The Mill sometimes adds oxidants to the leaching system to improve uranium recovery from some types of feeds. Sodium chlorate, the typical oxidizing agent used in the Mill's leach circuit, is a moderately effective oxidizer. It will be introduced in relatively weak aqueous solution in the leach system, not in concentrate.

The oxides of lead and aluminum react aggressively with strong mineral acids such as nitric acid or combinations of nitric and sulfuric acids. Sulfuric acid used at the Mill is a relatively weak acid (compared to nitric or phosphoric acid) and not an oxidizing acid. Aluminum oxides would be converted to sulfates in the leach step and removed from the system and transferred to the tailings management system.

As described above, neither of these metals will be present as pure metals. Both will be present initially as oxides, and subsequently as sulfates once reacted with sulfuric acid. Hazards associated with pure metals are not applicable and will not be discussed further.

All other compound and complex forms of these two metals are compatible with acid leach solutions and any other process chemicals to which they may be exposed in the Mill circuit. They will be dissolved or precipitated as sulfate salts, and discharged to the tailings. They do not pose any incompatibility hazards in the Mill process.

The Mill has previously processed alternate feed materials with comparable levels of aluminum and tin, ranging up to 13 percent aluminum and 2 percent tin, with no incompatibility issues in the Mill process. The Mill has processed alternate feed materials with substantially higher levels of lead, such as the Molycorp lead-iron filter cake alternate feed material with up to 23.6 percent lead, with no adverse effects to workers, the Mill process or the environment.

Metalloids

The metalloids, arsenic and selenium, are components of many of the accessory minerals commonly co-present in the tantalum and niobium ores. All are expected to be present in the concentrates processed, and the calcined residues produced, at the Facility.

In the Silmet assay data, selenium oxides averaged no more than 0.2 percent of the mass of the Uranium Material, with one of the two oxides being below detection limit in all samples. In the ALS data, selenium was below detection limit in all of the 15 samples. Arsenic oxides were at levels below the detection limit of 0.02 percent in all the Silmet assay samples.

Although in some circumstances, the introduction of oxides of the metalloids in sufficient quantities into an acid leach circuit has the potential to result in unwanted excess chemical reactivity, this situation will not occur from the processing of the Uranium Material at the Mill. As discussed above, none of the metalloids will be present as pure metals, and the minimal concentrations of oxides identified in the available data are too low to be of any concern in the Mill circuit. Hazards associated with pure metals and oxides will not be discussed further.

All other compound and complex forms of the metalloids anticipated in the Uranium Material are compatible with acid leach solutions and any other process chemicals to which they may be exposed in the Mill circuit. They will be removed as sulfates or other insoluble salts, and discharged to the tailings management system. They do not pose any incompatibility hazards in the Mill process.

Rare Earth Elements

The rare earth elements, cerium, dysprosium, gadolinium, lanthanum, neodymium, samarium, scandium, ytterbium, and yttrium are components of many of the accessory minerals commonly co-present in the tantalum and niobium ores. All are expected to be present in the concentrates processed, and the calcined residues produced, at the Facility. The Mill has previously processed thousands of tons of alternate feed materials comprised of residuals from tantalum, niobium and rare earth recovery, including:

- Cabot alternate feed (tantalum and niobium)
- Fansteel alternate feed (tantalum and niobium)

Each of these alternate feed materials contained similar, or even broader spectrum of rare earth element constituents as the Uranium Material. Every one of the rare earth components of the Uranium Material has been introduced into the Mill circuits at levels greater than those in the Uranium Material, with no adverse effects to workers, the Mill process or the environment.

6.0 Potential Worker Safety Issues

The Uranium Material is expected to have an average moisture content of less than 1 percent. The Mill is equipped with drum-emptying equipment at several locations, in both the main circuit and alternate feed circuit, and Mill personnel are experienced in the use of several different mechanisms to control dusting while emptying drums containing dry, powdered material such as the Uranium Material. Dust management for the Uranium Material, as required, may include:

- emptying of the drums within an enclosure with water sprays,
- wetting of the drum contents before emptying and remove of the material as a moist cake, or
- emptying the drums submerged.

If required, the most appropriate method will be determined based on inspection of the material condition after receipt at the Mill.

7.0 Radiation Safety

The Uranium Material is derived from the extraction of concentrates of tanatalum and niobium ores. The Uranium Material contains the same radionuclides as previously approved alternate feed materials received from rare earth, tantalum or niobium recovery facilities, at varying concentrations. The derived air concentrations ("DACs"), radiation protection measures, and emissions control measures used for ores and other alternate feed materials at the Mill are sufficiently protective for the processing of the Uranium Material. The Mill plans to manage the Uranium Material under a thorium-specific Standard Operating Procedure ("SOP") developed for feeds with elevated thorium content.

It should be noted that when the Uranium Material is managed under the additional precautions in the thorium-specific SOP, the procedures in the SOP will also protect workers from any potentially elevated levels of metal oxides or other components of the calcined product from emptying of the feed drums through disposal in the tailings system.

8.0 Potential Air Emissions Impacts

The introduction of a solid powder like the Uranium Material to any process may produce two potential forms of air emissions: fugitive dusts, and/or hazardous gases. Discussions in the previous sections demonstrate that engineering controls already in place at the Mill will prevent the generation or dispersion of both of these types of emissions. The Uranium Material will have a moisture content of less than 1 percent. As described in Section 4.0 and 6.0, above, one of a number of available wet methods for dust control will be applied during emptying of the drum contents, to minimize generation of radionuclide- or chemical containing-dusts and vapors. In addition, once introduced into the Mill, the constituents in the material will almost immediately be converted to sulfates or other stable aqueous ionic forms, which are non-volatile and produce no off gases.

Because the metals and ions in the Uranium Material are present at ppm levels or fractional percent levels, they are not expected to generate a significant increase in load on the existing demisters or air pollution control devices even if they reach the air control system as solids from potential spills in the pre-leach area.

9.0 Potential Effects on Tailings Management System

9.1 Tailings Cell Liner Material Compatibility

9.1.1 Effect on Tailings Composition

The Uranium Material will be received as a calcined dry solid powder product from the rotary calciners and rotary coolers at the Facility. A portion of this material may be insoluble in the acid leach process at the Mill and therefore, the discharge sent to tailings may contain some solid material. The remainder of the Uranium Material will be soluble and therefore be contained in the liquid phase after processing in the leach system. Tailings from processing of the Uranium Material will be sent to one of the active tailings cells at the Mill, Cell 3 or Cell 4A. Subsequent to the closure of Cell 3 tailings could be sent to Cell 4B or to a similarly designed new cell, depending on the timing of material shipments, and the status of the cells of the tailings management system at the time of receipt. For the purposes of this assessment, it has been assumed that the tailings from the Uranium Material will be transferred to Cell 4A.

The solutions from the Uranium Material tailings will be recirculated through the Mill process for reuse. The solids will be only a portion of the total mass of Uranium Material sent to the Mill from the Facility. However, assuming a worst-case scenario that all of the solid material ends up in the tailings, the additional load to the tailings management system will be minimal.

Cell 4A was placed into service in October of 2008 and received conventional ore tailings solids and, since July 2009, conventional ore tailings solutions. Cell 4B was authorized for use and placed into service in February 2011. Cell 4B, to date, has been used only as an evaporation pond. Hence, for this analysis, it is reasonable to use known information on the composition of Cell 4A and/or Cell 3.

Cell 3 is a mature cell, later in its operational life cycle, and contains a larger volume/mass of tailings, and relatively higher concentrations of most constituents than newer cells. Cell 4A is a newer cell, early in its operational life, and contains a lower volume/mass of tailings and relatively low concentrations of most constituents. As mentioned earlier in Sections 4.0 and 9.1, the filling of Cell 3 is nearing completion and the majority, or all, of the tailings from the Uranium Material is most likely to be placed in Cell 4A. However, Cell 3 provides a reasonable representation of the relative concentrations of constituents that can be expected to be seen in Cell 4A later in its operating life. Therefore, for comparison purposes, the effect of the Uranium Material on the concentrations in the tailings management system was prepared for both Cell 4A and Cell 3.

