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May 24, 2011 **PERMIT TO MINE NO. 478**

Mr. Glenn Mooney
Department of Environmental Quality
Land Quality Division
2100 West Fifth St.
Sheridan, WY 82801

RE: Mine Unit 7 well sampling – Docket Number 4831-11

Dear Mr. Mooney:

As agreed upon in at our meeting in Sheridan on May 18, 2011, Uranium One is providing the attached information outlining corrective actions implemented in response to the self identified non-compliance of failure to collect all routine monitor well samples for Mine Unit 7 during the first quarter of 2011. The attached information includes:

- An example of a check list identifying monitor wells to be sampled during a given week. The list is reviewed daily by the wellsamplers and Environmental Technician.
- A copy of the revised SOP ENV-1. Changes to the SOP include a procedure to be followed by the well samplers if a compliance well cannot be sampled. This requirement is identified in the revised SOP ENV-1 in section 6.4.
- Documentation that the wellsamplers and the Environmental Technician have been trained on the revised SOP ENV-1.
- An example of the work order form that will be used to schedule repairs or other needed actions to ensure the compliance monitoring well(s) are repaired within the time frame necessary to maintain the compliance schedule. This requirement is identified in the revised SOP ENV-1 in section 6.4.
- Each week the Laboratory Supervisor will submit to the RSO and the Environmental Technician a list of the monitoring well samples turned into the laboratory for analysis during the week. The list will be reviewed and compared with the daily check list maintained by the Environmental Technician. This requirement is identified in section 6.7 of the revised SOP ENV-1.
- A meeting between the RSO, Environmental Technician and the well samplers is now held on a weekly basis. During the weekly meeting the group will discuss the

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number of wells sampled during the week, the number of wells to be sampled the following week, the compliance schedule, a review of the laboratory list of received samples and how that compares to the recorded list of wells sampled for the week, and a discussion of the status of any work orders turned in for well repair. Any other issues that require attention to maintain compliance with the sample schedule will also be discussed. A report is generated from the weekly meeting, with a copy provided to the Mine Manager and the Manager, Wyoming Environmental and Regulatory Affairs.

- A compliance tracking schedule that identifies a broader range of site obligations and compliance requirements. This schedule is an active document (subject to changes) as certain obligations may change based on field conditions and potential modifications to license or permit conditions.

A Root Cause investigation of this event was conducted to evaluate all the factors that contributed to the eventual non-compliance event. The root cause investigation evaluated the immediate direct cause(s) of the non-compliance event, the underlying causes as well as secondary causal factors. The one immediate direct cause was the compliance samples were not collected as per the permit or license conditions. The underlying causes were 1) there were no checks or balances in place to assure the compliance samples were being collected and analyzed on the required schedule and 2) when problems were identified that prevented the collection of a compliance sample, the necessary steps were not taken to assure the samples were collected and analyzed on the required schedule.

Secondary causes were also identified that were not considered an underlying cause, but were evaluated and corrective actions implemented to support the two underlying causes. These corrective actions included the revision of SOP ENV-1; implementation of weekly meetings; coordination with the laboratory supervisor and RSO to track the status of well samples submitted in comparison to the daily checklist;tracking of work order progress; and development of a compliance tracking schedule.

As per the settlement agreement Uranium One will develop a "white paper" detailing procedures and corrective actions (identified above) for preventing non-compliance of this type in the future. The white paper will be submitted to the District III LQD by July 31, 2011, prior to distribution to the Wyoming Mining Association, uranium sub-committee.

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Uranium One feels obligated to point out that this event and subsequent NOV is a non-conformance with regulatory sampling requirements, however the resulting deviation from the sampling protocol did not result in any adverse impacts to the environment. Sampling of the Mine Unit 7 monitoring wells during operations was conducted albeit the sample frequency did not comply with the permit schedule. It is also noted that the non-compliance event was self-identified by Uranium One and subsequent sampling of all Mine Unit 7 compliance monitoring wells showed no impacts from ISR operations.

Please contact me at 307-234-8235, ext. 331 or at jon.winter@uranium1.com should you have any questions.

Sincerely,

Jon Winter
Manager, Wyoming Environmental and Regulatory Affairs

Cc: Larry Arbogast
Donna Wichers
Ron Linton, Project Manager, NRC Headquarters
Linda Gersey, Region IV NRC

Encl:

- Daily Monitor well check list
- Revised SOP ENV-1
- Documentation of training of employees to revised SOP ENV-1
- Example of Work Order form
- Example of weekly laboratory supervisor report to RSO and ENV Tech.
- Example of report from weekly meetings with the RSO, ENV Tech and well samplers
- Draft compliance tracking schedule

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Uranium One - Daily Well Sampling Checklist

MU7 biweekly sampling compliance schedule
for the period of ___________ through ____________

	WELL SAMPLED		PUMP WORKING		REPAIR REQUEST				
WELL_ID	YES	NO	YES	NO	YES	NO	DATE REPAIRED	DATE WELL SAMPLED	COMMENTS
7DM1									
7DM2									
7DM3									
7DM3A									
7DM4									
7DM4B									
7MW1									
7MW10									
7MW11									
7MW12									
7MW13									
7MW14									
7MW15									
7MW16									
7MW17									
7MW18									
7MW19									
7MW2									

Uranium One - Daily Well Sampling Checklist

MU7 biweekly sampling compliance schedule
for the period of __________ through ___________

WELL_ID	WELL SAMPLED YES	WELL SAMPLED NO	PUMP WORKING YES	PUMP WORKING NO	REPAIR REQUEST YES	REPAIR REQUEST NO	DATE REPAIRED	DATE WELL SAMPLED	COMMENTS
7MW20									
7MW21									
7MW22									
7MW23									
7MW24									
7MW25									
7MW26									
7MW27									
7MW28									
7MW29									
7MW3									
7MW30									
7MW31									
7MW32									
7MW33									
7MW34									
7MW35									
7MW36									

