November 21, 2014

Mr. Michael Lewis, Executive Director
Environmental, Safety and Quality Systems
Southwest Research Institute
P.O. Drawer 28510
San Antonio, TX 78228-0510

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION REPORT NO. 99900238/2014-201 AND NOTICE OF NONCONFORMANCE

Dear Mr. Lewis:

From October 6 to October 9, 2014, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Southwest Research Institute (SWRI) in San Antonio, Texas. The purpose of the limited-scope inspection was to assess SWRI's compliance with the provisions of selected portions of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," and 10 CFR Part 21, "Reporting of Defects and Noncompliance."

This inspection specifically evaluated SWRI's control over radiation and seismic testing services associated with the equipment qualification of nuclear safety-related components. The inspectors also reviewed other nuclear safety-related work including chemical analysis, mechanical failure analysis, and platinum plating services. The enclosed report presents the results of the inspection. This NRC inspection report does not constitute NRC endorsement of your overall quality assurance (QA) or 10 CFR Part 21 programs.

The NRC inspectors found that the implementation of your QA program failed to meet certain NRC requirements imposed on you by your customers. Specifically, the NRC inspectors determined that SWRI was not fully implementing its QA program in the areas of Test Control; Control of Measuring and Test Equipment; and Instructions, Procedures, and Drawings consistent with regulatory and contractual requirements and applicable procedures. The specific findings and references to the pertinent requirements are identified in the enclosures to this letter. As evidenced by the examples cited in this inspection report, we are particularly concerned regarding the lack of adequate procedures governing the performance of nuclear safety-related work in several program areas at SWRI.

Please provide a written statement or explanation within 30 days from the date of this letter in accordance with the instructions specified in the enclosed Notice of Nonconformance. We will consider extending the response time if you show good cause for us to do so.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure(s), and your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response, (if applicable), should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request that such material is withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld, and provide in detail the bases for your claim (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information).

Sincerely,

/RA/

Richard A. Rasmussen, Chief
Electrical Vendor Inspection Branch
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Docket No.: 99900238

Enclosures:
1. Notice of Nonconformance
2. Inspection Report 99900238/2014-201
   and Attachment

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure(s), and your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response, (if applicable), should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request that such material is withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld, and provide in detail the bases for your claim (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information).

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Division of Construction Inspection
and Operational Programs
Office of New Reactors

Docket No. 99900238

Enclosures:
1. Notice of Nonconformance
2. Inspection Report 99900238/2014-201 and Attachment

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OFC	NRO/DSEA/ RPAC	NRO/DCIP/ EVIB	NRO/DCIP/ EVIB	NRO/DCIP	NRO/DCIP/EVIB
NAME	RLaVera*	JJimenez*	JJacobson	TFrye*	RRasmussen
DATE	11/20/14	11/19/14	11/18/14	11/18/14	11/21/14

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NOTICE OF NONCONFORMANCE

Southwest Research Institute
P.O. Drawer 28510
San Antonio, Texas 78228-0510

Docket No. 99900238

Report No. 2014-201

Based on the results of an NRC inspection conducted of SWRI, at their facility in San Antonio, Texas from October 6-9, 2014, it appears that certain activities were not conducted in accordance with NRC requirements that were contractually imposed upon SWRI by its customers or by NRC licensees.

A. Criterion XI, "Test Control," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," states, in part, that "Test procedures shall include provisions for assuring that all prerequisites for the given test have been met, that adequate test instrumentation is available and used, and that the test is performed under suitable environmental conditions. Test results shall be documented and evaluated to assure that test requirements have been satisfied."

   Criterion V, "Instructions, Procedures, and Drawings," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," 10 CFR Part 50. Domestic Licensing of Production and Utilization Facilities," states, in part, that "Activities affecting quality shall be prescribed by documented instructions, procedures, and drawings of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Instructions, procedures, or drawings shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished."

   Paragraph 4.11, "Inspection and Testing," of the SWRI Program Quality Plan for Nuclear Services, Revision 3, states in part that, "Required tests shall be conducted under appropriate environmental conditions using the tools and equipment necessary to conduct the test in a manner to fulfill test requirements and acceptance criteria. Test procedures shall include or reference: 1) Configuration and objectives; 2) Prerequisites and environmental conditions; and 3) Adequate and calibrated instrumentation, equipment, and monitoring and data acquisition devices.

