

October 21, 2014

Mr. Jon Winter
Manager, Wyoming Environmental
and Regulatory Affairs
Uranium One Americas, Inc.
907 N. Poplar Street, Suite 260
Casper, WY 82601

SUBJECT: APPROVAL OF LICENSE AMENDMENT 3, REQUEST TO REDRY
HONEYMOON, AUSTRALIA DRIED YELLOWCAKE, URANIUM ONE, USA,
INC., WILLOW CREEK PROJECT, CAMPBELL AND JOHNSON COUNTIES,
WYOMING, MATERIALS LICENSE SUA-1341 (TAC NO. J00721)

Dear Mr. Winter:

The U.S. Nuclear Regulatory Commission (NRC) reviewed the Uranium One, USA, Inc. (Uranium One) license amendment request to redry dried yellowcake from the Honeymoon, Australia Project at its Willow Creek Project, Irigaray central processing plant. Uranium One requested the amendment in submissions dated February 28, 2014 (Agencywide Documents Access and Management System (ADAMS) ML14066A112), March 27, 2014 (ML14113A421), June 28, 2014 (ML14192B247), August 26, 2014 (ML14240A045), September 9, 2014 (ML14253A026) and October 2, 2014 (ML14275A443). The license amendment request to redry dried yellowcake from the Honeymoon, Australia Project is approved, with conditions.

The NRC staff's review is documented in the enclosed Safety Evaluation Report (SER) (Enclosure 1). The SER documents the NRC staff's conclusion that there is sufficient information to support the reasonable assurance finding that the equipment and process used to redry dried yellowcake is protective of public health, safety and the environment. As part of this reasonable assurance determination, the NRC will require the licensee to provide results of material testing for review and written verification before authorizing shipment of redried material. Materials License SUA-1341, Amendment No. 3, is enclosed (Enclosure 2) and has been amended to reflect the commitments made by Uranium One in its license amendment request. Uranium One agreed to the license amendment in correspondence dated October 3, 2014 (ML14276A462) and October 15, 2014 (ML14290A218).

This licensing action meets the categorical exclusion provisions in 10 CFR Part 51.22(c)(11). Therefore, no further environmental review is required for this action.

In accordance with 10 CFR 2.390 of the NRC's "Agency Rules of Practice and Procedure," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's ADAMS. ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

J. Winter

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If you have any questions regarding this action, please contact Mr. Ron Linton, the Project Manager for Source Material License SUA-1341, at 301-415-7777, or by e-mail at ron.linton@nrc.gov.

Sincerely,

/RA/

Andrew Persinko, Deputy Director
Division of Decommissioning, Uranium Recovery,
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

Docket No.: 040-08502

License No.: SUA-1341

Enclosures:

1. Safety Evaluation Report
2. License SUA-1341, Amendment No. 3

cc: Luke McMahan, PG. (WDEQ)

J. Winter

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SAFETY EVALUATION REPORT
URANIUM ONE USA, INC., LICENSE AMENDMENT REQUEST TO REDRY DRIED
YELLOWCAKE FROM HONEYMOON, AUSTRALIA AT THE WILLOW CREEK PROJECT,
JOHNSON AND CAMPBELL COUNTIES, WYOMING

DATE: October 21, 2014

DOCKET: 04008502

LICENSE NO.: SUA -1341

LICENSEE: Uranium One USA, Inc.

SITE: Willow Creek Project, Irigaray Facility

PROJECT MANAGER: Ron Linton

TECHNICAL REVIEWERS: Thomas McLaughlin, James Webb, Robert Evans, Ronald Burrows

SUBJECT: Uranium One, USA, Inc., Willow Creek Project, License Amendment Request to Redry Dried Yellowcake from Honeymoon Australia at the Willow Creek Project

BACKGROUND

Uranium One USA, Inc. (Uranium One or licensee) requested a license amendment for its Willow Creek Project, Nuclear Regulatory Commission (NRC) Materials License SUA-1341, to authorize the redrying of dried yellowcake from the Honeymoon, Australia (Honeymoon) uranium recovery Project. The Honeymoon Project is operated by a company affiliated with Uranium One, Uranium One Australia Pty Ltd. In correspondence dated December 10, 2013, NRC staff was notified that the Honeymoon Project produced dried yellowcake that did not meet the specifications of Cameco's Blind River, Canada (Blind River) and ConverDyn's Metropolis, Illinois (ConverDyn) uranium conversion facilities for organic material content (Agencywide Documents Access and Management System (ADAMS) ML13350A032). In correspondence dated March 27, 2014, Uranium One stated that the organic material was from the Honeymoon solvent extraction process and that the Honeymoon vacuum dryer could not heat the material to a sufficiently high temperature to remove the organics from the yellowcake (ML14113A421). Uranium One's Willow Creek Project uses a dryer/calciner that is capable of reaching temperatures high enough to volatilize the organics such that the Honeymoon yellowcake would meet the specifications of the conversion facilities (ML14066A112).

The license amendment was requested in correspondence dated February 28, 2014 (ML14066A112). NRC staff acknowledged receipt of the amendment request on March 6, 2014 (ML14065A139). Uranium One supplemented its request in correspondence dated March 27, 2014 (ML14113A421). NRC accepted the amendment for review and requested additional information on June 10, 2014 (ML14153A634). Uranium One responded to NRC's information

request with supplemental information dated June 28, 2014 (ML14192B247). Uranium One provided additional information and commitments in correspondence dated August 26, 2014 (ML14240A045), September 9, 2014 (ML14253A026) and October 2, 2014 (ML14275A443). The request to redry dried Honeymoon, Australia yellowcake dated February 28, 2014 (ML14066A112), March 27, 2014 (ML14113A421), June 28, 2014 (ML14192B247), August 26, 2014 (ML14240A045), September 9, 2014 (ML14253A026) and October 2, 2014 (ML14275A443) is hereafter referred to as the amendment application.