Uranium One - Daily Well Sampling Checklist

MU7 biweekly sampling compliance schedule
for the period of __________ through ___________

	WELL SAMPLED		PUMP WORKING		REPAIR REQUEST		DATE	DATE WELL	
WELL_ID	YES	NO	YES	NO	YES	NO	REPAIRED	SAMPLED	COMMENTS
7MW37									
7MW38									
7MW39									
7MW39-2									
7MW4									
7MW40									
7MW41									
7MW42									
7MW43									
7MW5									
7MW6									
7MW7									
7MW8									
7MW9									
7SM1									
7SM10									
7SM11									
7SM12									

Uranium One - Daily Well Sampling Checklist

MU7 biweekly sampling compliance schedule
for the period of __________ through ___________

WELL_ID	WELL SAMPLED YES	WELL SAMPLED NO	PUMP WORKING YES	PUMP WORKING NO	REPAIR REQUEST YES	REPAIR REQUEST NO	DATE REPAIRED	DATE WELL SAMPLED	COMMENTS
7SM13									
7SM2									
7SM3									
7SM4									
7SM5									
7SM6									
7SM7									
7SM8									
7SM9									
7TW1									
7TW2									
7TW3									
7TW4									
7TW5									
7TW6									

1 PURPOSE

The environmental groundwater monitoring program includes the routine monitoring and analysis of groundwater samples within the Willow Creek permit area and surrounding environs to ensure compliance with Federal and State rules and regulations and license and permit requirements. The groundwater monitoring program is designed to provide maximum surveillance for environmental control and is based on many years of monitoring experience in conjunction with guidance and suggested practices from numerous regulatory agencies. The following sections present a discussion of the groundwater monitoring program, sampling methodology, and types of sampling to be performed.

1.1 Groundwater Monitoring Program Elements

In order to ensure reliable data, the groundwater monitoring program specifies the following procedures that must be followed:

- Baseline groundwater monitoring (Section 2) ensures that sampling is performed following well development using acceptable procedures to accurately determine the preoperational groundwater characteristics. This preoperational data is used to determine the upper control limits for excursion monitoring and the groundwater restoration standards.
- Operational groundwater monitoring (Section 3) ensures that operating data accurately reflects groundwater characteristics during mining to allow excursion monitoring.
- Restoration groundwater monitoring (Section 4) is performed during groundwater restoration activities and is used to determine the effectiveness of restoration processes. The restoration groundwater monitoring program provides data for comparison with the approved groundwater restoration goals
- Sampling of private water supply wells (Section 5) in the vicinity of the Willow Creek project provides data to ensure that mining activities are not adversely affecting wells that are used as a source of domestic, agricultural or livestock water.
- General well sampling methods (Section 6) have been established that meet accepted standards for collection of environmental water samples. These methods include well water level monitoring, field determination of indicator parameters (i.e., pH and specific conductance), proper well purging techniques, sample documentation and custody control, and QA/QC requirements.

1.2 Quality of Measurements

The accuracy of monitoring data is critical to ensure that the groundwater monitoring program precisely reflects water quality in each phase of the program. In order to ensure consistent and accurate analytical results, WDEQ permitting requirements specify acceptable analytical procedures. The WDEQ Land Quality Division (LQD) Guideline No. 4, *In-situ Mining*, specifies that methods used to analyze water quality parameters should be consistent with EPA approved test procedures contained in 40 CFR Part 136, *Guidelines Establishing Test Procedures for the Analysis of Pollutants.*

In addition to approved analytical methods for water quality measurements, the NRC specifies analytical quality requirements for the measurement of radionuclides in various environmental media. These requirements are contained in Regulatory Guide 4.14, which specifies the following lower limits of detection (LLD) in water:

Radionuclide	LLD (µCi/ml)
Natural Uranium	2×10^{-10}
Thorium-230	2×10^{-10}
Radium-226	2×10^{-10}
Polonium-210	1×10^{-9}
Lead-210	1×10^{-9}

2 WELLFIELD BASELINE SAMPLING

Baseline sampling is required to determine the groundwater quality of the overlying, production, and underlying aquifers in a wellfield before mining operations in accordance with the NRC license and WDEQ permit requirements. Four samples are taken from each monitor well at least two weeks apart. The samples are analyzed for the parameters listed in Section 2.2.

Baseline sampling serves two purposes. First, it determines pre-mining water quality that is used to calculate the restoration goal against which groundwater restoration efforts will be compared. Second, baseline values are used to calculate upper control limits (UCLs) for the approved excursion monitoring parameters. During the life of the mine unit, these UCL values are used to determine when a monitor well is placed on excursion status.

2.1 Prerequisites

- Baseline samples are only taken after a well has been developed and the water quality has stabilized.
- Appropriate conductivity and pH instruments must be available for field monitoring during sampling. These instruments must be properly calibrated in accordance with the instructions contained in Section 6.2.

When the prerequisites have been met, baseline sampling is performed using the general well sampling instructions contained in Section 6.

2.2 Sample Analytical Requirements

The four rounds of perimeter, underlying, and overlying monitor well samples will be analyzed as follows:

Sample Round 1	Assay Suite A (Table 1)
Sample Round 2	Assay Suite B (Table 3)
Sample Round 3	Assay Suite B
Sample Round 4	Assay Suite B

The four rounds of interior baseline water quality wells will be analyzed as follows:

Sample Round 1	Assay Suite A
Sample Round 2	Assay Suite A
Sample Round 3	Assay Suite B
Sample Round 4	Assay Suite B

Baseline samples will be filtered, preserved and delivered to an approved lab. The assay requirements are as follows:

Table 1
Assay Suite A Analytes and Methods
(WDEQ Guideline 8 for Uranium Mines)

Constituents (reported in mg/l unless noted)	*Analytical Method*
Ammonia Nitrogen as N	*EPA 350.1*