The constituents in the tailings solids and liquids resulting from the processing of Uranium Materials are not expected to be significantly different from those resulting from processing of conventional ores or previously approved alternate feed materials. The Uranium Material contains generally lower concentrations of every constituent than has been received in previously approved alternate feed materials, in many cases two or more orders of magnitude lower than other alternate feed materials. Tables 4-1 and 4-2, which provide the potential tailings composition Cells 4A, and Cell 3, respectively before and after processing of the Uranium Material, indicate that all of the constituents found in the Uranium Material have been processed in the Mill's main circuit and/or the alternate feed circuit and are present in the tailings system.

As described above, it is expected that most of the metal and non-metal components entering the leach system with the Uranium Material will be converted to sulfate ions, precipitated, and eventually discharged to the tailings management system.

Every metal and non-metal cation and anion component in the Uranium Material already exists in the Mill's tailings management system and/or is analyzed under the GW monitoring program.

Every component in the Uranium Material has been:

1. detected in analyses of the tailings cells liquids;
2. detected in analyses of tailings cells solids;
3. detected in analyses of alternate feed materials licensed for processing at the Mill; or
4. detected in process streams or intermediate products when previous alternate feed materials were processed at the Mill; at concentrations that are generally comparable or higher than the concentrations in the Uranium Material.

As can be seen from Tables 4-1, the constituents in the Uranium Material are estimated to raise the current concentration in Cell 4A by no more than a few mg/L, and for many constituents, due to the low levels in the Uranium Material, the resulting concentration in tailings is expected to go down, in some cases significantly.

based on the calculations in Table 4-1, lead concentrations may increase up to 14.9 mg/L 127%) compared to the currently estimated concentration of lead in Cell 4A.Over its operating life, Cell 4A is expected to receive up to 1.9 million tons of tailings solids from ores and alternate feed materials, and the eventual resulting concentration of lead will be much lower. When Cell 4A is later in its operational life cycle, the relative effect of the Uranium Material residuals on lead concentration in the tailings management system will more resemble the effect calculated based on Cell 3 (an increase of approximately one third (36%) above the current concentrations, as indicated in Table 4-2. This represents an actual increase over the life of Cell 4A, as represented by Cell 3, of 3.4 mg/L (36%).

Additionally, it should be noted that, the maximum lead content of 4,100 mg/kg in the Uranium Material is substantially lower than the elevated lead levels of previously approved alternate feed materials such as Molycorp and others, which have ranged up to 236,000 mg/kg, and the anticipated quantity of Uranium Material is far lower than the quantities of those alternate feed materials.

Similarly, over the life of Cell 4A, the effects of the Uranium Material on the concentration of barium, will also be more like the effects shown in Table 4-2 for Cell 3. That is, the concentration may be expected to increase 1.6 mg/L (1,590%) when considering Cell 4A. However, this percentage increase represents and actual increase of only 0.4 mg/L (71%) when considering Cell 3 concentrations as representative of the future composition of Cell 4A.

The chemistry of the tailings management system would limit the mobility of barium due to the abundance of sulfate in the tailings cells. The insolubility of barium in the presence of sulfate is generally consistent regardless of the liquid medium. That is, the solubility of barium sulfate in cold water is 0.022 mg/L and in concentrated sulfuric acid is 0.025 mg/L (Handbook of Chemistry and Physics, 68th Edition). At the listed concentrations of sulfate in the tailings solutions (67,600 mg/L to 87,100 mg/L in Cell 4A), a change in the ambient barium concentration in the tailings solutions 0.4 mg/L, or even 1.6 mg/L would be negligible.

9.1.2 Liner Resistivity and Suitability

As discussed above, the majority, or all, of the tailings from the Uranium Material is expected to be placed in Cell 4A. For the purpose of completeness, the evaluation below addressed both Cell 3 and Cell 4A.

Cell 3 was constructed with a polyvinyl chloride ("PVC") membrane liner. Cell 4A (as well as Cell 4B) has a high-density polyethylene ("HDPE") liner.

Mitchell (1985) studied the chemical resistivity of both PVC and HDPE at a pH range of 1.5 to 2.5 standard units using sulfuric acid. This study concluded that PVC performed satisfactorily under these conditions, HDPE performed better, and both were structurally stable under these acidic conditions. Haxo, et. al. (EPA 1991) evaluated the performance of PVC (s well as other vinyl and polyethylene liner materials) in leachate solutions containing metals, salts and volatile hydrocarbons, such as chloroform. Although most of the materials softened during the first 12 months of exposure, due to the normal wetting process when exposed to solutions, the PVC and some of the ethylene materials subsequently re-hardened and recovered and retained their tensile properties for the long-term performance.

According to Gulec, et al. (2005), a study on the degradation of HDPE liners under acidic conditions (synthetic acid mine drainage), HDPE was found to be chemically resistant to solutions similar to the tailings solutions at the Mill. Battelle Laboratories (Farnsworth and Hymas, 1989) studied the performance of five synthetic geomembrane liner materials in a complex synthetic solution at elevated temperatures of 90°C (194°F), containing high levels of anions, including fluoride, nitrite, sulfate and phosphate ions, along with over 20 of the same metals and metal oxides found in the Mill's tailings and the Uranium Material. In the post-immersion stress/break tests after 120 days exposure, HDPE was determined to be the best performing material of all those tested.

It can be concluded that the PVC liner of Cell 3 and the HDPE liners of Cell 4A are suitable for the chemical and mineral composition of tailings expected from the Uranium Material in the sulfuric acid conditions to be encountered in the tailings management system

9.1.3 Conclusions Regarding Tailings Management System Effects

The constituents in the Uranium Material, are expected to produce no incremental additional environmental, health, or safety impacts in the Mill's tailings management system beyond those produced by the Mill's processing of natural ores or previously approved alternate feed materials. Since the impacts of all the constituents on the tailings management system are already anticipated for normal Mill operations, and permitted under the Mill's license, they have not been re-addressed in this evaluation.

10.0 Groundwater Monitoring Program

The chemical and radiological make-up of the Uranium Material is similar to other ores and alternate feed materials processed at the Mill, and their resulting tailings will have the chemical composition of typical process tailings from the ores and previously approved feeds, for which the Mill's tailings management system was designed.

Specifically, each of the constituents of the Uranium Material

- is monitored under the Mill's current Groundwater Permit, or
- has been evaluated in the environmental evaluations for one or more previously approved alternate feed materials, and it has been determined that one or more analytes monitored under the Groundwater Permit is an effective indicator for the constituent.

With respect to barium, as discussed above, given the strong tendency of barium to partition to solids, especially in the presence of sulfate in the Mill's tailings management system, there is no reasonable potential for barium to migrate to ground water from the tailings management system at the Mill in the unlikely event of a leak in the tailings cells. Calcium Kd value in UDEQ Statement of Basis for the permit (December 1, 2004) contains published Kd values for calcium of 5 to 100 L/kg for sandy to clayey soils. The Kd for barium is 100 to 150,000 L/kg for the same soil types indicating less mobility in groundwater, and it has therefore been concluded that barium is sufficiently represented by monitoring for calcium and has identified no technical reason to add barium to the list of constituents monitored in ground water in the vicinity of the tailings management system

As a result, the existing groundwater monitoring program at the Mill will be adequate to detect any potential future impacts to groundwater for any constituent in the Uranium Material.

11.0 Conclusions and Recommendations

While elevated levels of certain constituents in the Uranium Material may be present, no additional material management requirements during handling and processing will be needed. The Mill has successfully implemented processing of previous alternate feed materials with similar or higher concentrations of each constituent contained in the Uranium Material. For example, the Mill has successfully processed and recovered uranium from tantalum and niobium recovery residuals, uranium-bearing salts, calcium fluoride precipitates, recycled metals, metal oxides, and calcified product, all of which posed potential chemical reactivity and material handling issues comparable to or more significant than those associated with this Uranium Material.

Based on the foregoing information, it can be concluded that:

1. All the constituents in the Uranium Material have either been reported to be, or can be assumed to be, already present in the Mill tailings management system or were reported in other alternate feed materials processed at the Mill, at levels generally comparable to those reported in the Uranium Material.

2. All the constituents in the Uranium Material have either been reported to be, or can be assumed to be, previously introduced into the Mill process, with no adverse effects to the process, or worker health and safety.