NRC staff notified Uranium One in correspondence dated December 24, 2013, that under its current material license SUA-1341, there were no restrictions in license SUA-1341 to prohibit the transfer, possession, or storage of yellowcake from the Honeymoon Project to the Willow Creek Project. However, if yellowcake from the Honeymoon Project is stored and possessed at the Willow Creek Project, the material is required to be transferred, possessed, handled, and stored according to the requirements in the NRC's Willow Creek Project license SUA-1341 and NRC regulations to ensure the protection of public health, safety, and the environment (ML13358A155). Drums of dried Honeymoon yellowcake located at Honeymoon, Blind River and ConverDyn were shipped to Uranium One's Willow Creek Project, Irigaray central processing plant (CPP) for storage.

Subsequent to receiving this amendment request, the NRC staff received a notification from Uranium One that on September 9, 2014, a drum of yellowcake shipped from its Willow Creek facility to the ConverDyn Metropolis, Illinois, conversion facility resulted in a release of yellowcake due to pressurization of the yellowcake drum (ML14258A133). Uranium One is in the process of determining the root cause of this incident (ML14276A107). This incident is similar in nature to two previous incidents occurring in June 2012 and April 1998 (ML12187A734, ML12340A473), except that the most recent event occurred even though Uranium One maintained a minimum of 24 hours of cooling and venting of the yellowcake drums prior to shipping as discussed in NRC Information Notice 1999-03, Rev. 1 (ML14028A175). Therefore, in addition to removing the residual organic material in the yellowcake from the Honeymoon Project, this amendment will also provide a technical foundation for ensuring the yellowcake from the Honeymoon Project is chemically stable for shipping offsite and thus does not present an increased potential for radiological accidents.

REGULATORY REQUIREMENTS

The Willow Creek Project operates under NRC license SUA-1341, which requires the licensee to abide by commitments made in its License Application. The license also contains license condition 9.6 that requires the licensee to establish procedures to follow when handling radioactive materials. Uranium One is requesting an amendment to:

- Modify Section 3.4.1.4 of the approved License Renewal Application ("LRA," which is incorporated by reference into condition 9.3 of the license) to allow redrying dry yellowcake in addition to processing of uranium-laden resin and slurry materials from other ISR [insitu recovery] operations; and
- Modify Condition [license condition] 9.3 to add language that states that the 4.5 hour [dryer] retention time does not apply to the redrying of the Honeymoon yellowcake.

The NRC staff reviewed Uranium One's amendment request to redry dried yellowcake from the Honeymoon Project at its Willow Creek Project in accordance with requirements in 10 CFR Part 40, Appendix A, 10 CFR Part 20 and guidance in NUREG-1569, "Standard Review Plan for In Situ Leach Uranium Extraction License Applications," in determining elements to be included in the license amendment review. The results of the NRC staff's review are documented in this Safety Evaluation Report (SER).

TECHNICAL EVALUATION

Honeymoon Yellowcake Chemistry & Compatibility

The licensee stated in its amendment application that the Honeymoon Project uses an older solvent extraction process for the recovery of uranium due to the presence of very high total dissolved solids in the ground water. The solvents used in the extraction process include di-2-ethyl-hexyl-phosphoric acid, Alamine 336 (Alamine 336 is a water insoluble tri-octyl/dodecyl amine capable of forming oil soluble salts of anionic species at low pH), tri-butyl-phosphonate, iso-decanol, and kerosene. The dryer at Honeymoon is an oil-heated vacuum dryer operated at less than 200 °C and is not hot enough to remove all the residual organics carried over from the strip solution to the final precipitated yellowcake.

The licensee stated that the Blind River facility has a yellowcake quality specification of 0.10% by weight for hexane extractable organics. Several drums of the Honeymoon yellowcake exceed this quality specification. Uranium One has determined that the Honeymoon yellowcake with high residual organics can be redried in their dryer/calciner at the Willow Creek Project. The Willow Creek dryer/calciner can operate at a range of temperatures between 93 °C to 649°C. The licensee determined that proper temperature and retention time will be key factors in reducing the residual organics. The combustion products that may be created during the burning of the residual organics in the Honeymoon yellowcake would include carbon monoxide, carbon dioxide, and water vapor.

Uranium One stated in the amendment application that it has conducted two bench tests to determine the appropriate drying temperature and retention time to redry the Honeymoon yellowcake. The first test was done by the laboratory at Blind River using a hot plate and a beaker containing Honeymoon yellowcake. An exothermic reaction was noted along with a color change as the temperature was increased. After heating, the yellowcake met the organic quality specification. A second bench test was conducted by Intermountain Laboratory using a muffle furnace to simulate the conditions inside the Willow Creek dryer/calciner and to more closely estimate the optimal temperature and residence time for removing the residual organics. The temperature of the muffle furnace ranged from 300 °C to 600 °C with a residence time of 2 hours. All of the heated samples met the organic quality specification.