Nitrate + Nitrite as N	*EPA 353.2*
Bicarbonate	*EPA 310.1/310.2*
Boron	*EPA 212.3/200.7*
Carbonate	*EPA 310.1/310.2*
Silicon dioxide (Total or dissolved??)	*EPA 200.7/200.8*
Dissolved Barium	*EPA 200.7/200.8/208.1/208.2*
Fluoride	*EPA 340.1/340.2/340.3*
Sulfate	*EPA 375.1/375.2*
Total Dissolved Solids (TDS) @ 180°F	*EPA 160.1/SM2540C*
Dissolved Aluminum	*EPA 200.7/200.8/200.9/202.1/202.2*
Dissolved Arsenic	*EPA 206.3/200.9/200.8*
Dissolved Cadmium	*EPA 200.9/200.7/200.8*
Dissolved Calcium	*EPA 200.7/215.1/215.2*
Dissolved Chloride	*EPA 300.0*
Dissolved Chromium	*EPA 200.9/200.7/200.8*
Total and Dissolved Iron	*EPA 236.1/200.9/200.7/200.8*
Dissolved Magnesium	*EPA 200.7/242.1*
Dissolved Copper	*EPA 200.7/200.8/200.9/220.1/220.2*
Dissolved Lead	*EPA 200.7/200.8/200.9/239.1/239.2*
Total Manganese	*EPA 200.9/200.7/200.8/243.1/243.2*
Dissolved Molybdenum	*EPA 200.7/200.8*
Dissolved Nickel	*EPA 200.10/200.12/1638/1639/1640*
Dissolved Potassium	*EPA 200.7/258.1*
Dissolved Selenium	*EPA 270.3/200.9/200.8*
Dissolved Mercury	*EPA 200.7/200.8/245.1/245.2*
Dissolved Sodium	*EPA 200.7/273.1*
Dissolved Zinc	*EPA 200.9/200.7/200.8*
Radium-226 (pCi/l)	*DOE RP450/EPA 903.1/SM 7500-R-AD*
Uranium	*DOE MM 800/EPA 200.8*
Vanadium	*EPA 286.1/286.2/200.7/200.8*

Table 2
Assay Suite A Bottle List

Volume	No. of Containers	Filtered (F) Non-Filtered (NF)	Preservation	Destination
64 ounces (Half Gallon)	1	F	HNO_3 (4 mls)	Approved/Certified Lab
32 ounces (Quart)	1	NF	None	Approved/Certified Lab
12 ounces	1	F	None	Approved/Certified Lab
8 ounces	1	F	H_2SO_4 (1 ml)	Approved/Certified Lab
8 ounces	1	NF	None	Christensen Lab

Table 3
Assay Suite B Analytes and Methods

Constituents (reported in mg/l unless noted)	*Analytical Method*
Bicarbonate	*EPA 310.1/310.2*
Carbonate	*EPA 310.1/310.2*
Sulfate	*EPA 375.1/375.2*
Total Dissolved Solids (TDS) @ 180°F	*EPA 160.1/SM2540C*
Dissolved Arsenic	*EPA 206.3/200.9/200.8*
Dissolved Calcium	*EPA 200.7/215.1/215.2*
Dissolved Chloride	*EPA 300.0*
Total and Dissolved Iron	*EPA 236.1/200.9/200.7/200.8*
Dissolved Magnesium	*EPA 200.7/242.1*
Dissolved Potassium	*EPA 200.7/258.1*
Dissolved Selenium	*EPA 270.3/200.9/200.8*
Dissolved Sodium	*EPA 200.7/273.1*
Radium-226 (pCi/l)	*DOE RP450/EPA 903.1/SM 7500-R-AD*
Uranium	*DOE MM 800/EPA 200.8*
Vanadium	*EPA 286.1/286.2/200.7/200.8*

Table 4
Assay Suite B Bottle List

Volume	**No. of Containers**	**Filtered (F) Non-Filtered (NF)**	**Preservation**	**Destination**
64 ounces (Half Gallon)	1	F	HNO_3 (4 mls)	Approved/Certified Lab
32 ounces (Quart)	1	NF	None	Approved/Certified Lab
12 ounces	1	F	None	Approved/Certified Lab
8 ounces	1	NF	None	Christensen Lab

2.3 Baseline Sampling Results

In general, baseline water quality is determined by averaging the data for each parameter for each well or zone that has been monitored. When determining the average for a zone and depending on site-specific conditions, the average water quality may be determined by establishing sub zones of data represented by water of different quality.

Outlier data are determined using accepted methods. The following procedures will be followed when analyzing the water quality data base for outliers:

- The data will first be screened visually, to identify obvious outliers, if present.
- The data will then be screened using a statistical analysis. Uranium One uses the tolerance-limit formula (Loftis, et al., 1987) as its method for outlier screening. This method is currently approved in the WDEQ Permit to Mine, NRC license, and is recommended in the WDEQ Guideline No. 4 for In Situ Mining. The tolerance-limit method is as follows:

$$X \pm Ks$$

Where:

X = sample mean

K = tolerance factor, corresponding to $\gamma = 0.99$ and $\alpha = 0.001$
s = sample standard deviation

- Once an outlier is identified, either by the visual screening, or by the tolerance-limit method, reasons for the outlier will be investigated. The analyzing laboratory will be contacted to see if the outlier could be a result of a calculation error, transcription error, or unit of measurement error. Errors in sampling will also be investigated. If an error is detected, the data point will be corrected. In a case where no explanation for the outlier can be reasonably found, the data point will be excluded if it fails the tolerance limit statistical screening.

The tolerance limit screening method is also useful with identifying separate water quality populations, such as found on occasion in the Christensen Ranch shallow monitor zones. In this case, separate upper control limits are set for these particular wells instead of the group upper control limit.

3 OPERATIONAL WELLFIELD MONITORING

Once a wellfield is placed into production, each of the monitor wells must be sampled in accordance with the approved sampling schedule during the life of the mine unit. Perimeter (production zone) monitor wells are placed around the wellfield perimeter to ensure horizontal confinement of mining solutions. An exceedance of the upper control limits (UCLs) in these wells indicates the possibility of a horizontal excursion. Overlying and underlying monitor wells are placed in the first aquifer above and below the production zone, respectively. These wells are sampled to ensure vertical confinement of mining solutions. An exceedance of the UCLs in these wells indicates the possibility of a vertical excursion.