3. All the known impurities in the Uranium Material have either been reported to be, or can be assumed to be, previously introduced into the Mill tailings management system, with no adverse effects to the tailings management system, or human health and safety.

4. The Uranium Material will raise the respective concentrations of most constituents in tailings by a fractional percent or a few parts per million to 10 parts per million. In the case of most other analytes, the resulting concentrations of constituents in tailings will be reduced

5. While the Uranium Material is elevated in lead, it is orders of magnitude lower in concentration than previously approved alternate feed materials, and the quantity of Uranium Material is far lower than those feeds. Over the life of Cell 4A, the Uranium Material may raise the concentration of lead 3 to 4 mg/L.

6. The levels of barium in the Uranium material may raise the concentration of Cell 4A 1.6 mg/L, or over its lifetime, 0.4 mg/L. These levels are insignificant compared to the sulfate levels of any cell in the tailings management system, which precipitates barium in immobile forms.

7. There will be no significant incremental environmental impacts from the processing of Uranium Material beyond those that are already anticipated in the Environmental Impact Statements for the Mill.

8. Spill response and control measures designed to minimize particulate radionuclide hazards will be more than sufficient to manage chemical hazards from the constituents of the Uranium Material.

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Table 3: Incompatibilities and Chemical Hazards for Components of Uranium Material

Component	Chemical Symbol	Maximum Concentration (mg/kg)	Incompatibilities	Will constituent be present in this chemical form?	Will constituent be exposed to these incompatible agents?
Aluminum	Al	11,000	As Al_2O_3 – chlorine trifluoride, hot chlorinated rubber, acids, oxidizers	As di-aluminum trioxide	Sulfuric acid only. Al_2O_3 will not be present at greater than 1%, and will be consumed by the overabundance of sulfuric in the leach system.
			As Al – Strong oxidizers and acids, halogenated hydrocarbons	No	None present except sulfuric acid. Al is not present as reduced Al, but as aluminum oxide.
			As pure powder - varies	No	---
			As Al salts and alkyls - varies	No. Aqueous solutions on ly	---
Ammonia	NH4	190	Strong oxidizers, halogens, acids, salts of silver and zinc	No. Will only be present as ammonium oxides, hydrates.	None present except sulfuric acid. NH4 will only be present at low levels as ammonium oxides and hydrates.
Arsenic	As	11	As metal and inorganic compounds – strong oxidizers, bromine azide	Yes. As inorganic salts	No. None present except moderate oxidizers only, if used.
			As organic compounds - varies	No.	---
			As AsH_3 (arsine) – strong oxidizers, chlorine, nitric acid	No.	No. Mild oxidizer only if used.
Barium	Ba	550	As Barium oxides – reacts with water to form hydroxides; reacts with N_2O_4, hydroxylamines, SO_3, H_2S	Will be in oxide form.	No.
Beryllium	Be	6.9	As BeO – gives off toxic gases in fire	No.	---
Cadmium	Cd	28	As CdO – reacts with magnesium, decomposes on heating to form cadmium fumes	No.	No.
Calcium	Ca	13,000	As Ca oxides – react with water	No.	Water only.
			As Ca hydroxides – react with water	No.	No.
			As $CaSO_4$ – diazomethane, aluminum, phosphorous, water	No.	Water only.
			As $CaSiO_3$ or $CaOSiO_2$ – none listed	No.	---
Cerium	Ce		None listed	---	---
Chloride	Cl^-	110	As inorganic salts – none. As phosphorus pentachloride – magnesium oxide	Only as trace inorganic salts. Not as phosphorus pentachloride.	No.

Table 3: Incompatibilities and Chemical Hazards for Components of Uranium Material

Component	Chemical Symbol	Maximum Concentration (mg/kg)	Incompatibilities	Will constituent be present in this chemical form?	Will constituent be exposed to these incompatible agents?
Chromium	Cr	260	As CrO_2 - none	No.	---
			As CrO_3 – combustible materials (paper, wood, sulfur, aluminum, plastics)	No.	No.
Cobalt	Co	20	As CoO - none	No.	---
Copper	Cu	860	As CuO – acetylene, zirconium	No.	No.
Fluoride	F	20,000	Varies with compound form. As inorganic salts - none	Yes.	---
Iron	Fe	20,000	As Fe_2O_3 – calcium hypochlorite, carbon monoxide, hydrogen peroxide	No.	No.
			As $Fe_2(SO_4)_3$ – decomposes at high temperature	No.	No.
			As $As_2Fe_2O_6$ – decomposes on heating to yield fumes of arsenic and iron	No.	No.
Lanthanum	La	7,700	None listed	---	---
Lead	Pb	6,100	As PbO – strong oxidants, aluminum powder, sodium; also decomposes on heating to form lead fumes	No.	No. None present except moderate oxidizers only, if used.
Magnesium	Mg	4,200	As $MgCO_3$ – acids, formaldehyde	No.	None present except sulfuric acid. No issues: Mg will not be present in the carbonate form.
			As MgO – chlorine, trifluoride, phosphorus pentachloride	No.	No.
Manganese	Mn	4,400	As $Mn(OH)_3$ MN_2O_3, MnO - none	No.	---
Mercury	Hg	0.88	As metal and inorganic compounds – acetylene, ammonia, chlorine dioxide, azides, calcium, sodium carbide, lithium, rubidium, copper	No. Will be present as oxide only.	No.
			As organic compounds – strong oxidizers such as chlorine gas	No.	No.
Molybdenum	Mo	4.8	As metal – strong oxidizers	No.	No. Moderate oxidizers only, if used.
			As soluble compounds - varies	Yes.	---
Nickel	Ni	150	As NiO- iodine, H_2S	No.	No.
Niobium	Nb	2,300	As metal – hydrofluoric acid, hydrofluoric-nitric	No.	No.

Table 3: Incompatibilities and Chemical Hazards for Components of Uranium Material

Component	Chemical Symbol	Maximum Concentration (mg/kg)	Incompatibilities	Will constituent be present in this chemical form?	Will constituent be exposed to these incompatible agents?
			acid mixtures, cold fluorine; or chlorine, bromine or halocarbons above 200°C.		
Nitrates/Nitrites	NOx	0.18	None reported	Yes.	---
Phosphorus	P	4,400	As P – oxidizers, halogens;	No.	No.
			As PCl_3 – water, reactive metals, nitric acid, acetic acid, organic matter	No.	No.
			As PCl_5 - Water, magnesium oxide, chemically-active metals such as sodium, potassium, alkalis, amines	No.	No.
			As P_2S_5 - Water, alcohols, strong oxidizers, acids, alkalis	No.	No.
			As PH_3 - Air, oxidizers, chlorine, acids, moisture, halogenated hydrocarbons, copper	No.	No.
			As $POCl_3$ - Water, combustible materials, carbon disulfide, dimethyl-formamide, metals (except nickel, lead	No.	No.
			As P2O5 - Strong caustics, most metals	Yes.	No.
Potassium	K	7,200	As KCN – strong oxidizers (such as acids, acid salts, chlorates, and nitrates).	No.	No.
			As KOH - acids, water, metals, halogenated hydrocarbons, maleic anhydride. Will not be present in these forms.	No.	No. None present except water and sulfuric acid. No issues. K2O will only be present at low (less than percent) levels.
Silver	Ag	7.6	As Ag_2O – fire and explosion hazard with organic material or ammonia	No.	No. Will not be exposed to ammonia in circuit.
Sodium	Na	13,000	As Na_2AlF_6 – strong oxidizers	No.	No. Moderate oxidizers only, if used
			As NaN_3 – acids, metals, water	No.	No. None present except sulfuric acid. No issues: Na will not be present as sodium azide (NaN_3)
			As Sodium bisulfate (dry product) - heat	No.	No.
			As NaCN – strong oxidizers (such as acids, acid salts, chlorates, nitrates)	No.	No.
			As NaF – strong oxidizers	No.	No.
			As Sodium fluoroacetate – none reported	No.	---

Table 3: Incompatibilities and Chemical Hazards for Components of Uranium Material