Uranium One proposes to operate the Willow Creek dryer in the range of 300 °C to 500 °C with a proposed residence time of 1 to 2 hours. The initial operation will be conducted at 300 °C and a test run will be conducted with a single drum of the Honeymoon yellowcake. The redried yellowcake will be tested for residual organics using hexane extraction to see if it meets the conversion facility required quality specifications. If the specifications are not met, the dryer temperature will be increased in increments of 38 °C until the optimal temperature for reducing

the organics to acceptable levels is identified. The licensee has committed to testing redried yellowcake prior to shipment to a conversion facility.

The NRC staff has determined that this is an acceptable testing process for removing residual organics in the Honeymoon yellowcake since the Willow Creek dryer/calcliner has an operational history of running as high as 649 °C. NRC staff agrees with the licensee, based on their testing, that temperatures in the range of 300 °C to 500 °C will likely remove the organics from the yellowcake. NRC staff notes that the Willow Creek dryer/calcliner has operated at the Irigaray CPP for over 30 years and has been inspected periodically by NRC Region IV staff for compliance with Materials License SUA-1341 requirements (see NRC docket 040-08502 for previous inspection reports). NRC staff agrees with the licensee's proposal of determining the optimal temperature by testing of the first few drums of redried yellowcake.

However, the NRC staff does not agree that dryer residence time can be used as a measurement or specification since Uranium One has stated in past correspondence to the NRC (ML13255A345) that dryer residence time can only be estimated. Also, since the Honeymoon yellowcake was dried at a low temperature, NRC staff requires assurance that the yellowcake heated at a higher temperature can be dried, drummed, and safely shipped. Accordingly, NRC staff will require the licensee to provide additional test results of their Honeymoon yellowcake testing program for review and written verification prior to the licensee shipping the redried Honeymoon yellowcake offsite (see license condition 10.22 below).

NRC staff has determined that the combustion products carbon monoxide, carbon dioxide, and water vapor are environmentally innocuous. The licensee remains bound by the discharge limits in License Application, Section 4.0, as approved by the NRC, and the discharge ranges specified in Wyoming Department of Environmental Quality Air Quality Permit No. OP-254. NRC staff agrees with the licensee's previous correspondence (ML13255A345) that the 4.5 hour dryer retention time the licensee committed to in its Response to Confirmatory Action Letter, September 21, 2012 (ML12268A270), cannot be accurately measured. Accordingly, the NRC will not require Honeymoon yellowcake to meet the 4.5 hour dryer retention time and will amend the license to specifically exclude the Honeymoon yellowcake from these requirements. As stated above, the licensee will be required to submit its analysis of the Honeymoon yellowcake from the testing program discussed in the application and in proposed license condition 10.22 for NRC review and written verification providing measureable parameters for optimum yellowcake drying and demonstrating the redried yellowcake is stable for shipping. Based on its amendment application and the requirements for NRC staff to independently review and verify the results of testing prior to shipment of Honeymoon yellowcake, the NRC staff has reasonable assurance that the Honeymoon material chemistry is compatible with the Willow Creek Project equipment and drying process and that the redrying of dried yellowcake will be protective of public health, safety, and the environment.

Process Operations and Equipment

The licensee plans to redry the Honeymoon yellowcake material separately from the Willow Creek slurry material in order to maintain traceability and accountability of the Honeymoon yellowcake. The licensee stated it will not run Irigaray yellowcake slurry and the Honeymoon dry material through the dryer concurrently and will run the Honeymoon material on a batch or campaign basis separate from Irigaray yellowcake slurry operations (ML14240A045).

To redry the Honeymoon yellowcake, the licensee proposes to install additional equipment in the Irigaray CPP as necessary to transfer the dried yellowcake contained in 55-gallon drums from the CPP floor into the top of the Irigaray dryer. To accomplish this, the licensee plans to install a drum tipping station and a conveyor system to transfer the dried yellowcake. The yellowcake material will be added directly to the top of the hearth of the dryer at the same location where the Willow Creek uranium slurry material is added to the dryer. The Honeymoon yellowcake will be redried at a temperature and for a length of time necessary to remove the organics from the material (see previous discussion). The redried yellowcake will then be drummed at the licensee's existing drumming station. With the exceptions of drying temperature and drying time, the drying and drumming processes will be identical to the processes used by the licensee for the uranium slurry originating from the Willow Creek Christensen Ranch site.

The licensee plans to construct and operate the tipping station and interconnected conveyor system near the current yellowcake slurry filter press. This location is adjacent to the yellowcake dryer but outside of the dryer room. The proposed location is shown on Figure 3.10, "General Plant Arrangement," in the amendment application. To minimize the potential for worker exposures to airborne uranium, the licensee proposes to construct an enclosure around the drum tipping station and conveyor system. The licensee plans to install and operate a high-efficiency particulate air filtration system to help minimize airborne uranium particulates within the enclosure. Amendment application, Figure 3.10a, "Drum Tipper and Hopper Enclosure," provides a visual representation of the proposed location of the various components within the enclosure. The licensee has also committed to several measures to avoid any possible build-up of organic vapors in the enclosure including the use of enhanced ventilation and gas monitoring (ML14253A026). In addition, the licensee has committed to provide workers inside the drum tipping enclosure with respirators equipped with activated carbon to adsorb organic vapors in addition to particulate filters used to filter airborne yellowcake (ML14253A026).