Monitor wells are sampled biweekly for routine sampling and weekly for wells on excursion status as per the License conditions, State Permit to Mine and approved application for parameters that, if present over the UCLs, would potentially establish the presence of an excursion of mining solutions and indicate that corrective action is necessary. The excursion indicator parameters are chloride, conductivity, and total alkalinity.

Operational wellfield sampling is performed using the general well sampling instructions contained in Section 6.

3.1 Operational Sampling Results

The Christensen Ranch laboratory will forward the monitoring well data to the designated reviewer as soon as possible after completion of the analyses. In order to meet excursion reporting requirements, the data must be reviewed the first regular work day that the data are made available from the laboratory. The reviewer will process the data to:

- Determine if any wells exceed excursion criteria.
- Determine any trends in the water quality or water level data that could potentially lead to excursion conditions.
- Determine if any data appears abnormal and determine if reanalysis of a sample or resampling of a well, or wells, is necessary.

In the event that a review of the data shows that excursion conditions exist, or there is a significant change in one or more parameters, the conditions should be brought to the attention of the RSO to determine if additional sampling is necessary or operational changes are needed.

4 RESTORATION GROUNDWATER SAMPLING

Once a wellfield is placed into restoration, monitor wells must be sampled in accordance with the approved sampling schedule shown in Table 5. During restoration, monitor wells are sampled monthly for routine sampling and weekly for wells on excursion status for parameters that, if present over the UCLs, would potentially establish the presence of an excursion of mining solutions and indicate that corrective action is necessary. The excursion indicator parameters are chloride, conductivity, and total alkalinity.

Restoration groundwater sampling is performed using the general well sampling instructions contained in Section 6.

Table 5
Restoration Monitoring Schedule

PHASE	SAMPLE ORIGIN	FREQUENCY	ANALYTICAL PARAMETERS

Post-Mining	Designated Restoration Wells Ore Zone Monitor and Trend Wells Ore Zone Monitors Ore Zone Trends (if present) Coal Zone Trends (Irigaray only) Deep Zone Shallow Zone	Once Biweekly	Assay Suite A Water Level Chloride, Conductivity, Total Alkalinity (monitor wells) Chloride (trend wells) Water Level
Restoration	Recovery Stream Composite Designated Restoration Wells Ore Zone Monitor Wells Ore Zone Deep Zone Shallow Zone Trend Wells Coal Zone Trends (Irigaray only) Ore Zone Trends (if present)	Weekly As Needed End of Each Pore Vol. Displacement End of Each Restoration Phase Monthly Monthly (Groundwater Sweep Only)	HCO_3/CO_3, SO_4, Cl, Conductivity, pH, U_3O_8 Add Na, Ca, NH_4, TDS, etc. Assay Suite A Assay Suite A Chloride, Conductivity, Total Alkalinity Chloride
Post-Restoration Stability	Designated Restoration Wells Ore Zone Monitor Wells Ore Zone Deep Zone Shallow Zone	Four times (Beginning, Quarterly, and End) Quarterly	Assay Suite A Water Level Chloride, Conductivity, Total Alkalinity Water Level

5 PRIVATE WATER SUPPLY WELL SAMPLING

NRC license and WDEQ permit requirements provide that private domestic and agricultural/livestock wells near active wellfields must be monitored. This monitoring is required for radionuclides and is performed on a quarterly basis for Christensen Ranch and on a semiannual basis for Irigaray. The purpose of this sampling is to ensure that there is no radiological impact on water resources in the region around the mine. Samples are analyzed for radium-226 and natural uranium.

The following wells are sampled on a quarterly basis:

Christensen Ranch House #3, Ellendale #4, First Artesian #1, Middle Artesian #2, Del Gulch Lower Well #13, and Willow Corral #32

The following well is sampled on a semiannual basis:

Willow #2 (Irigaray)

5.1 Private Water Supply Well Sampling Procedure

Prior to sampling, a trip blank must be prepared in the on-site lab. A trip blank is a one gallon sample of distilled water which is processed as stated on the submittal and taken with the sampler in the field during sampling.

Before taking the sample, rinse out the sample bottles thoroughly with a portion of the filtered water. Record the time of sample collection and include any remarks as to unusual conditions of the water quality on the data sheet.

Collect a sample of water as specified on the submittal at each sample location. Be sure to rinse both sample bottles and caps prior to sampling to remove any foreign material.

Fill out the well name and pertinent data in the sampling records.

All samples must be filtered and preserved according to the Bottle List at the site lab before the end of the day. After all of the samples are collected and preserved, the Chain of Custody form is completed and the samples are sent to the contract laboratory for analysis.

6 GENERAL WELL SAMPLING METHOD

Groundwater samples obtained for baseline, operational, and restoration purposes are critical to meeting environmental protection goals at Willow Creek. The results of these samples are used to determine preoperational conditions, to monitor operational environmental protection efforts, and to determine whether restoration activities are successful. In order to ensure the accuracy of these monitoring efforts, strict compliance with groundwater sampling procedures is necessary. This section provides instructions on water level determination, proper well purging and sampling techniques, sample preservation and documentation, and QA/QC requirements. These instructions apply to all groundwater sampling conducted for baseline, operational monitoring, and restoration monitoring purposes.

6.1 Water Level Determination

The accurate determination of the static water level in wells provides important information concerning aquifer conditions. Significant changes in the water level in underlying and/or overlying aquifers may indicate a vertical excursion of mining solutions. Similarly, changes in the production zone water levels may provide an early indication of the migration of mining solutions from the active wellfield. Water level measurements are also used to determine groundwater gradients in the mining zone to assist operating personnel in managing wellfield balancing.