Component	Chemical Symbol	Maximum Concentration (mg/kg)	Incompatibilities	Will constituent be present in this chemical form?	Will constituent be exposed to these incompatible agents?
			As NaOH – water, acids, flammable liquids, organic halogens, aluminum, tin, zinc, nitromethane	No.	No. None present except sulfuric acid. No issues: NaO will be present at extremely low levels.
			As sodium metabisulfite - heat	No.	---
Sulfate	SO_4	18,000	As calcium sulfate - Diazomethane, aluminum, phosphorus, water	Will only be present in inorganic salt form.	Water only.
			As ferrous sulfate – alkalies, soluble carbonates, oxidizing materials	No.	No.
			As ferrous sulfate – carbon steel, brass, nylon	No.	No.
Tantalum	Ta	440	As metal or metal oxide dust – strong oxidizers, bromine trifluoride, fluorine	Will be present as tantalum pentoxide.	No. Moderate oxidizers only, if used
Thallium	Tl	5.2	Varies with compound	Will only be present in wet filter cake or aqueous solution.	---
Thorium	Th	9,200	As thorium dicarbide – with sodium chlorate	Will be present as thorium dioxide.	No.
Tin	Sn	120	As metal – chlorine, turpentine, acids, alkalies	No. Will be present as tin oxides.	No. Tin will not be present as pure metal. In the oxide form It will be consumed by the overabundance of sulfuric acid in the leach system.
Titanium	Ti	12,600	None listed	---	---
Vanadium	V	18	As dust or fume - lithium, chlorine trifluoride	No.	No.
Ytterbium	Yb	13,300	None listed	---	---
Yttrium	Y	22,200	As metal - oxidizers	No.	Moderate oxidizers only, if used
Zinc	Zn	180	As ZnO - none	No.	---
Zirconium	Zr	5,100	As metal – potassium nitrate, oxidizers.	No. Will be present as zirconium oxides.	No. Moderate oxidizers only, if used

Note: None of the above incompatibilities are applicable to the components as they will be present in the Uranium Material. None of the components will be present in pure/reduced metal form or as pure high concentration metal oxides. None of the components will be exposed to any of the incompatible agents identified in the table.

Values for cerium, lanthanum, phosphorus, titanium, tungsten, ytterbium and yttrium were estimated from mineral composition data from NEO internal quality laboratory. All other values are from ALS 2018 report.

Sources: NIOSH Pocket Guide to Chemical Hazards accessed September 2018; Wiley Guide to Chemical Incompatibilities Richard Pohanish & S. Greene 2009

Table 4-1 Comparison of Uranium Material to Tailings and Alternate Feeds - Cell 4A

Component	A Estimated Average Conc. in Uranium Material (mg/kg or ppm)[1]	B Estimated Mass in Uranium Material (tons)[2]	C Conc. Range in Mill Tailings before Processing Uranium Material (mg/L or *ppm*)[3A]	D Estimated Average Conc. in Mill Tailings before Processing Uranium Material (mg/L or ppm)[3B, 3C]	E Estimated Current Analyte Mass in Mill Tailings (tons)[4]	F Mass in Mill Tailings after Uranium Material Processing (tons)[5]	G Conc. in Mill Tailings after Uranium Material Processing (ppm)[6]	H Difference between Column G and D (Incremental Increase in Mill Tailings Conc. after Uranium Material Processing) (ppm)[7]	I Increase in Mill Tailings Conc. after Uranium Material Processing (%)[8]	J Conc. in Ores and Other Alternate Feed Materials (mg/kg or ppm)[9]
Inorganic Nitrogen[10]	65.9	0.14	31-9133	3,410	2,046	2,046.1	3,398	-12.2	-0.4	350,000 [11]
Chloride	15.6	0.03	4530-10,100	6,489	3,893	3,893.4	6,465	-23.6	-0.4	89,900 [11]
Fluoride	4,937	10.86	0.3-2,030	962.6	578	588.4	977	14.5	1.5	460,000 [11]
Phosphorus as phosphate	2,600	Not analyzed in Mill tailings								65,000 [11]
Aluminum (Al)	4,427	9.74	1,510	1,510	906	915.7	1,521	10.7	0.7	2,000-160,000
Arsenic (As)	5.0	0.01	60.5-626	143	86	85.8	142	-0.5	-0.4	3.5-16,130
Barium (Ba)	435	0.96	0.10	0.10	0.06	1.0	1.7	1.6	1588.8	21-36,200
Beryllium (Be)	1.8	0.00	0.167-0.538	0.30	0.2	0.2	0.3	0.005	1.8	1-105
Cadmium (Cd)	2.6	0.01	0.844-3.85	2.4	1	1.4	2.4	0.001	0.04	0.004-59,000
Calcium (Ca)	4,912	10.81	445-707	604	362	373.0	619	15.7	2.6	up to 217,000
Cobalt (Co)	3	0.01	9.44-41	27.0	16	16.2	27	-0.1	-0.3	9-350,400
Chromium (Cr)	89.1	0.20	3.22-9.35	6.37	4	4.0	6.7	0.3	4.7	8-16,000
Copper (Cu)	74	0.16	99.2-683	428	257	257.0	427	-1.3	-0.3	8-296,000
Iron (Fe)	8,767	19.29	2280-5320	3,350	2,010	2,029.3	3,370	19.8	0.6	up to 164,000
Lead (Pb)	4,093	9.00	5.27-16.4	12	7	16.0	27	14.9	127.4	9-236,000
Magnesium (Mg)	1,242	2.73	2,230-7,030	4,064.00	2,438	2,441.1	4,054	-10.3	-0.3	1,020-43,400
Manganese (Mn)	1,458	3.21	112-307	187	112	115.2	191	4.6	2.5	172-3,070
Mercury (Hg)	0.14	0.00	0.0008-0.015	0.004	0.002	0.002	0.004	0.0005	14.6	0.0004-14
Molybdenum (Mo)	2.3	0.01	24.2-59.1	39.6	24	23.8	39	-0.1	-0.3	12-17,000
Nickel (Ni)	52	0.11	17.1-71.9	49	29	29.5	49	0.01	0.02	7-450,000
Potassium (K)	1,480	3.26	558-2020	1,138.0	683	686.1	1,139	1.2	0.1	17-7,740
Silver (Ag)	3.6	0.01	0.078-0.521	0.24	0.14	0.1	0.2	0.012	5.2	0.007-90.8
Thallium (Tl)	1.3	0.00	0.162-0.727	0.37	0.22	0.2	0.4	0.003	0.9	0.02-960
Tin (Sn)	89	0.20	0.0696	0.0696	0.04	0.2	0.4	0.325	466.8	116,000
Vanadium (V)	7.4	0.02	237-1,090	732	439	438.9	729	-2.6	-0.4	10-25,000
Zinc (Zn)	88	0.19	142-406	250,900	150,540	150,540.2	249,984	-916.3	-0.4	8-14,500
Zirconium (Zr)	1,885	4.15	2.53	2.53	1.5	5.7	9.4	6.9	271.8	8-14,500

Table 4-1 Comparison of Uranium Material to Tailings and Alternate Feeds - Cell 4A

Notes to Table 4:

1. The concentration in the Uranium Material is from 2018 ALS Laboratory data. Values reported as less than (<) were used as reported.
2. Estimated mass in the Uranium Material is calculated by multiplying column B by an assumed 2,200 dry tons of Uranium Material.
3. Cell 4A Mill tailings range and average concentrations were taken from Mill tailings samples to date, as summarized in the Annual Tailngs Characterization Report except for Al, Ba, Sn and Zr. These metals were analyzed by AWAL Laboratories in additional samples collected in 2019.
4. Estimated current mass in Mill tailings Cell 4A is approximately 600,000 dry tons.
5. Mass in Mill tailings after Uranium Material processing is calculated by adding columns B and E.
6. The concentration in Mill tailings after Uranium Material processing is calculated by dividing column F by 602,200, which is the existing volume of tailings in Cell 4A of 600,000 dry tons plus the assumed 2,200 dry tons of Uranium Material.
7. The increase in Mill tailings concentration after Uranium Material processing (ppm) shows the increase (decrease) in concentration of each constituent in the Mill's tailings, stated in ppm of the total mass of tailings in Cell 4A, which is calculated as the difference between column G and column D.
8. The increase in Mill tailings concentration after Uranium Material processing is the ratio of Column D to Column H expressed in %
9. The concentration in other alternate feeds represents some selected concentrations for constituents found in characterization data for other alternate feed materials licensed for processing at the Mill, for comparison purposes.
10. Inorganic nitrogen shown here is the sum of ammonia nitrogen and nitrate/nitrite nitrogen.
11. Sources of data for cations in other feeds is provided in Table 5.