   Contrary to the above, as of October 9th, 2014, SWRI failed to ensure that activities affecting quality were prescribed by documented instructions or procedures or failed to ensure that test procedures contained instructions and associated quantitative or qualitative acceptance criteria. The following provides the details of three specific examples of this nonconformance:

1. SWRI procedure TAP-01-0412-004 did not require that overall measurement uncertainty be determined as necessary to account for all errors that could impact the accuracy of the measured and reported radiation dose. The procedure did not account for changes in the hot cell environment during the radiation exposure of components that could occur due to the drawing in of outside air through the ventilation system. Furthermore, the procedure did not contain sufficient instructions to ensure uniform exposure or account for the non-uniformity of exposure due to variation in the dose rate fields. Also, the procedure did not contain sufficient instructions to address whether the reported dose applies only to surface or depth exposures.

2. SWRI did not have a procedure or instruction to describe when or how to account for differences in test methods associated with the use of biaxial versus triaxial seismic test equipment. During the inspection, discussions with SWRI personnel indicated that SWRI's approach to this was to use a scaling factor, but they also indicated that the scaling factors were not always used and were used only when requested by, or approved by, SWRI's customers. Failing to account for the biaxial versus triaxial testing differences could invalidate the Certificate of Conformances provided by SWRI to their customers stating the testing performed meets the requirements of IEEE 344 "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Stations."

3. SWRI did not have a procedure or instruction for performing testing to verify the purity of commercially procured platinum used at SWRI to coat main steam safety relief pilot valve internals. Factors such as the number of tests to perform on each sample, acceptance criteria for test results, and the basis for sample homogeneity were not prescribed or evaluated by procedures or instructions.

This issue has been identified as Nonconformance 99900238/2014-201-01.

B. Criterion XII, "Control of Measuring and Test Equipment," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," 10 CFR Part 50, Domestic Licensing of Production and Utilization Facilities," states that "Measures shall be established to assure that tools, gages, instruments, and other measuring and testing devices used in activities affecting quality are properly controlled, calibrated, and adjusted at specified periods to maintain accuracy within necessary limits."

Paragraph 4.11, "Inspection and Testing," of the SWRI Program Quality Plan for Nuclear Services, Revision 3, states in part that, "Required tests shall be conducted under appropriate environmental conditions using the tools and equipment necessary to conduct the test in a manner to fulfill test requirements and acceptance criteria. Test procedures shall include or reference: 1) Configuration and objectives; 2) Prerequisites and environmental conditions; and 3) Adequate and calibrated instrumentation, equipment, and monitoring and data acquisition devices.

Contrary to the above, as of October 9, 2014, SWRI failed to ensure that measures were established to assure that instruments used in activities affecting quality were properly

controlled, calibrated, and adjusted at specified periods to maintain accuracy within necessary limits. The following provides the details of three specific examples of this nonconformance:

1. SWRI failed to ensure that the measuring and testing system (e.g. the radiation survey instrument, associated procedures, and temperature and barometric measuring equipment) used to determine the applied radiation dose to nuclear components was properly controlled and calibrated. Specifically, during the irradiation of components for Project 17669.16.001, Project 19347.01.001 and Project 17669.15.001, radiation was applied to components in excess of 1000 kR/hr, which exceeded the calibrated range of the equipment being used to measure the exposure rate.

2. SWRI failed to ensure that the systems utilized to perform seismic testing of nuclear safety related equipment were properly calibrated. The inspectors identified that while portions (accelerometers and analog to digital converters) of the two seismic excitation systems had been calibrated, the portion of the systems that analyzed the resulting digital signals had never been fully calibrated or verified.

3. SWRI failed to ensure that the test instrumentation used to verify the purity of commercially procured platinum used in the plating of main steam safety relief pilot valve internals was properly controlled. Specifically, the inspectors determined that the test equipment being utilized to verify the platinum purity was inappropriate for this purpose and did not have the necessary sensitivity to measure the platinum purity down to the levels being requested.