6.1.1 Water Level Determination with an E-Line

Well static water levels may be monitored using an electrical measuring line (an "e-line"). An e-line is a device that measures electrical conductance with two electrodes contained in a shielded probe. The probe is mounted to a graduated strip to allow measurement of water levels. The probe is slowly lowered into the well. When the probe contacts the water surface in the well, the circuit is completed and an audible device is actuated. The e-line uses batteries to provide the electrical current for the signaling device.

Caution: There may be a potential for contamination from radioactive materials when using this equipment in production zone wells. The following precautions are required in these situations:

- *Wash hands before eating, drinking or using tobacco products; and*
- *Perform an alpha survey before entering a designated clean area and at the end of shift before leaving the site.*

Before lowering the probe in the well, the e-line circuitry should be checked by dipping the probe in water or pressing the test button (if equipped) and observing the indicator. The probe is then lowered slowly into the well until contact with the water surface is indicated. Slowly move the e-line up and down until point of contact with water has been established. Using a tape measure, measure from top of casing to nearest footage mark on e-line, add or subtract as appropriate and record the measurement on the well sample form.

During wellfield production, all e-line readings should be taken to within at least a tenth of a foot.

It is important to check the e-line length by measuring with a steel tape after the line has been used for a long time, when the length has been altered due to repairs, or after it has been pulled hard in an attempt to free the line. If an e-line's length is altered by these causes, a correction factor should be written on the side of the e-line so readings may be properly adjusted.

6.1.2 Water Level Determination Using a Sonic Water Level Indicator

Water level may also be determined using a sonic water level indicator. When using a sonic water level indicator, place the 3 inch nipple that is on the bottom of the meter in the discharge pipe from the well. Press the red button on the meter, the meter will ping three times and the water level will be read out digitally on the meter screen.

6.2 Field pH and Specific Conductivity Measurements

Field meters are used to measure pH and specific conductance of water samples. The use, calibration, and care of these meters are discussed in the owner's manual. The following sections discuss general instructions for obtaining accurate field pH and conductivity measurements.

6.2.1 Field pH Measurements

Field measurement of pH is used in conjunction with conductivity as an indication that well purging has successfully removed stagnant water from the well casing and formation water is being sampled.

Degasification (such as loss of carbon dioxide), precipitation (such as calcium carbonate), and other chemical and physical reactions may cause the pH of a water sample to change significantly within several hours after the sample is collected. Immediate analysis of a sample in the field is required if dependable results are to be obtained. Field measurement of pH is carried out with a calibrated pH meter using a suitable glass and reference electrode. A combination electrode (glass and reference contained in a single unit) is preferred for this application. It is important to remember that the expensive pH bulb is fragile and that it should not be allowed to dry out. The manufacturer recommends that the probe be cleaned occasionally and stored in pH buffer solution.

Standardization should be checked before initial use and should be checked daily during regular use. For the range of water quality encountered in well sampling activities, standardization should be performed using a pH 7.00 buffer and a pH 10.00 buffer. Calibration results will be recorded. Instrument calibration will be performed in accordance with the manufacturer's recommendations.

The operator should be on the alert for erratic meter response. In the event of erratic meter response, the operator should check for weak batteries, cracked electrodes, fouled electrodes, etc. The meter probe should be rinsed after every sample measurement. At the end of the day, the probe should be stored in accordance with manufacturer's recommendation. Normally, probes must be stored in a buffer solution.

At any time that the meter cannot be adjusted to the manufacturer's specifications, the meter will be returned to the manufacturer or a qualified instrument repair service for repair and calibration.

pH measurements will be performed in accordance with manufacturer's recommendations. The probe should be swirled in the sample to remove any air bubbles adhering to the surface of the probe. A reading is not valid until the reading on the panel is stable for at least ten (10) seconds or bounces around a point for at least ten (10) seconds.

It is a common misconception that the pH probe should be cleaned with deionized or distilled water between samples in order to remove water from the previous sample. Because the chemistry of field samples, especially within the same wellfield, is so similar, it is likely that deionized or distilled water will result in contamination of the probe with dissimilar quality water. This will result in a longer time for the probe to stabilize when analyzing the next sample. Once removed from a sample, the probe tries to read the pH of the air and what little water is left on the probe. Then, when the probe is placed back into a water sample it takes considerable time for it to adjust to the correct reading. In order to circumvent the lengthy readjustment time, the user can let the probe sit in water from the previous sample until he is ready for the next sample. Salts will not build up on the probe if it is left in sample from the previous well. Because most samples in a wellfield have very similar characteristics, once placed in the new sample the probe will not have to make a large adjustment. The probe should only be cleaned with deionized or distilled water if it is not stored in sample between sampling events or at the end of the shift to prevent salt buildup before placing it in buffer solution for storage.

6.2.2 Field Conductivity Measurements

Field measurement of conductivity is used in conjunction with pH as an indication that well purging has successfully removed stagnant water from the well casing and formation water is being sampled.

The conductivity cell is checked before initial use and should be checked daily during regular use. A standard solution of known electrical conductance that falls in the range of samples to be measured is used to check the cell. For the range of water quality typically encountered, a standard solution of from 500 to 1500 micromhos/cm at 25°C is used. Routine checks are made by using the standard solution at the ambient temperature. Calibration results will be recorded. Instrument calibration will be performed in accordance with the manufacturer's recommendations.

The operator should be on the alert for erratic meter response. In the event of erratic meter response, the operator should check for weak batteries, cracked electrodes, fouled electrodes, etc. The meter probe should be rinsed with distilled water at the end of the shift. At the end of the day, the probe should be stored in accordance with manufacturer's recommendation.

At any time that the meter cannot be adjusted to the manufacturer's specifications, the meter will be returned to the manufacturer or a qualified instrument repair service for repair and calibration.

Measurements will be performed in accordance with manufacturer's recommendations. The probe should be swirled in the sample to remove any air bubbles adhering to the surface of the probe. Conductivity readings stabilize much more quickly than pH readings. The operator should ensure that the reading is stable before recording the results.