Table 4-2

Comparison of Uranium Material to Tailings and Alternate Feeds - Cell 3

Component	A Estimated Average Conc. in Uranium Material (mg/kg or ppm)[1]	B Estimated Mass in Uranium Material (tons)[2]	C Conc. Range in Mill Tailings before Processing Uranium Material (mg/L or *ppm*)[3A]	D Estimated Average Conc. in Mill Tailings before Processing Uranium Material (mg/L or ppm)[3B, 3C]	E Estimated Current Analyte Mass in Mill Tailings (tons)[4]	F Mass in Mill Tailings after Uranium Material Processing (tons)[5]	G Conc. in Mill Tailings after Uranium Material Processing (ppm)[6]	H Difference between Column G and D (Incremental Increase in Mill Tailings Conc. after Uranium Material Processing) (ppm)[7]	I Increase in Mill Tailings Conc. after Uranium Material Processing (%)[8]	J Conc. in Ores and Other Alternate Feed Materials (mg/kg or ppm)[9]
Inorganic Nitrogen[10]	65.9	0.14	29-10,600	6,945	18,166	18,166.2	6,939	-5.8	-0.1	350,000 [11]
Chloride	15.6	0.03	2,460-115,000	26,545	69,434	69,433.8	26,523	-22.3	-0.1	89,900 [11]
Fluoride	4,937	10.86	0.6-46,500	5,873	15,362	15,372.9	5,872	-0.8	-0.01	460,000 [11]
Phosphorus as phosphate	2,600	Not analyzed in Mill tailings								65,000 [11]
Aluminum (Al)	4,427	9.74	330-2530	1,827	4,779	4,788.6	1,829	2.2	0.1	2,000-160,000
Arsenic (As)	5.0	0.01	0.87-489	120.6	315	315.5	121	-0.1	-0.1	3.5-16,130
Barium (Ba)	435	0.96	0.021-0.1	0.048	0	1.1	0	0.4	761.5	21-36,200
Beryllium (Be)	1.8	0.00	0.21-12.5	1.89	5	4.95	2	0.000	0.0	1-105
Cadmium (Cd)	2.6	0.01	1.19-52.1	14.0	37	36.6	14	-0.010	-0.07	0.004-59,000
Calcium (Ca)	4,912	10.81	148-887	488	1,276	1,287.3	492	3.7	0.8	up to 217,000
Cobalt (Co)	3	0.01	4.44-120	62	162	162.2	62	0.0	-0.1	9-350,400
Chromium (Cr)	89.1	0.20	2.38-76.2	19.2	50	50.4	19	0.1	0.3	8-16,000
Copper (Cu)	74	0.16	9.72-3,000	589	1,541	1,540.8	589	-0.4	-0.1	8-296,000
Iron (Fe)	8,767	19.29	262-15,400	5,543	14,499	14,518.1	5,546	2.7	0.0	up to 164,000
Lead (Pb)	4,093	9.00	15.8-20.5	9.6	25	34.1	13	3.4	35.7	9-236,000
Magnesium (Mg)	1,242	2.73	1,910-84,400	18,031	47,164	47,166.4	18,017	-14.1	-0.1	1,020-43,400
Manganese (Mn)	1,458	3.21	82-5,690	1,435	3,754	3,756.7	1,435	0.02	0.001	172-3,070
Mercury (Hg)	0.14	0.00	0.0024-0.873	0.173	0	0.453	0	-0.00003	-0.01	0.0004-14
Molybdenum (Mo)	2.3	0.01	0.014-209	51.6	135	135.0	52	0.0	-0.08	12-17,000
Nickel (Ni)	52	0.11	7.22-241	96	252	251.7	96	-0.04	-0.04	7-450,000
Potassium (K)	1,480	3.26	133-6657	2,223	5,815	5,818.0	2,222	-0.62	-0.03	17-7,740
Silver (Ag)	3.6	0.01	0.101-6.78	2.01	5	5.27	2	0.001	0.07	0.007-90.8
Thallium (Tl)	1.3	0.00	0.021-4.7	1.31	3	3.43	1	0.000	0.0	0.02-960
Tin (Sn)	89	0.20	<5.0	5.0	13	13.3	5	0.071	1.4	116,000
Vanadium (V)	7.4	0.02	5.6-10,300	1,880	4,918	4,917.5	1,878	-1.6	-0.1	10-25,000
Zinc (Zn)	88	0.19	142-406	2,100	5,493	5,493.2	2,098	-1.7	-0.1	8-14,500
Zirconium (Zr)	1,885	4.15	2.3-38.5	12.20	32	36.1	14	1.6	12.9	8-14,500

Table 4-2 Comparison of Uranium Material to Tailings and Alternate Feeds - Cell 3

Notes to Table 4:

1. The concentration in the Uranium Material is from 2018 ALS Laboratory data. Values reported as less than (<) were used as reported.
2. Estimated mass in the Uranium Material is calculated by multiplying column B by an assumed 2,200 dry tons of Uranium Material.
3. Cell 3 Mill tailings range and average concentrations were taken from Mill tailings samples to date, as summarized in the Annual Tailngs Characterization Report Values for Al, Ba, Sn, and Zr were taken from Utah SOB for initial Utah GW Discharge Permit
4. Estimated current mass in Mill tailings Cell 3 is approximately 2,615,700 dry tons based on Mill tailings cell capacity estimate 2019.
5. Mass in Mill tailings after Uranium Material processing is calculated by adding columns B and E.
6. The concentration in Mill tailings after Uranium Material processing is calculated by dividing column F by 2,617,900, which is the existing volume of tailings in Cell 3 of 2,615,700 dry tons plus the assumed 2,200 dry tons of Uranium Material.
7. The increase in Mill tailings concentration after Uranium Material processing (ppm) shows the increase (decrease) in concentration of each constituent in the Mill's tailings, stated in ppm of the total mass of tailings in Cell 3, which is calculated as the difference between column G and column D.
8. The increase in Mill tailings concentration after Uranium Material processing is the ratio of Column D to Column H expressed in %
9. The concentration in other alternate feeds represents some selected concentrations for constituents found in characterization data for other alternate feed materials licensed for processing at the Mill, for comparison purposes.
10. Inorganic nitrogen shown here is the sum of ammonia nitrogen and nitrate/nitrite nitrogen.
11. Sources of data for cations in other feeds is provided in Table 5.

Table 5
Chemicals Present in Alternate Feeds

Chemical	Value in Tailings Table 4 for Concentration in Other Alternate Feeds	Supporting or Additional Information	Source
Inorganic Nitrates	350,000 mg/kg	35% (350,000 mg/kg) in Cameco Regen Product alternate feed	Section II of Regen Product MSDS
Ammonia Nitrogen	Used as Mill reagent at 100% anhydrous.	A 108,000 pound (31,000 gallon) inventory of 100% anhydrous ammonia is used to prepare concentrated ammonia solutions introduced into the yellowcake precipitation area. Ammonia in this form is added far downstream of feed area and is never in contact with ores or feeds. (These concentrations far exceed those of the alternate feed.)	Mill process description, 1991 RML renewal application and 2007 RML renewal application
Barium	36,244 mg/kg	36.2 % in Molycorp Mt. Pass drummed material alternate feed	Molycorp characterization data in amendment request December 2000.
Chloride	89,900 mg/kg	Maximum sample from Molycorp ponds alternate feed, 89,900 mg/kg	TTLC table from December 2000 Molycorp Amendment Request
Fluoride	460,000 mg/kg	Honeywell/Converdyne/Allied Signal alternate feed, up to 2% U, 98% calcium fluoride and fluoride impurities (48% or 480,000 mg/kg F based on all being as CaF_2)	MSDS for CaF_2 product.
Phosphorus as Phosphate	65,000 mg/kg	Cameco Calcined alternate feed, 8 to 20% as PO_4^{-3} (2.6 to 6.5% or 26,000 to 65,000 mg/kg)	MSDS for Cameco Calcined Product