The licensee described the general flow path that it plans to use to transfer the Honeymoon yellowcake into the dryer. The basic flow path is provided on revised amendment application Figure 3.11, "Process Flow Diagram," and revised Figure 4.1, "Drying/Packaging Unit Schematic." Initially, the licensee will store the drummed Honeymoon yellowcake in designated areas within the Irigaray facility. Each 55-gallon drum will be moved by forklift from the storage area to the drum tipping station. The tipping system will provide a method to safely remove the drum lid and attach a cone adaptor to the open drum. The tipping station will invert the drum. The drum will be locked into a receiving hopper. The hopper will feed the yellowcake material into the tubular drag conveyance system. The conveyance system will transport the dried yellowcake product from the ground level to the top of the dryer, an elevation change of approximately 32 feet.

After the drum has been emptied, the licensee plans to reuse the drum for future packaging and shipment of yellowcake material. As a result, the licensee does not expect to have any residual solid wastes due to redrying the Honeymoon yellowcake material. The drummed material will be handled and shipped in accordance with existing site procedures for yellowcake material. The licensee has concluded that the drying, packaging, and transportation of redried Honeymoon yellowcake will be no different than previously analyzed for Willow Creek Project

yellowcake, with the exception of the Honeymoon yellowcake dryer residence time of less than 4.5 hours. In accordance with currently approved procedures, the drummed material will be allowed to cool for a minimum of 24 hours prior to lidding, to help prevent pressurization of the drummed material, and the drums will be inspected for pressurization prior to shipment. The licensee has provided sufficient information and amount of detail in its amendment application such that NRC staff agrees that the drying, packaging, and transportation of re-dried Honeymoon yellowcake will be no different than previously analyzed for Willow Creek material, with the exception of the Honeymoon yellowcake dryer residence time of less than 4.5 hours and new license condition 10.22 that requires testing, review, and verification of Honeymoon yellowcake prior to shipping.

The licensee does not anticipate any significant changes in the types of emissions or effluents released from the site as a result of drying the Honeymoon yellowcake. The emission control equipment that will be utilized for drying the Honeymoon yellowcake, including the scrubber and dust collector, will be the same equipment currently being used for drying Willow Creek slurry. The licensee committed to conduct special sampling of the emission control system, during the first Honeymoon yellowcake drying campaign, to demonstrate that the system is working as designed. Additionally, the licensee is still bound by Materials License SUA-1341 condition 10.5 that limits dried yellowcake production to 2.5 million pounds annually. This production limit is inclusive of the Honeymoon yellowcake and Willow Creek yellowcake.

The NRC staff reviewed the licensee's proposed construction and operation of the drum tipping station and interconnected conveyor system. The licensee provides a description of the drying and packaging circuits in the amendment application, revised Section 3.4.1.4, of the LRA (incorporated into the license via license condition 9.3). The amendment application contains a sufficient amount of detail describing the basic operation of the new equipment such that the NRC staff is reasonably assured the drum tipping station and interconnected conveyor system can be operated safely. The NRC staff recognizes that the application does not provide detailed information about all aspects of drum tipping station and conveyance system operations. Condition 9.6 of Materials License SUA-1341 requires that the licensee establish and follow detailed written standard operation procedures (SOPs) for all operational process activities involving radioactive materials, which must be reviewed and approved by the licensee's radiation safety officer before implementation. The NRC Region IV inspectors will verify that the licensee has implemented such SOPs for operating the new equipment during a future inspection, as already required by the license.

The licensee committed in its amendment application to have contingency actions in place prior to actually drying the Honeymoon yellowcake in case of an accident or incident that resulted in failure of the tipping station or conveyance system. The licensee conducted a limited review of possible system failures that were discussed in the amendment application. In addition, the licensee noted in the amendment application that it will use its existing maintenance SOPs and the radiation work permit process as necessary.

NRC staff notes the use of a drum tipping station and enclosed tubular drag conveyance system is relatively unique in the uranium recovery industry. Licensee management observed a drum tipping station and associated tubular drag system in service at a platinum smelter in Montana. Based in part on these observations, the licensee is confident that a similar feed process can be constructed and operated safely at the Irigaray facility. The licensee plans to procure the drum

tipping station from a manufacturer in Michigan. The manufacturer will provide a tipping station designed specifically to transfer yellowcake material. The design of the tipping station will include a number of safeguards and interlocks to eliminate the potential for dropping a drum, harming workers, or generating airborne uranium particulates. As noted earlier, the NRC staff will review the construction and operation of this equipment during a future inspection.

Based on its amendment application review, the NRC staff has reasonable assurance that the proposed process for redrying the Honeymoon yellowcake, using both new and existing equipment, will be protective of public health, safety, and the environment. The licensee has provided a sufficient amount of detail in its amendment application such that NRC staff is reasonably assured that the drum tipping station and interconnected conveyance system in the amendment application are designed such that they may be constructed and operated in a safe manner. The rest of the operational flow path for the Honeymoon yellowcake, including the drying, drumming, shipping, and effluent control circuits, will remain the same as what currently exists at the Irigaray CPP, with the exception of the Honeymoon yellowcake dryer residence time of less than 4.5 hours and new license condition 10.22 that requires testing, review, and verification of Honeymoon yellowcake prior to shipping. The NRC Region IV inspectors will review and inspect the construction, testing, and operation of the equipment during a future inspection, to ensure compliance with existing license requirements. If the licensee's staff or NRC inspectors determine that the licensee's system design or operational commitments need updating, the licensee should make these changes in accordance with its performance-based license condition 9.4.

Radiation Protection

Background Radiological Characteristics

Background radiological characteristics are used to evaluate the potential radiological impact of operations on human health and the environment. Such impacts could result from spills, routine discharges from operations, and other potential releases to the environment. In addition, the data collected are used to identify a radiological baseline for decommissioning restoration, and reclamation.