As previously noted for pH probes, the conductivity probe may be cleaned in water from the previous sample. The probe should be cleaned with deionized or distilled water at the end of the shift to prevent salt buildup before storage.

6.3 Well Purging

Water that remains in the well casing between samples may not be representative of the formation water quality. The quality of water left in the casing between samples may be changed by sorption or desorption from casing materials, oxidation, or biological activity. Purging is required to remove this stagnant water and allow formation water into the well screen.

Purging should be accomplished at a flowrate that is lower than the well development rate. The purge rate should approximate the natural groundwater flow rate (i.e., little change in the well water level during purging) while satisfying time constraints. Purging at too high of a flow rate can result in redevelopment of the well and increased turbidity. In no case should a well be purged at a flowrate high enough to cause the well to pump dry.

The well must have a sufficient volume of water removed to induce the flow of formation water through the well screen. Two approaches to purging are provided in ASTM Guide D 4448.

- The first approach requires purging a large volume of water. A smaller volume of water may be removed if purging is performed at the recharge rate.

- The second approach requires the removal of stagnant casing water until one or more indicator parameters are stable. Stabilization is considered achieved when the measurements of all parameters are stable within a predetermined range. Parameters that may be monitored include pH, temperature, specific conductivity, turbidity, redox potential, and dissolved oxygen.

Reliance exclusively on purging a set number of casing volumes may not ensure that all wells are adequately purged before sampling. Uranium One has adopted a combined approach to purging that minimizes the purge volume removed from the well while ensuring that stagnant water in the casing has been removed. Minimum purge volumes are used in conjunction with stability monitoring for field parameters before sampling may be performed. For sampling baseline wells during preoperational monitoring, a minimum of two casing volumes must be removed. For routine monitor well sampling, a minimum of one casing volume must be removed. In either situation, purging is deemed complete only when it is determined through field monitoring of pH and conductivity that the water quality is stable.

Accurate records of well purging must be maintained to document that the minimum number of casing volumes are purged from the well before sampling. These records include the casing volume (gallons), the pumping rate (gpm), and pumping start and stop times. The pumping rate can be determined with a flowmeter or by timing how long it takes to fill a 5-gallon bucket or other container of a known volume.

The following formula shall be used to calculate the number of gallons contained in one casing volume:

Casing Volume (Gals) = (Height of water in well in ft) x (Radius of the well in inches) x (π) x (0.052)

Where: $\pi = 3.1416$
The height of the water in the well = the total depth (TD) of the well in feet minus the depth to water in feet.

Using the preceding formula, conversion factors may be determined for standard casing diameters. This conversion factor (i.e., gallons per foot of pipe), when multiplied by the height of water in the casing, will yield the casing volume.

Casing Type	Casing Inside Diameter (in.)	Conversion Factor (gal/ft.)
PVC (IR)	4	0.65
Fiberglass (IR)	4 5/16	0.76
Yellowmine or PVC (CR)	4 ½	0.83
SDR-17 PVC	4.88	0.97

To determine how long the well needs to be pumped to remove a casing volume, divide the casing volume in gallons by the pumping rate in gpm. This will result in the number of minutes required to pump one casing volume.

For monitor wells, the pH and conductivity are measured immediately after starting the well. These readings are then repeated no more frequently than each ½ casing volume of water that is pumped from the well. All readings are recorded on the well sampling sheet. When a minimum of three field parameter readings indicate that the well is stable, the monitoring results are compared to determine the effectiveness of well purging. The acceptance criteria to determine whether the well is stable are:

Conductivity:	All values within ± 10 percent of the average with no discernable trends
pH:	All values within ± 0.2 S.U. of the average with no discernable trends

6.4 Well Sampling Method

The sample should be taken as soon as the well is adequately purged. If the well was pumped dry during purging, the sample should be obtained as soon as adequate formation water is present in the casing.

Before collecting the sample, make sure that the sample container is clean. For containers that are reused on site for routine sampling, wash out the collection container(s) with the water to be sampled. Containers provided by contract laboratories for analysis are presumed clean and do not need to be rinsed. Make sure that the water being sampled is very low in visible solids and any contamination that may show up in the analysis. Fill the sampling container(s) completely, so all air is excluded from the container.

NOTE: Do not touch the sampled water with your hands as this could result in contamination of the sample.

NOTE: If a down hole pump is not working or any other reason a well cannot be sampled the well sampler will inform the Environmental Technician or the RSO immediately. They will fill out a work order and turn it into the wellfield supervisor with a time restraint of when the well must be fixed to stay in the compliance sampling schedule for each well.

Record the time of sample collection and include any remarks as to unusual conditions of the water quality (e.g., odor, color) on the data sheet.

Keep the sample cool and transport it to the Laboratory as soon as possible for analysis or filtering, preservation and shipment to a commercial laboratory.

6.5 Sample Filtering and Preservation

Once a water sample has been taken, the quality of the sample begins to degrade with time. Because of this, all samples must be kept cool and some must be preserved in order to lengthen the acceptable holding time. Preservation techniques must be coordinated with the contract laboratory. Samples to be analyzed for dissolved metals should be filtered to < 0.45 microns to remove suspended solids that may affect the results.

NOTE: The sample should be filtered, if required, before preservation.

6.5.1 Sample Filtration

Place a disposable 0.45-micron pore size filter membrane in the filtering device. Flush the filter membrane and filtering device with sample water before use. Discard the portion of the sample used to flush the filter membrane, filtering device, and sample container (approximately the first 150 ml of filtered sample). If the sample is very turbid, it may be necessary to use a filter membrane with a larger pore size or surface area to pre-filter the sample. Collect the remaining filtered sample into the appropriate sample containers.

After filtering, the used filter membrane must be properly disposed. If the sample is from the mining zone, the filter will be potentially contaminated with radioactive material and must be disposed as byproduct material. Decontaminate the filtering device and any transfer vessels used by flushing or rinsing with distilled water.