Attachment 6
Cross Index to DWMRC Interrogatory Template for Review of License Amendment Requests and Environmental Reports under UAC R313-24

Cross Index to UAC R313-24 Interrogatory Template

DRC Interrogatory Number	Topic	Regulatory Basis	Where Addressed in This Document	Where Addressed in Other Documents
UAC R313-24-3-01A/01	Environmental Analysis - Radiological and Nonradiological impacts	UAC R313-24-3	Section 1.0-1.4, 2.3, 2.5, 4.1, Attachment 5	ER Lic. App 3.1-3.10; ER Cell 4B 9.0
	Geology and Soils (Land)	RG 3.8, Section 6.1.4.1	Section 4.1	ER Lic. App. 3.4.1-3.4.4, 3.5; Rec Plan 1.6; ER Cell 4B 6.0
	Exposure Pathways	RG 3.8, Section 5.2.1	Section 4.1	ER Lic. App. 3.13.2.2, Figure 3.13-1; Dames and Moore 5.2; ER Cell 4B 10.1
	Liquid Effluents	RG 3.8, Section 5.2.2	Section 4.1, 4.6, 4.8	Rec. Plan 2.2.3.2; Dames and Moore 5.2
	Airborne Effluents	RG 3.8, Section 5.2.3	Section 4.1, 4.8	GW Permit App. 2.6; Dames and Moore 2.7.4, Dames and Moore 5.2
	Direct Radiation	RG 3.8, Section 5.2.4	Section 2.4, 4.1, 4.9, 4.10	Dames and Moore 2.7.4
	Effects of Sanitary and Other Waste Discharges	RG 3.8, Section 5.4	Section 4.1	Dames and Moore 5.4
	Other Effects	RG 3.8, Section 5.5	Section 4.1, 4.2.2	Dames and Moore 5.5
	Hazard Assessment	NUREG-1620, Section 4.3.3.1	Section 4.1, Attachment 4	GW Permit App. 2.6-2.7
	Exposure Assessment	NUREG-1620, Section 4.3.3.2	Section 4.1	GW Permit App. 2.6-2.7
	Accidents	DG-3024, Section 6	Section 4.1, 4.2.3	ER Lic. App. 4.0
	Mill Accidents Involving Radioactivity	RG 3.8, Section 7.1	Section 4.1, 4.4.1	ER Lic. App. 4.0
	Other Accidents	RG 3.8, Section 7.3	Section 4.1, 4.2.3	ER Lic. App. 4.0
	Summary of Annual Radiation Doses	RG 3.8, Section 5.2.5	Section 4.1	ER Lic. App Tables 3.13-3, 3.13-4
UAC R313-24-3-01B/01	Environmental Analysis - Impact on Waterways and Groundwater	UAC R313-24-3	Section 4.1, 4.6, 4.7	GW Permit App. 2.5-2.7; ER Cell 4B 10.0
	Surface Water	RG 3.8, Section 6.1.1	Section 4.1, 4.7	ER Lic. App. 3.7.1.1-3.7.1.3; Rec Plan 1.4.1-1.4.3, 1.7.5.5
	Physical and Chemical Parameters (Ground Water)	RG 3.8, Section 6.1.2.2	Section 4.1, 4.6, Attachment 4	GWDP Table 2
UAC R313-24-3-01C/01	Environmental Analysis - Alternatives	UAC R313-24-3	Section 4.1, 4.14	ER Lic. App. 2.0-2.4
	Alternatives to the Proposed Action	RG 3.8, Section 10	Section 4.1, 4.14	ER Lic. App 2.1, 2.4
	Benefit - Cost Analysis	RG 3.8, Section 11	Section 4.1, 4.13	ER Lic. App. 5.0; Rec Plan Attachment C
UAC R313-24-3-01D/01	Environmental Analysis - Long-Term Impacts	UAC R313-24-3	Section 4.1, 4.5.3, 4.11	ER Lic. App. 5.0; ER Cell 4B 14.0
	Mill Decommissioning	DG-3024, Section 8.1	Section 4.1, 4.5.3	Rec. Plan 3.2.3,
	Site and Tailings Reclamation	DG-3024, Section 8.2	Section 4.1, 4.5.3	Rec. Plan 3.2.1, 3.2.2.;
	Decommissioning and Reclamation	RG 3.8, Section 9	Section 4.1, 4.5.3	Rec. Plan Attachment A, 3.2.1, 3.2.2

Cross Index to UAC R313-24 Interrogatory Template

DRC Interrogatory Number	Topic	Regulatory Basis	Where Addressed in This Document	Where Addressed in Other Documents
	Decommissioning Plan for Land and Structures	NUREG-1620, Section 5.2.3	Section 4.1, 4.5.3	Rec. Plan 3.2.1
10CFR40.26(c)(2)-02/01	General License	UAC R313-24-4		Satisfied by ongoing compliance with mill license
10CFR40.31(H)-03/01	Application for Specific Licenses	UAC R313-24-4		Satisfied by ongoing compliance with mill license
	Corporate Organization and Administrative Procedures	DG-3024, Section 5.1	Section 4.1, Section 4.12	Satisfied by ongoing compliance with mill license
	Management Control Program	DG-3024, Section 5.2	Section 4.1, Section 4.12	Satisfied by ongoing compliance with mill license
	Management Audit and Inspection Program	DG-3024, Section 5.3	Section 4.1, Section 4.12	Satisfied by ongoing compliance with mill license
	Qualifications	DG-3024, Section 5.4	Section 4.1, Section 4.12	Satisfied by ongoing compliance with mill license
	Training	DG-3024, Section 5.5	Section 4.1, 4.4, 4.10.2, 4.12	Satisfied by ongoing compliance with mill license
	Security	DG-3024, Section 5.6	Section 4.1, 4.12	Satisfied by ongoing compliance with mill license
	Quality Assurance	DG-3024, Section 7	Section 4.1	Satisfied by ongoing compliance with mill license
	References	DG-3024	Section 4.1	Satisfied by ongoing compliance with mill license
10CFR40.4(c)-04/01	Terms and Conditions of Licenses	UAC R313-24-4	Section 4.1	Satisfied by ongoing compliance with mill license
10CFR40.40.42(K)(3)(I)-05/01	Expiration, Termination, Decommissioning	UAC R313-24-4	Section 4.1	Satisfied by ongoing compliance with mill license
10CFR40.61-06/01	Records	UAC R313-24-4		Satisfied by ongoing compliance with mill license
10CFR40.65(A)(1)-07/01	Effluent Monitoring Reporting Requirements	UAC R313-24-4	Section 4.1	Rec. Plan 1.7.5.4
	Mill Effluent Monitoring (Proposed Operational Monitoring Program	RG 3.8, Section 6.2.1.1	Section 4.1	Rec. Plan 1.7.5.4
	Enviromental Radiological Monitoring (Proposed Operational Monitoring Program)	RG 3.8, Section 6.2.1.2	Section 4.1	Rec Plan 2.3.2.1 9 (c), (d); ER Cell 4B 10.4
	Meteorological Monitoring (Proposed Operational Monitoring Program)	RG 3.8, Section 6.2.3	Section 4.1	Rec. Plan 1.1.1-1.1.3, 2.3.2.1(d), 1.7.5.6; ER Cell 4B 2.2
10CFR40.INTRODUCTION-08/01	Capacity of Tailings or Waste Systems Over the Lifetime of Mill Operations	UAC R313-24-4	Section 4.1, 4.5.2	GW Permit App. 2.15.2.3