The licensee previously reported background radiological characteristics in the original licensing document(s) for the Willow Creek Project (formally known as the Irigaray and Christensen Ranch Project) that provided a summary of background radiological characteristics to support remediation and decommissioning of the Willow Creek Project. The NRC staff's SER for the renewal of Willow Creek Project Materials License SUA-1341 provides details and references of Willow Creek's background radiological characteristics and decommissioning plan, including initial licensing reviews and license renewals (see package ML13015A179 (LRA SER)). NRC staff previously determined that preoperational environmental monitoring program was consistent with 10 CFR Part 40, Appendix A (see LRA SER). The NRC staff has found nothing during this review to invalidate or call into question its previous findings in the LRA SER; therefore, the original findings and NRC staff's prior conclusions remain valid. The amendment to redry yellowcake Honeymoon yellowcake during the operational phase of this license does not affect or impact the preoperational environmental monitoring program. In accordance with NUREG-1569, Appendix A, the NRC staff is not re-examining the background radiological characteristics or the preoperational environmental monitoring program.

Gaseous and Airborne Particulates

This section discusses the basic design of the gaseous and airborne particulates effluent control systems for the Willow Creek Project as proposed by the licensee in this amendment. The purpose of the effluent control systems is to prevent and minimize the spread of gaseous and airborne particulate contamination to the atmosphere by the use of emission controls and to ensure compliance for radiation dose limits to the public.

Unless otherwise stated, the information review in this section is from information, data, and maps submitted by the licensee in this amendment application. Notwithstanding previous license conditions as described in the LRA SER, NRC staff reviewed the description of the licensee's effluent control program in the license amendment at the Willow Creek Project and reviewed the current semiannual effluent reports.

The licensee has indicated that the emission control equipment utilized for the redrying of the Honeymoon Yellowcake will be the same equipment that is currently utilized for the Willow Creek Project operations. Effluent control system operations will be consistent with those specified in Section 4.0 of the LRA and Condition 10.8 of Materials License SUA-1341. Uranium One commits to conduct stack sampling during the first Honeymoon yellowcake redrying campaign to demonstrate that emission control systems are operating properly and are effectively maintaining stack effluent releases below those specified in Wyoming Air Quality Permit OP-254. Stack sampling during the Honeymoon yellowcake redrying would be in addition to the semi-annual stack sampling performed during the processing of Willow Creek Project yellowcake slurry as described in the approved LRA. NRC staff has determined that the additional stack sampling, in conjunction with the semi-annual stack sampling, is protective of health and safety and provides an additional measure of monitoring of the gaseous and air effluents from the Irigaray facility.

The licensee stated in the amendment application, Technical and Impact Analysis, that Uranium One is authorized under Materials License SUA-1341 to produce 2.5 million pounds of dried yellowcake on an annual basis. The combined quantities of redried Honeymoon yellowcake (570,000 lb.) and Uranium One's forecasted annual yellowcake production (600,000 lb.) from Willow Creek will total almost 1,200,000 lb. This combined quantity remains below the annual licensed production capacity of 2.5 million pounds.

The licensee further stated in the amendment application that the proposed action is not anticipated to result in a change to the types or amounts of any effluents that may be released off-site. NRC staff reviewed the airborne uranium effluent release process, including the annual production limits in the recent LRA SER. The licensee updated the MILDOS evaluation for an operation with 1.1 million kilograms per year (2.5 million pounds per year) dryer throughput. NRC staff has determined that the total dryer throughput, which includes both the Honeymoon production and Uranium One production, will be less than the total dryer throughput described and analyzed in the recent LRA SER. NRC staff agrees that a change to the types or amounts of any effluents that may be released off-site is not likely since Uranium One is maintaining its yellowcake production at or below its licensed limits.

NRC staff has reasonable assurance that the licensee's airborne effluent controls proposed in the license amendment request are protective of the workers at the facility and the public. NRC staff has found nothing to invalidate or call into question its previous findings in the LRA SER; therefore, the original findings and NRC staff's prior conclusion remains valid.

Radiation Safety Controls And Monitoring

This section describes the techniques the licensee proposes to use to monitor and minimize radiation exposures. As part of its assessment, the NRC staff will discuss regulations and standards with which the licensee must comply and NRC guidance for implementing the regulations and standards. These regulations, standards and guidance are listed below and referenced throughout the remaining portion of this SER, as follows:

Regulations

- 10 CFR 19.12, Instructions to Workers;
- 10 CFR Part 20, Subpart B - Radiation Protection Programs, § 20.1101;
- 10 CFR Part 20, Subpart C – Occupational Dose Limits, §§ 20.1201 – 1208;
- 10 CFR Part 20, Subpart F – Surveys and Monitoring, §§ 20.1501 and 20.1502;
- 10 CFR Part 20, Subpart L – Records, §§ 20.2101 – 20.2110; and
- 10 CFR Part 20, Subpart M – Reports, §§ 20.2201 – 20.2207.