6.5.2 Sample Preservation

Preservative (acid) shall be added to sample containers either before or immediately after collection and filtration, if required, of samples. If the acid is added to the container before adding the sample, do not overflow the container with the water sample. This can dilute the preservative. In addition, do not cause undue splashing out of the container opening. This can expose the sampler to acid.

The following Table provides a summary of the sampling and preservation recommendations for analytes typically of concern in groundwater. Consult the bottle and preservation list provided by the contract laboratory to ensure that the appropriate sample preservation method is used.

Parameter	**Volume Required (mls)**	**Preservative**	**Holding Time**
Dissolved Metals	250	Filter (0.45 µm), then add HNO_3 to ph<2	6 months
Total Metals	250	HNO_3 to ph<2	6 months
Alkalinity	100	Cool, 4°C	14 days
Chloride	50	None Required	28 days
Conductance	100	Cool, 4°C	28 days
Fluoride	50	None Required	28 days
Ammonia as N	50	H_2SO_4 to pH<2, Cool, 4°C	28 days
Nitrate + Nitrite	50	H_2SO_4 to pH<2, Cool, 4°C	28 days
Nitrate	50	Cool, 4°C	48 hours
Nitrite	50	Cool, 4°C	48 hours
pH	25	None Required	Analyze immediately
TDS	500	Cool, 4°C	7 days
TSS	500	Cool, 4°C	7 days
Sulfate	100	Cool, 4°C	28 days
Lead-210	1000	HNO_3 to ph<2	6 months
Polonium-210	1000	HNO_3 to ph<2	6 months
Radium-226	1000	HNO_3 to ph<2	6 months
Uranium	1000	HNO_3 to ph<2	6 months

6.6 Chain of Custody Forms

Chain of Custody (COC) forms should accompany every sample sent to off-site laboratories. The chain of custody should contain at a minimum the type of sample, the sample identification number, the preservation techniques (if any), the name of the sampler, the date and time the sample was taken, the name(s) of individuals who handled the sample and when they passed it on to another person, and the required analysis. Once the laboratory is finished with the chain of custody, it is sent back to the EHS Department with the analytical package so it can be filed for future reference.

6.7 Wellfield Sampling QA/QC

A strong QA/QC program is vital to ensure that water sampling results are valid and representative of the ambient water conditions. The bulleted items below are minimum standards implemented as part of the water sampling QA/QC program:

- The pH meter is calibrated before each day's use as discussed in Section 6.2.1.
- The conductivity meter is calibrated before each day's use in a calibration solution that has a similar conductivity to the groundwater being tested as discussed in Section 6.2.2.
- The well is properly purged before sampling in accordance with the instructions in Section 6.3. This ensures that any stagnant water is removed and representative groundwater is drawn into the well bore for sampling;
- Sample containers are flushed with the sample water in order to remove potential contaminants from the container;
- The pH and conductivity probes are stored in sample water between wells instead of with deionized water that might act to contaminate the probe. Only at the end of the day or if the probes are not stored in sample water are the probes rinsed with deionized water to remove any salts;
- All samples analyzed by a contract laboratory are accompanied by a chain of custody to ensure proper analysis is performed and the sample is tracked;
- The on-site laboratory maintains a stringent QA/QC program that includes daily or weekly analysis of replicate samples, daily or weekly spiked replicate analysis, and a comparison of results against historic values. The laboratory maintains records of all replicate and spiked replicate quality assurance tests;

- For wellfield water samples analyzed by the on-site laboratory, all results are reviewed for errors and trends by the Plant Chemist;

- NOTE: On Thursday of each week the Laboratory Supervisor will submit to the Environmental Technician and the RSO a list of wells that had not been turned in to the site laboratory.

- Wellfield samples that are sent off-site for analysis will only be sent to laboratories that maintain a stringent QA/QC program and have obtained the required lab certifications and licenses. All analysis must be performed using the analytical procedure requirements from the appropriate federal and State license(s) and permit(s).

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May 10, 2011 Letter to File; Revision of SOP ENV-1

Scott Gibbs, Environmental Tech.

Everett Parsons, Environmental Sampler

Ron Simmons, Environmental Sampler

The above employees were retrained on the importance of regulatory compliance in regards to environmental sampling. They also have read and signed off on the new revision of SOP ENV-1 regarding communication to supervisors when there is pump problems, filling out work orders for repair work and a time table when repair must be done to keep sampling in compliance.

Larry Arbogast

Raidation Safety Officer

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REPAIR REQUEST

Uranium One Americas Willow Creek Project

1002

Defects on self-propelled mobile equipment affecting safety, which are not corrected immediately, shall be noted below on this form as per OSHA 29 CFR 1926.601. This form must be given to the maintenance supervisor who will arrange to have the repair(s) completed If the Defect is considered hazardous, the equipment shall be taken out of service and tagged out.

Date Requested: 4-19-11 Requested by: [signature]

Vehicle or equipment identification: 5MW-50, 5MW-6

Repair(s) requested: Pumps Down / Repair by 4-21-11 if Possible

Date repair (s) were completed: 4-21-11 Initials: S. [signature]

Monitor wells in UNIT 7

The list below are wells we have not received as of 1:00pm 5/12/2011

1. 7DM2
2. 7DM3AB
3. 7DM4B
4. 7MW1
5. 7MW10
6. 7MW12
7. 7MW14
8. 7MW15
9. 7MW2
10. 7MW4
11. 7MW5
12. 7MW7
13. 7MW8
14. 7SM10
15. 7SM2
16. 7SM3
17. 7SM4
18. 7SM5
19. 7SM6
20. 7SM7
21. 7SM9
22. 7TW1 THRU 7TW6

A TOTAL OF 27 WELLS ARE LEFT TO SAMPLE

Lab tech._SUSAN BRUBAKER__Susan Brubaker__

ENVIRONMENTAL WEEKLY MEETING

Thursday, May 19, 2011

Meeting Attendance:

Larry Arbogast, RSO

Scott Gibbs, ENV. Tech

Everett Parsons, Sampler

Clay Ledux, Fill in Sampler

SAMPLING:

All wells in MU7 were sampled within the compliance schedule. MU6 will be sampled next week.