This issue has been identified as Nonconformance 99900238/2014-201-02

Please provide a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001 with a copy to the Chief, Electrical Vendor Inspection Branch, Division of Construction Inspection and Operational Programs, Office of New Reactors, within 30 days of the date of the letter transmitting this Notice of Nonconformance. This reply should be clearly marked as a "Reply to a Notice of Nonconformance" and should include for each noncompliance: (1) the reason for the noncompliance, or if contested, the basis for disputing the noncompliance; (2) the corrective steps that have been taken and the results achieved; (3) the corrective steps that will be taken to avoid noncompliances; and (4) the date when your corrective action will be completed. Where good cause is shown, consideration will be given to extending the response time.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html, to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information.

If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information).

Dated this 21 day of November 2014.

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NEW REACTORS
DIVISION OF CONSTRUCTION INSPECTION AND OPERATIONAL PROGRAMS
VENDOR INSPECTION REPORT

Docket No.:	99900238
Report No.:	999000238/2014-201
Vendor:	Southwest Research Institute P.O. Drawer 28510 San Antonio, Texas 78228-0510
Vendor Contact:	Ms. Faye Brockwell, Group Leader Faye.brockwell@SWRI.org
Background:	Southwest Research Institute performs radiation aging, seismic, chemical analysis, and mechanical failure analysis testing services to the nuclear industry.
Inspection Dates:	October 6-9, 2014
Inspection Team Leader:	Jeffrey Jacobson, NRO/DCIP/EVIB
Inspectors:	Ronald LaVera, NRO/DSEA/RPAC Jose Jimenez, NRO/DCIP/EVIB
Approved by:	Richard A. Rasmussen, Chief Electrical Vendor Inspection Branch Division of Construction Inspection and Operational Programs Office of New Reactors

Enclosure 2

EXECUTIVE SUMMARY
Southwest Research Institute
99900238/2014-201

The NRC performed an inspection at the SWRI facility in San Antonio, Texas. The inspectors focused their review on the areas of SWRI's work in the following areas: radiation testing; seismic testing; platinum plating of main steam isolation pilot valve internals; chemical analysis; and mechanical failure analysis.

Radiation Testing

The inspectors reviewed the processes being utilized by SWRI to control radiation testing for nuclear safety-related components. Radiation testing is required to be performed as part of an equipment qualification program for safety-related equipment that will be installed in a harsh environment that includes radiation. The focus of the inspection was on ensuring that the processes used at SWRI were sufficient to ensure that nuclear components were being properly irradiated to meet customer requirements, specifically with regard to the radiation dose rate and total applied dose.

The inspectors determined that SWRI procedure, TAP-01-0412-004, does not require that overall measurement uncertainty be determined as necessary to account for all errors that could impact the accuracy of the measured and reported radiation dose. The procedure does not account for changes in the hot cell environment during the radiation exposure of components that could occur due to the drawing in of outside air through the ventilation system. These temperature changes could impact the accuracy of the radiation detectors. Furthermore, the procedure does not contain sufficient instructions to ensure uniform exposure or account for the non-uniformity of exposure due to variation in the dose rate fields. Also, the procedure does not contain sufficient instructions to address whether the reported dose applies only to surface or depth exposures. This was identified to be a Nonconformance of Criterion XI, "Test Control," and Criterion V "Instructions, Procedures, and Drawings" of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," Example 1 of Nonconformance 9990238/2014-201-01.

Also, the inspectors determined that in some instances, radiation was applied to components in excess of 1000 kR/hr, which exceeded the calibrated range of the equipment being used to measure the exposure rate. This was identified to be a Nonconformance of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." Criterion XII, "Control of Measuring and Test Equipment." Example 1 of Nonconformance 99900238/2014-201-02.

Seismic Testing

SWRI performs seismic testing which is required to show that nuclear safety-related components can withstand and/or operate during and after a seismic event. The testing is performed using two different biaxial seismic testing systems which contain the excitation tables themselves (shake tables) plus all the associated control and data acquisition systems. The

inspectors determined that SWRI did not have a procedure or instruction to describe when or how to account for differences in test methods associated with the use of biaxial versus triaxial seismic test equipment. During the inspection, discussions with SWRI personnel indicated that SWRI's approach to this was to use a scaling factor, but they also indicated that the scaling factors were not always used and were used only when requested by or approved by SWRI's customers. Failing to account for the biaxial versus triaxial testing differences could invalidate the validity of the Certificate of Conformances provided by SWRI to their customers which state the testing performed meets the requirements of IEEE 344 "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Stations." This was identified to be a Nonconformance of Criterion XI, "Test Control" and Criterion V, "Instructions, Procedures, and Drawings," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." Example 2 of Nonconformance 99900238/2014-201-01.