Numerical Standards

- 10 CFR Part 20, Appendix B, Table 1 - Annual Limits on Intake and Derived Air Concentrations of Radionuclides for Occupational Exposure: Natural Uranium Class W Derived Air Concentration (DAC): 3.0E-10 microcuries per milliliter ($\mu\text{Ci}/\text{mL}$); Natural Uranium Class D DAC: 5E -10 $\mu\text{Ci}/\text{mL}$;
- 10 CFR Part 20, Appendix B, Table 2 – Effluent Concentration Values for Air and Water (see 10 CFR Part 20, Appendix B, Table 2 for concentration values);
- 10 CFR 20.1201 – Total Effective Dose Equivalent (TEDE): 5 rem, or the sum of the Deep-Dose Equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye being equal to 50 rem;
- 10 CFR 20.1201 - Annual Limit to the Eye Lens: 15 rem;
- 10 CFR 20.1201 - Annual Limits to the Skin of the Whole Body and Extremity: 50 rem; and
- 10 CFR 20.1201(e) – Limit on the Soluble Uranium Intake by an Individual: 10 mg per week.

Guidance

- Regulatory Guide 4.14, "Radiological Effluent and Environmental Monitoring at Uranium Mills," Revision 1, April 1980;
- Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Inception through Normal Operations to License Termination) - Effluent Streams and the Environment," Revision 2, July 2007;

- Regulatory Guide 8.7, "Instructions for Recording and Reporting Occupational Radiation Exposure Data," Revision 2, November 2005;
- Regulatory Guide 8.13, "Instruction Concerning Prenatal Radiation Exposure," Revision 3, June 1999;
- Regulatory Guide 8.15, "Acceptable Programs for Respiratory Protection," Revision 1, October 1999;
- Regulatory Guide 8.22, "Bioassay at Uranium Mills," Revision 1, August 1988;
- Regulatory Guide 8.25, "Air Sampling in the Workplace," Revision 1, June 1992;
- Regulatory Guide 8.29, "Instruction Concerning Risks from Occupational Radiation Exposure," Revision 1, February 1996;
- Regulatory Guide 8.30, "Health Physics Surveys in Uranium Recovery Facilities," Revision 1, May 2002;
- Regulatory Guide 8.31, "Information Relevant to Ensuring that Occupational Radiation Exposures at Uranium Recovery Facilities Will Be as Low as Is Reasonably Achievable," Revision 1, May 2002;
- Regulatory Guide 8.34, "Monitoring Criteria and Methods To Calculate Occupational Radiation Doses," July 1992;
- Regulatory Guide 8.36, "Radiation Dose to the Embryo/Fetus," Revision 0, July 1992; and
- Regulatory Guide 8.37, "ALARA Levels for Effluents from Materials Facilities," July 1993.

Unless otherwise stated, the information reviewed related to radiation protection by NRC staff, in its entirety, is from information submitted by the licensee in its last LRA and documented in the LRA SER. Notwithstanding the license conditions identified in the LRA SER, NRC staff has reasonable assurance that the radiation safety program and monitoring is consistent with 10 CFR 20.1101. Section 5.7.7 of the LRA was reviewed independently by NRC staff to support the review of the amendment application. NRC staff reviewed the information provided by the licensee in the amendment application to support the radiation safety and monitoring program.

The licensee stated that to safely add the drummed material to the dryer, Uranium One is proposing to utilize a drum tipping system to minimize the manual handling risk combined with an enclosed tubular drag conveyor that is designed to prevent or minimize airborne dust. This system is fully enclosed to control and minimize employee exposures from yellowcake dust (amendment application). The drum tipping system will involve removal of the Honeymoon yellowcake drum lid and attachment of a cone adaptor with a valve. The drum will then be inverted and locked into a receiving hopper which will form a dust-tight seal. The valve on the

drum cone attachment is then opened and the yellowcake will flow into the hopper which feeds the enclosed tubular drag conveyance system for transport to the yellowcake dryer (amendment application). The licensee stated that the use of the drum tipping and enclosed tubular drag conveyance system has less potential for employee dust exposure issues, will minimize employee contact with the material, and is less labor intensive. Airborne uranium concentrations will be monitored to ensure engineering and management controls are effective in controlling employee exposures as low as reasonably achievable (ALARA). The location of the drum tipping system on the ground floor adjacent to the yellowcake filter press will allow for easy access to the current Irigaray emission control duct work should air sampling indicate that additional engineering controls are necessary to maintain occupational exposures ALARA (amendment application).

The licensee stated that a temporary containment structure will be constructed within the Irigaray plant to enclose the drum tipping equipment and the receiving hopper which includes the transfer point from the hopper to the tubular drag conveyance system. The enclosure will be a 10-foot by 20-foot by 14-foot wood framed structure enclosed with durable plastic sheeting. The enclosure will have one point of ingress/egress for drums and personnel. The containment structure will isolate the drum tipping and transfer equipment from other Irigaray CPP equipment. The temporary enclosure will be equipped with a negative air high efficiency particulate air (HEPA) filtration system adequate to maintain a negative draft on the enclosure; in addition a smaller HEPA filtration system will be utilized to gather any residual fugitive dust (if present) when the seal between the cone and empty yellowcake drum is broken. Any dusting from the drum tipping system and transfer point to the tubular drag conveyor will be fully contained within the enclosed temporary containment structure. SOPs will be in place prior to operation of the system and will include the use of personal protective equipment (PPE) including respiratory protection when working in the enclosure as an additional precautionary measure to keep employee exposure potentials ALARA (amendment application).