Cross Index to UAC R313-24 Interrogatory Template

DRC Interrogatory Number	Topic	Regulatory Basis	Where Addressed in This Document	Where Addressed in Other Documents
10CFR40APPENDIX A, Introduction-09/01	Alternative Requirements	UAC R313-24-4	Section 4.1	ER Lic. App 2.1-2.4
10CFR40 APPENDIX A, CRITERION 1-10/01	Permanent Isolation Without Ongoing Maintenance	UAC R313-24-4	Section 4.1, 4.5.3	Rec Plan 3.2.3.1
	Slope Stability	NUREG-1620, Section 2.2.3	Section 4.1, 4.5.3	Rec Plan 3.3.6
	Settlement	NUREG-1620, Section 2.3.3	Section 4.1, 4.5.3	Rec Plan 3.3.6
	Liquidifacation Potential	NUREG-1620, Section 2.4.3	Section 4.1, 4.5.3	Rec Plan 3.3.6
10CFR40, APPENDIX A, CRITERION 2-11/01	Proliferation	UAC R313-24-4	Section 4.1	Rec Plan 3.3.6
10CFR40, APPENDIX A, CRITERION 3-12/01	Placement Below Grade	UAC R313-24-4	Section 4.1	GW Permit App. 2.5.1.5
10CFR40, APPENDIX A, CRITERION 4-13/01	Location and Design Requirements	UAC R313-24-4	Section 4.1	Rec. Plan 3.1
	Site Location and Layout	RG 3.8, Section 2.1	Section 4.1	Rec Plan 1.1, Figure 3.2-1; ER Lic. App 3.2
	Site Area	RG 3.8 Section 3.1	Section 4.1	Rec Plan 1.1, Figure 1-2, Figure 3.2-1
	Geography	DG-3024, Section 2.1.1	Section 4.1	Rec Plan 1.1-1.3
	Land Use and Demographic Surveys (Land)	RG 3.8, Section 6.1.4.2	Section 4.1	FES 2.5; ER Cell 4B 3.0
	Uses of Adjacent Lands and Waters	RG 3.8, Section 2.2	Section 4.1	FES 2.5; ER Cell 4B 3.0
	Population Distribution	RG 3.8, Section 2.3	Section 4.1	ER Lic. App. Figure 3.9-1; FES 2.4.1.2; ER Cell 4B 4.0
	Demography	DG-3024, Section 2.1.2	Section 4.1	FES 2.4.1.2, 2.4.1.3, 2.4.2
	Meteorology	RG 3.8, Section 2.8	Section 4.1	Rec Plan 1.1, 1.7.5.6; ER Cell 4B 2.0
		DG-3024, Section 2.2	Section 4.1	Rec Plan 1.1, 1.7.5.6; ER Cell 4B 2.0
		RG 3.8, Section 6.1.3.1	Section 4.1	Rec Plan 1.1, 1.7.5.6; ER Cell 4B 2.0
	Models (Air)	RG 3.8, Section 6.1.3.2	Section 4.1	ER Lic App. 3.3.2
	Geology and Soils	RG 3.8, Section 2.5	Section 4.1	Rec Plan 1.6
		DG-3204, Section 2.4.1	Section 4.1	Rec Plan 1.6
	Seismology	RG 3.8, Section 2.6	Section 4.1	Rec Plan 1.6.2.4, 1.6.2.5
		DG-3024, Section 2.4.2	Section 4.1	Rec Plan 1.6.3, 1.6.3.1, 1.6.3.2
	Hydrological Description of Site	NUREG-1620, Section 3.1.3	Section 4.1	Rec Plan 1.5.1.2, 1.5.1.3, Figure 1.5-1, 1.5-3; ER Cell 4B Appendix A
	Surface Water (Hydrology)	RG 3.8, Section 2.7.2	Section 4.1	GWDP I.F.10

Cross Index to UAC R313-24 Interrogatory Template

DRC Interrogatory Number	Topic	Regulatory Basis	Where Addressed in This Document	Where Addressed in Other Documents
		DG-3024, Section 2.3.2	Section 4.1	GWDP I.F.10
	Flooding Determinations	NUREG-1620, Section 3.2.3	Section 4.1	GW Permit App. 2.13
	Surface Water Profiles, Channel Velocities, and Shear Stresses	NUREG-1620, Section 3.3.3	Section 4.1	GW Permit App. 2.4
	Ground Water (Hydrology)	RG 3.8 Section 2.7.1	Section 4.1	Rec Plan 1.5.1.2, 1.5.1.3, Figure 1.5-1, 1.5-3
		DG-3024, Section 2.3.1	Section 4.1	Rec Plan 1.5.1.2, 1.5.1.3, Figure 1.5-1, 1.5-3
	Radiological Surveys	RG 3.8, Section 6.1	Section 4.1	ER Cell 4B 10.3-10.4
	Site and Uranium Mill Tailings Characteristics	NUREG-1620, Section 2.1.3	Section 4.1, 4.5.1, Attachment 5	Rec. Plan 2.2
	Disposal Cell Cover Engineering Design	NUREG-1620, Section 2.5.3	Section 4.5.3	GW Permit App. 2.7.2.4; Rec Plan 3.2.2.1
	Design of Erosion Protection Covers	NUREG-1620, Section 3.5.3	Section 4.5.3	GW Permit App. 2.7.2.4; Rec Plan 3.2.2.1, 3.3.5
10CFR40, APPENDIX A, CRITERION 5A(1)-14/01	Groundwater Protection Standards	UAC R313-24-4, NUREG-1620 section 4.2.3	Section 4.1, 4.6, Attachment 5	GWDP I.A Table 1, I.B, I.C Table 2, I.E
10CFR40, APPENDIX A, CRITERION 5A(2)-15/01	Liner	UAC R313-24-4	Section 4.1, 4.6, Attachment 5	GWDP I.D.2, I.E.8 (c), I.E.7(f)
10CFR40, APPENDIX A, CRITERION 5A(3)-16/01	Exemption from Groundwater Protection Standards	UAC R313-24-4	Section 4.6, Attachment 5	Rec. Plan 2.3.1.1 (a)
10CFR, APPENDIX A, CRITERION 5A(4)-17/01	Prevent Overtopping	UAC R313-24-4	Section 4.1, 4.5.2	Rec Plan 2.2.3.1, 2.2.3.2
10CFR APPENDIX A, CRITERION 5A(5)-18/01	Dikes	UAC R313-24-4	Section 4.1	Rec Plan 2.2.3.1, 2.2.3.2
10CFR APPENDIX A, CRITERION 6(1)-19/01	Cover and Closure at End of Milling Operations	UAC R313-24-4	Section 4.1, 4.5.3	GW Permit App. 2.19
	Radon Attenuation	NUREG -1620, Section 5.1.3.1	Section 4.1, 4.5.3	GW Permit App. 2.19; Rec Plan 3.3.2
	Gamma Attenuation	NUREG-1620, Section 5.1.3.2	Section 4.1, 4.5.3	GW Permit App. 2.19; Rec Plan 3.3.2
	Cover Radioactivity Content	NUREG-1620, Section 5.1.3.3	Section 4.1, 4.5.3	GW Permit App. 2.19; Rec Plan 3.3.6, 3.3.8; ER Cell 4B Figure 13
10CFR40, APPENDIX A, CRITERION 6(2)-20/01	Verify Effectiveness of Final Radon Barrier	UAC R313-24-4	Section 4.1, 4.5.3	Rec Plan. 3.2, 3.2.3.1; GW Permit App. 2.19.4