The inspectors also determined that SWRI failed to ensure that the systems utilized to perform seismic testing of nuclear safety related equipment were properly calibrated. The inspectors identified that while portions (accelerometers and analog to digital converters) of the two seismic excitation systems were calibrated, the portion of the systems that analyzed the resulting digital signals were never fully calibrated or verified. This was identified to be a Nonconformance of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." Example 2 of Nonconformance 99900238/2014-201-02.

Platinum Plating of Main Steam Safety Relief Pilot Valve Internals

SWRI performs a platinum plating operation on internal portions of the main steam safety relieve pilot valves. The plating is performed using a plasma injection process. The inspectors determined that SWRI failed to ensure that activities affecting quality were prescribed by documented instructions or procedures. Specifically, SWRI did not have a procedure or instruction for performing testing to verify the purity of commercially procured platinum used at SWRI to perform the process. Factors such as the number of tests to perform on each sample, acceptance criteria for test results, and the basis for sample homogeneity were not prescribed or evaluated by procedures or instructions. This was identified to be a Nonconformance of Criterion XI, "Test Control" and Criterion V, "Instructions, Procedures, and Drawings," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." Example 3 of Nonconformance 99900238/2014-201-01.

SWRI also failed to ensure that the test instrumentation used to verify the purity of commercially procured platinum was properly controlled and was appropriate for the application. Specifically, the inspectors determined that the test equipment being utilized to verify the platinum purity was inappropriate for this purpose and did not have the necessary sensitivity to measure the platinum purity down to the levels being requested. This was identified to be a Nonconformance of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." Example 3 of Nonconformance 99900238/2014-201-02.

Chemical Analysis

The inspectors reviewed policies, procedures and records, and interviewed personnel associated with SWRI performance of chemical analysis services to verify that activities associated with chemical testing and analyses met applicable regulatory requirements. The inspectors reviewed SWRI's procurement records for different types of chemical analyses to verify the evaluations identified the associated safety functions of the items or that the scope of the testing plan, laboratory technician training, test procedures, and documentation of results properly captured the requirements of the PO and, Criterion XI, "Test Control" and Criterion XII, "Control of Measuring and Test Equipment" of Appendix B to 10 CFR Part 50. The inspectors also assessed whether the equipment been used for analysis (i.e. spectroscopy, chromatography, titration) were adequate for the analysis of diesel generators fuels.

The inspectors determined that testing activities observed complied with the established testing plans. The reviewed testing plans provided the necessary guidance to determine the tested component met the applicable acceptance criteria. The sampling methods, response to failures, knowledge of acceptable values and tolerances, and documentation of results were done in accordance with established procedures. The QC inspectors and laboratory technicians that used spectroscopy and chromatography instruments demonstrated they were knowledgeable on the test scope and expected actions for acceptance. The inspectors observed that all instrumentation used for the different tests reviewed were used properly and noted they were all calibrated. No findings of significance were identified.

Procurement and Supplier Control Programs

The NRC inspectors reviewed procurement and supplier related procedures, a sample of purchasing records, qualification of suppliers' audits, and interviewed related personnel to determine if SWRI procurement and supplier controls were in compliance with the regulatory requirements of Criterion IV, "Procurement Document Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50.
No findings of significance were identified.

Mechanical Failure Analysis

The inspectors reviewed policies, procedures and records, and interviewed personnel associated with SWRI's performance of mechanical failure analysis services to verify that activities associated with failure analysis met applicable regulatory requirements. No findings of significance identified.

REPORT DETAILS

Radiation Testing

1. Measurement of Applied Radiation Dose

a. Scope

The inspectors reviewed procedures and records and interviewed personnel utilized by SWRI to perform radiation testing. SWRI provides radiation aging services to the nuclear industry for the purpose of permitting equipment vendors to demonstrate compliance with the requirements of 10 CFR Part 50—Domestic Licensing Of Production And Utilization Facilities, subsection 50.49 Environmental Qualification Of Electric Equipment Important To Safety For Nuclear Power Plants.