The licensee stated that changes to the types of effluents will occur as a result of the redrying of the Honeymoon yellowcake and will require a change in the solubility classification of the dried uranium from 85% Class D and 15% Class W (DAC of 4.7×10^{-10} uCi/ml) material to Class Y (DAC of 2×10^{-11} uCi/ml) for the areas associated with the dryer (drum packaging room, furnace room and exterior yellowcake control room) and used for the determination of occupational exposures during the redrying of the Honeymoon yellowcake (amendment application). One additional change will be the uranium solubility classification from the drier stack during the redrying of the Honeymoon yellowcake will change from a 47% Class D and 53% Class W (1.92×10^{-12} uCi/ml) material to a Class Y (9.0×10^{-14} uCi/ml) material (amendment application). NRC staff agrees with these changes and notes that the DAC and the uranium solubility will be reduced during the processing of the Honeymoon yellowcake for the purpose of complying with the occupational radiation protection standards of 10 CFR Part 20. In addition, the licensee committed to continue to apply the limits for soluble uranium specified in 10 CFR 20.1201(e) for all Honeymoon yellowcake (ML14253A026).

The licensee stated that personnel will be utilizing respiratory protection, coveralls and other additional PPE as appropriate during the initial drum tipping tests. Personnel operating the drum tipping system will be monitored using breathing zone samples to establish airborne uranium concentrations. Additionally, area samples will be collected at multiple locations around the drum tipping system to establish the potential influence (if any) to airborne

concentrations as a result of the drum transfer activities. Results of these air samples will determine if additional engineering or management controls are needed for the drum tipping system. Uranium One will utilize the site action level of 25% of the DAC for Class D at the drum tipping station as the guideline to determine if additional control measures are needed to maintain ALARA (amendment application).

NRC staff has determined that Uranium One has designed a system to minimize airborne exposures to personnel working inside the drum tipping system. In addition, the enclosed containment around the drum tipping system with HEPA system to maintain negative pressure inside the drum tipping area will also minimize potential airborne exposures to personnel working outside of the drum tipping area. NRC staff has determined that these practices are consistent with 10 CFR 20.1101(b) and ALARA principles.

NRC staff has determined that Uranium One has augmented its radiation safety program to conduct air sampling around the enclosure to detect potential leakage and utilize respiratory protection and PPE for personnel is consistent with 10 CFR 20.1101 for a radiation protection program. Uranium One has also taken a conservative approach to evaluating air samples associated with the dryer (drum packaging room, furnace room, and exterior yellowcake control room) by making comparison to the Class Y DAC for natural uranium while still applying the limits for soluble uranium specified in 10 CFR 20.1201(e). The Class Y concentration for natural uranium has a lower concentration limit in 10 CFR Part 20, Appendix B, Table 1 for air when compared to a Class D or Class W.

NRC staff has reasonable assurance that the radiation safety program for the license amendment is protective of health and safety of the workers at the facility. The licensee revised the DAC values and NRC staff has determined that these revised values reflect a conservative approach. NRC staff has found nothing to invalidate or call into question its previous findings in the LRA SER; therefore, the original findings and NRC staff's prior conclusion remain valid.

Airborne Effluent and Environmental Monitoring Program

This section discusses and evaluates the licensee's proposed operational airborne effluent and environmental monitoring program. This program covers environmental monitoring outside of the plant area during operations.

Unless otherwise stated, the information reviewed in this section is from the amendment submitted by the licensee. Notwithstanding previous license conditions as described in the LRA SER, NRC staff reviewed the description of the licensee's airborne effluent and environmental monitoring program in the Willow Creek Project LRA and reviewed the current semiannual effluent reports. The operational airborne and environmental monitoring program at Willow Creek includes air particulate, air radon, direct radiation, soil, and vegetation sampling.

During the review of the last LRA, NRC staff concluded that the operational airborne and environmental monitoring program is acceptable and is in compliance with the regulations identified in the LRA SER. The licensee stated in its amendment application that the proposed action will not result in any increase to the types or amounts of any effluent that may be released offsite. NRC staff agrees with this determination for the reasons previously discussed in this SER. For this license amendment, NRC staff has determined that there are no changes

to the airborne and environmental monitoring program at the Willow Creek Irigaray facility. NRC staff has determined that the Willow Creek Project continues to implement an environmental monitoring program consistent with Regulatory Guide 4.14 that meets 10 CFR Part 40, Appendix A, Criterion 7 requirements. Uranium One conducts an effluent and environmental monitoring program in accordance with Materials License SUA-1341, license condition 12.1. NRC staff evaluated the potential effluent emissions for annual public dose and determined that the estimated annual public dose is below the 10 CFR 20.1301 and 10 CFR 20.1302 public dose limit of 100 millirem per year.

NRC staff has reasonable assurance that the operational environmental and effluent monitoring for the license amendment is protective of the members of the public. NRC staff has found nothing to invalidate or call into question its previous findings in the LRA SER; therefore, the original findings and NRC staff's prior conclusion remain valid.

CONCLUSION

NRC staff has reviewed the Honeymoon yellowcake chemistry for compatibility with the Willow Creek Project, Irigaray CPP equipment and process. NRC staff has reviewed the proposed process flow and equipment to be used to redry the Honeymoon yellowcake. NRC staff has reviewed the radiation protections currently employed at the Irigaray CPP and proposed radiation protections to be employed while redrying the dried Honeymoon yellowcake. Based on the information provided in the application, the detailed NRC review discussed in this SER of the request to redry dried yellowcake at Uranium One's Willow Creek Project, and the license conditions added to Materials License SUA-1341, the NRC staff concludes that the material, equipment, process, and radiological protections used by Uranium One are acceptable and NRC staff has reasonable assurance that public health, safety and the environment will be protected.