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DRC Interrogatory Number	Topic	Regulatory Basis	Where Addressed in This Document	Where Addressed in Other Documents
10CFR40, APPENDIX A, CRITERION 6(3)-21/01	Phased Emplacement of Final Radon Barrier	UAC R313-24-4	Section 4.5.3	Rec Plan. 3.2, 3.2.3.1; ER Cell 4B Table 5
10CFR40, APPENDIX A, CRITERION 6(5)-23/01	Elevated Raduim Concentrations in cover Materials	UAC R313-24-4	Section 4.5.3	GW Permit App. 2.19; Rec Plan 3.3.6, 3.3.8
	Cover Radioactivity Content	NUREG-1620, Section 5.1.3.3	Section 4.1, 4.5.3	GW Permit App. 2.19; Rec Plan 3.3.6, 3.3.8; ER Cell 4B Figure 13
10CFR40, APPENDIX A, CRITERION 6(6)-24/01	Concentrations of Radionuclides other than Radium in Soil	UAC R313-24-4	Section 4.5.3	GW Permit App. 2.19; Rec Plan 3.3.5
	Background Radiological Characteristics	RG 3.8, Section 2.1	Section 4.1	Lic. App. 3.13.1; ER Cell 4B 9.0
10CFR40, APPENDIX A, CRITERION 6(7)-25/01	Nonradiological Hazards	UAC R313-24-4	Attachment 5	Dames and Moore 3.3.1; ER Cell 4B 9.0
	Regional Nonradiological Characteristics	RG 3.8, Section 2.11	Section 4.1	Dames and Moore 3.3.1; ER Cell 4B 9.0
	Concentrations of Nonradiocative Wastes	RG 3.8, Section 5.3	Section 4.5.1, Attachment 5	Dames and Moore 3.3.1; ER Cell 4B 9.0
10CFR40, APPENDIX A, CRITERION 6A(1)-26/01	Completion of Final Radon Barrier	UAC R313-24-4	Section 4.5.3	Rec Plan. 3.2, 3.2.3.1; GW Permit App. 2.19.4
10CFR40, APPENDIX A, CRITERION 6A(2)-27/01	Extending Time for Milestones Performance	UAC R313-24-4	Section 4.5.3	Rec Plan. 3.2, 3.2.3.1; GW Permit App. 2.19.4
10CFR40, APPENDIX A, CRITERION 6A(3)-28/01	Accepting Uranium Byproduct Material from Other Sources During Closure	UAC R313-24-4	Section 4.5.3	License Condition 9.11
10CFR40, APPENDIX A, CRITERION 7-29/01	Preoperational and Operational Monitoring Programs	UAC R313-24-4	Section 4.1	Rec Plan 2.3.2
10CFR40, APPENDIX A, CRITERION 8-30/01	Effluent Control During Operations	UAC R313-24-4	Section 4.1	GW Permit App. 2.15
	Gaseous and Airbourne Particulate Materials	DG-3024, Section 4.1	Section 4.1, Attachment 5	GW Permit App. 2.15
	Liquids and Solids	DG-3024, Section 4.2	Section 4.1	GW Permit App. 2.15
	Contaminated Equipment	DG-3024, Section 4.3	Section 4.1	GW Permit App. 2.15
	Sources of Mill Wastes and Effluents	RG 3.8, Section 3.4	Section 4.4	GW Permit App. 2.15; Dames and Moore 3.3
	Control of Mill Wastes and Effluents	RG 3.8, Section 3.5	Section 4.4	GW Permit App. 2.15; Dames and Moore 3.4
	Sanitary and Other Mill Waste Systems	RG 3.8 Section 3.6	Section 4.1	GW Permit App. 2.15; Dames and Moore 3.5
	Effluents in the Environment	RG 3.8, Section 5.1.2	Section 4.1	GW Permit App. 2.15; Dames and Moore 3.3
	Effluent Control Techniques	DG-3024, Section 5.7.1	Section 4.1	GW Permit App. 2.15; Dames and Moore 3.3
	External Radiation Exposure Monitoring Program	DG-3024, Section 5.7.2	Section 4.1	GW Permit App. 2.15

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	Airborne Radiation Monitoring Program	DG-3024, Section 5.7.3	Section 4.1	GW Permit App. 2.15; ER Lic. App 3.3.2
	Exposure Calculations	DG-3024, Section 5.7.4	Section 4.1	EFRI RPM
	Bioassay Program	DG-3024, Section 5.7.5	Section 4.1	EFRI RPM
	Contamination Control Program	DG-3024, Section 5.7.6	Section 4.1	EFRI RPM
	Airborne Effluent and Environmental Monitoring Programs	DG-3024, Section 5.7.7	Section 4.1	GW Permit App. 2.9; Dames and Moore 3.3; ER Cell 4B Appendix C
	Groundwater and Surface Water Monitoring Programs	DG-3024, Section 5.7.8	Section 4.1	GWDP I.E, I.F; ER Cell 4B 10.2; EFRI SOPs
	Control of Windblown Tailings and Ore	DG-3024, Section 5.7.9	Section 4.1	EFRI SOPs
10CFR40, APPENDIX A, CRITERION 8A-31/01	Daily Inspections	UAC R313-24-4	Section 4.1	EFRI SOPs; DMT Plan
10CFR40, APPENDIX A, CRITERION 9-32/01	Financial Surety Arrangements	UAC R313-24-4	Section 4.5.3	Annual Surety
	Financial Assurance	DG-3024, Section 8.3	Section 4.5.3	Annual Surety
	Maintaining Financial Surety	NUREG-1620, Section 4.4.3(10)	Section 4.5.3	Annual Surety
10CFR40, APPENDIX A, CRITERION 10-33/01	Costs of Long-Term Surveillance	UAC R313-24-4	Section 4.5.3	Annual Surety
UAC R317-6-6.1-34/01	Duty to Apply for a Groundwater Discharge Permit	UAC R313-24-4	Section 4.1, 4.6	GWDP IV.D
UAC R317-6-6.3-35/01	Groundwater Discharge Permit Application	UAC R313-24-4	Section 4.1, 4.6	GWDP IV
UAC R317-6.6.4-36/01	Issuance of Discharge Permit	UAC R313-24-4	Section 4.1, 4.6	GWDP IV
UAC R317-6-6.9-37/01	Permit Compliance Monitoring	UAC R313-24-4	Section 4.1, 4.6	GWDP III
	Examination of Compliance and Monitoring Program	NUREG -1620, Section 4.3.3.4	Section 4.1, 4.6	GWDP I.F.1
UAC R317-6-6.10-38/01	Background Water Quality Determination	UAC R313-24-4	Section 4.1, 4.6	GWDP I.B; ER Lic App. 3.7.3.2 (c)
UAC R317-6-6.10-39/01	Commencement and Discontinuance of Groundwater Discharge Operations	UAC R313-24-4	Section 4.6	GW Permit App. 2.19
UAC R317-6-6.12-40/01	Submission of Data	UAC R313-24-4	Section 4.6	GWDP I.F.1
UAC R317-6-6.13-41/01	Reporting of Mechanical Problems or Discharge System Failures	UAC R313-24-4	Section 4.6	GWDP I.G; GW Permit App 2.15
UAC R317-6-6.10-42/01	Correction of Adverse Effects	UAC R313-24-4	Section 4.6	GWDP I.G
	Corrective Action Assessment	NUREG-1620, Section 4.3.3.3	Section 4.6	GWDP I.G
UAC R317-6-6.10-43/01	Out-of-Compliance Status	UAC R313-24-4	Section 4.6	GWDP I.G

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UAC R317-6-6.10-44/01	Procedure When a Facility is Out-of-Compliance	UAC R313-24-4	Section 4.6	GWDP I.H
UAC R317-6-6.10-45/01	Groundwater Discharge Permit Transfer	UAC R313-24-4	Section 4.6	GWDP IV.L

Notes:
If not stated otherwise, section number refers to section in the license amendment application, not its attachments.

References:

GWDP - "*Ground Water Discharge Permit UGW370004*".

ER Cell 4B - "*Environmental Report in Support of Construction Tailings Cell 4B*". Revised and Resubmitted September 11, 2009

GW Permit App. - "*Permit Renewable Application. State of Utah Ground Water Discharge Permit NO. UGW370004*".

Rec. Plan - "*Reclamation Plan White Mesa Mill Blanding, Utah. Radioactive Material License NO. UT1900479 Most Recent Version*

ER Lic. App. - "*White Mesa Uranium Mill License Renewal Application. State of Utah Radioactive Materials License No. UT1900479*". *Volume 4 of 5 (Environmental Report).* February 28, 2007

Dames and Moore - "*Environmental Report. White Mesa Uranium Project. San Juan County, Utah for Energy Fuels Nuclear, Inc*". Prepared by Dames and Moore. January 30, 1978

FES - "*Final Environmental Statement related to operation of White Mesa Uranium Project. Energy Fuels Nuclear, Inc*". May 1979.

Annual Surety - *"Revised Cost Estimates for Reclamation of the White Mesa Mill and Tailings Management System".*

License Condition - "*Utah Department of Environmental Quality Division of Radiation Control Radioactive Material License*". License #UT1900479.

EFRI RPM - *"EFRI Radiation Protection Manual"*

EFRI SOPs - *"EFRI Standard Operating Procedures"*

EFRI DMT - *"EFRI Discharge Minimization Technology "*