WORK ORDERS:

7MW15, Check electrical power and pump motor repair as necessary. Work order was completed by the ENV Dept. on May 19, 2011. Pump was pulled with the dozer because the pump spooler was in town for repair.

7MW7 and 7MW19, Drill out check valves.

A work order was filled out for dirt work to be done where the oxygen lines are crossed in MU6 with all the rain they are getting rutted out exposing the line.

PERSONNEL:

Ron Simmons was on vacation this week. S. Graham let us use Clay Ledux as a fill in sampler. Clay was trained on SOP ENV1 before sampling.

EQUIPMENT:

All equipment ok and in good working order.

EXCURSION WELLs:

All wells sampled without problems.

Excursion wells dropping nicely due to the pumping of correction wells. Have two pumping in unit 2 for mw 89, two for 4mw1, and three for 5mw8 and 5mw66 respectfully. The data shows a nice downward trend for all the wells. I think we will be able to terminate all three by the end of the month.

BASELINE SAMPLINE:

One round left for the sampling it will be finished on June 1, 2011 for all five wells.

Larry Arbogast

Radiation Safety Officer

cc: Donna Wichers

Scott Gibbs

Pablo Avila

Mike O'Leary

Jon Winter

REGULATORY COMPLIANCE SCHEDULE - 2ND QUARTER 2011

Sampling, Monitoring and Calibration	APR 3	APR 10	APR 17	APR 24	MAY 1	MAY 8	MAY 15	MAY 22	MAY 29	JUN 5	JUN 12	JUN 19	JUN 26
Exposure calculations (TWE & RWP); weekly	X	X	X	X	X	X	X	X	X	X	X	X	X
Self monitor calibration check; weekly	X	X	X	X	X	X	X	X	X	X	X	X	X
Surface contamination swipes; Weekly	X	X	X	X	X	X	X	X	X	X	X	X	X
Employee urine collection & submittal; monthly & week	X	X	X	X	X	X	X	X	X	X	X	X	X
Gamma surveys (>5 mR/hr); weekly	X	X	X	X	X	X	X	X	X	X	X	X	X
Airborne uranium sampling; monthly	X					X				X			
Radon daughters sampling; monthly	X					X				X			
Gamma surveys; monthly	X				X					X			
Employee spot check surveys; quarterly						X							
Vehicle spot check surveys; quarterly										X			
Employee TLDs; quarterly													X
Employee time study surveys; annually - January													
Surface discharge sediment; annually - Oct.													
Air sampling pumps calib.; 6 months or manufacture recommendation	see individual records												
Survey meters & flowmeters calib.; annually	see individual records												

Inspections and Tests	APR 3	APR 10	APR 17	APR 24	MAY 1	MAY 8	MAY 15	MAY 22	MAY 29	JUN 5	JUN 12	JUN 19	JUN 26
Radiation inspection; weekly	X	X	X	X	X	X	X	X	X	X	X	X	X
Radiation inspection; daily	X	X	X	X	X	X	X	X	X	X	X	X	X
Emergency respirators inspections; quarterly							X						
SOP review / update; annually - March/April	X	X	X	X									
Respirator fit tests; annually - January													
Contingency packages insp.; annually - March													
DDW pressure falloff test; annually - August HAL DEMUTH													

Training	APR 3	APR 10	APR 17	APR 24	MAY 1	MAY 8	MAY 15	MAY 22	MAY 29	JUN 5	JUN 12	JUN 19	JUN 26
Annual refresher; quarterly						X	X						
Haz-mat; every 3 years (2004)													

Reports	APR 3	APR 10	APR 17	APR 24	MAY 1	MAY 8	MAY 15	MAY 22	MAY 29	JUN 5	JUN 12	JUN 19	JUN 26
Monthly RSO Report				X					X				X
ALARA audit; February													
Employee annual dose (TEDE); January													
NRC quarterly excursion	X												
NRC annual effluent & env. monitoring; Feb. 28													
DEQ monthly excursion	X				X				X				
DEQ quarterly, well casing tests - M.I.T.	X												
DEQ quarterly surface discharge (due the 28th)			X										
DEQ quarterly deep disposal wells (due the 30th)			X										
DEQ semi-annual scrubber; if operated													
DEQ annual report; August 18													
SEO annual ; CR flows, February 15													

J:EXCEL\SAF-FORM\COMPLIAN

ENVIRONMENTAL SAMPLING AND INSPECTION COMPLIANCE SCHEDULE - 2ND QUARTER 2011

Water Sampling	APR 3	APR 10	APR 17	APR 24	MAY 1	MAY 8	MAY 15	MAY 22	MAY 29	JUN 5	JUN 12	JUN 19	JUN 26
CR monitor wells MU2 - quarterly								X					
CR monitor wells MU3 - quarterly	X												
CR monitor wells MU4 - quarterly					X								
CR monitor wells MU5 - quarterly										X			
CR monitor wells MU6 - quarterly/bi-weekly	X		X		X		X		X		X		X
CR monitor wells MU7 - bi-weekly		X		X		X		X		X		X	
Monitor wells on excursion status - weekly	X	X	X	X	X	X	X	X	X	X	X	X	X
Monitor well in-house QA/QC - weekly	X	X	X	X	X	X	X	X	X	X	X	X	X
Monitor wells outside lab QA/QC (4) - monthly					X				X				X
Surface discharge - Not in use at this time.													
Ponds - quarterly except winter					X								
Surface Water - quarterly					X								
Ranch wells - quarterly					X								
Deep disposal wells - quarterly					X	X	X						
Potable wells - quarterly						X							

Inspections and Tests	APR 3	APR 10	APR 17	APR 24	MAY 1	MAY 8	MAY 15	MAY 22	MAY 29	JUN 5	JUN 12	JUN 19	JUN 26
Pond inspections; weekly	X	X	X	X	X	X	X	X	X	X	X	X	
Pond leak detection tests; quarterly							X						

L: Env/Compliance Schedule