ENVIRONMENTAL REVIEW

This license amendment belongs to a category of actions which the NRC has determined do not individually or cumulatively have a significant effect on the environment. Such actions qualify for a categorical exclusion under 10 CFR 51.22(c) and do not require an environmental assessment. Specifically, the NRC staff has determined that this amendment of NRC Materials License SUA-1341 is categorically excluded from further environmental review under 10 CFR 51.22(c)(11) because the amendment results in change in process operations and equipment, with (i) no significant change in the types or significant increase in the amounts of any effluents that may be released offsite, (ii) no significant increase in individual or cumulative occupational radiation exposure, (iii) no significant construction impact, and (iv) no significant increase in the potential for or consequences from radiological accidents. The basis for the NRC staff's determination is documented in this SER.

PROPOSED LICENSE CONDITIONS

Based on the NRC review as discussed above, NRC Materials License SUA-1341, license condition 9.3, will be changed to add a statement that the Honeymoon yellowcake will not be subject to the 4.5 hour dryer retention time and to add an additional bullet incorporating the commitments and representations made in the license amendment application on February 28,

2014 (ML14066A112), March 27, 2014 (ML14113A421), June 28, 2014 (ML14192B247) August 26, 2014 (ML14240A045), September 9, 2014 (ML14253A026) and October 2, 2014 (ML14275A443). Additionally, NRC is correcting a typographical error noted in the next to the last paragraph of license condition 9.3. The 2011 date will be changed to 2001 as noted, "June 18, 2011 2001 (ADAMS Accession No. ML011710035). A new operational license condition 10.22 will be added to the license to require the licensee to submit results of its testing program prior to shipping the redried Honeymoon material offsite. Uranium One agreed to the license amendments in correspondence dated October 3, 2014 (ML14276A462) and October 15, 2014 (ML14290A218).

Materials License SUA-1341, license condition 9.3 will be modified to read as follows:

9.3 The licensee shall conduct operations in accordance with the commitments, representations, and statements contained in the following:

- License Renewal Application (LRA), May 30, 2008, NRC Agencywide Documents Access and Management System (ADAMS) Accession Package Number ML081850689.
- LRA Revision, October 31, 2008, ADAMS Accession Number ML083110405.
- LRA Revision, July 17, 2009, ADAMS Accession Package Number ML092110700.
- LRA Revision, November 19, 2010, ADAMS Accession Number ML103280266.
- LRA Revision, March 7, 2012, ADAMS Accession Package Number ML120820095.
- LRA Revision, July 10, 2012, ADAMS Accession Number ML12206A436.
- Response to Confirmatory Action Letter, September 21, 2012, ADAMS Accession Number ML12268A270. The redrying of dried Honeymoon, Australia yellowcake as documented in NRC Safety Evaluation Report (ADAMS Accession Number ML14212A154) is not subject to the 4.5 hour dryer retention time commitment by the licensee in Response to Confirmatory Action Letter, September 21, 2012, ADAMS Accession Number ML12268A270.
- Amendment Request to Redry Dried Honeymoon, Australia yellowcake, February 28, 2014 (ML14066A112), March 27, 2014 (ML14113A421), June 28, 2014 (ML14192B247), August 26, 2014 (ML14240A045), September 9, 2014 (ML14253A026) and October 2, 2014 (ML14275A443).

The documents listed in this section are hereby incorporated by reference except where superseded by license conditions below.

The land and structures will be decommissioned according to the Decommissioning Plan submitted December 19, 2000 (ADAMS Accession No. ML003781238), as revised by submittals dated June 15, 2001 (ADAMS Accession No. ML011700655), June 18, 2001 (ADAMS Accession No. ML011710035), and August 31, 2001 (ADAMS Accession No. ML012490112), and in accordance with 10 CFR 40.42.

Whenever the word "will" is used in the above referenced documents, it shall denote a requirement.

[Applicable Amendment: 3]

Materials License SUA-1341, license condition 10.22 will be added to read as follows:

10.22 Redried Honeymoon yellowcake shall be tested prior to shipment offsite. In addition to testing for the successful removal of organics, the licensee shall test the first Lot of redried Honeymoon yellowcake as specified below. A Lot is defined as a group of drums containing between 20,000 lbs and 50,000 lbs of yellowcake that are intended for shipment.

The licensee shall provide the following test information for the first Lot of Honeymoon redried yellowcake:

- residual organics
- information on how the optimal temperature and drying time was determined including dryer temperature profile, including (if available) minimum and maximum temperatures, time at designated temperature, and copies of temperature charts
- yellowcake product temperature, color and consistency as drummed
- an estimate of time the yellowcake is physically in the dryer with a technical basis for determining that estimate
- information on individual drum venting and cooling times, and drum pressurization tests conducted on site
- Samples for yellowcake chemical analysis, including results for $\text{UO}_4 \cdot 2\text{H}_2\text{O}$, amorphous UOX , where $(3 < x \leq 3.5)$ (refer to Information Notice 1999-03, Rev. 1), and crystalline UO_3 and lower oxides, will be taken during each significant change in the dryer temperature, the speed of the dryer rake arm, or yellowcake feed rate to the dryer as recommended in RAI-2 (b) response "Recommendations for Dryer Operating Conditions" Nos. 1 - 4 (ML14192B247, ML14275A443) during the redrying of the first Lot, as the optimal drying conditions are established.

Results from the testing of the first Lot of the redried material will be submitted in writing to the NRC for review and written verification. Redried Honeymoon yellowcake shall not be shipped offsite until written verification is received from NRC headquarters staff.

[Applicable Amendment: 3]