The inspectors reviewed the process used by SWRI to measure the radiation dose applied to nuclear components. The focus of the inspection was on ensuring that the processes used at SWRI were sufficient to ensure that nuclear components were being properly irradiated to meet customer requirements, specifically with regard to the radiation dose rate and total applied dose. The inspectors toured the SWRI facility, including the common pre-irradiation and post irradiation storage area, the operating station, and the irradiation cell. The inspectors observed a pre-irradiation dose rate measurement preparation and the subsequent irradiation of a radiation detector used to characterize the radiation field for a nuclear component to be irradiated.

The inspectors reviewed how SWRI personnel implemented the instructions in procedures TAP-01-0412-004, regarding the methods for performing irradiation of components, SOP-1-7.6.1, regarding the processes for controlling measurement and test equipment and SOP-01-4.2.2, regarding the processes used for data control and reporting.

b. Findings and Observations

The inspectors determined that the irradiator used at SWRI consists of two shielded irradiation rooms connected to a central source storage vault. Irradiations may be performed using Cesium-137 (Cs-137) or Cobalt 60 (Co-60) sources, as identified by the customer purchase order. The only source irradiations observed by, or reviewed by the inspectors, were performed using Co-60 sources. The irradiation sources observed by the inspectors were Co-60 source capsules salvaged from industry irradiation sources, such as medical teletherapy devices. The capsules are small cylinders whose external dimensions vary dependent on the capsule model. The internal configuration of the capsule, including source material composition (e.g., pellets, powder or slug) as well as the presence or absence of non-source materials, such as tungsten alloy plugs, is capsule model dependent. The radioactive content of each individual capsule is model and age dependent.

The inspectors determined that the capsules are typically assembled into 16 inch by 16 inch planar arrays in an aluminum frame, custom built by SWRI to hold the sources in a

fixed geometry. To allow adjustment of the activity contained in the source assembly, the configuration of the source frame assembly permits the installation of different number of source capsules. Depending on the desired irradiation dose profile, either one or two of these source frames may be used to irradiate materials. When not in use, the sources are stored in an air cooled shielded vault adjacent to the irradiation room. When the sources are in the storage vault and the vault shield doors are closed, the radiation levels inside the irradiation room are minimal, allowing personnel entry to position components or mockups for irradiation. Once the mockup or product is in the proper position, personnel are evacuated from the cell, the irradiation room access port shield door is raised, irradiation cell exhaust fan speed is increased, the Co-60 source assemblies are moved into the room, and an operator uses remote manipulator arms to move the source frames to the correct location. If dose rate measurements are being made, then an operator uses the remote manipulator arms to move the radiation detector to each point that requires a measurement. At the end of the irradiation interval, the operator places the source frames on the racks and returns them to the source vault.

The inspectors identified that SWRI does not take radiation readings while the nuclear component is being irradiated. SWRI uses Procedure TAP-01-0412-004 to direct the operation of the irradiation facility. The inspectors identified that while the SWRI technicians are preparing to take radiation measurements, the access port shield door between the irradiation room and the preparation/control area is open. While the inspectors were there, the open irradiation room was near or at the same temperature as the air conditioned preparation/control area. Air is removed from the irradiation room by the operation of an exhaust fan on low speed. Prior to initiating an irradiation, the irradiation room is isolated and unheated/uncooled external air is drawn into the room.

The inspectors identified that SWRI uses an MDH Industries Inc. Monitor (a.k.a., Radcal) Model 2025 or Radcal Corporation, Accu-Series ion chamber based radiation survey instrument to characterize the dose rate to the component to be irradiated from the source assembly. For small components, a grid drawn on a 16 inch by 16 inch by 1/16 inch aluminum plate is used to establish the measurement locations. For large components, a custom measurement grid may be used. While using the radiation meter to characterize the radiation field, one SWRI technician uses the remote manipulator arms to move the radiation detector to the each location on the measurement grid. The detector is held in place while another technician near the remote arm operator records the radiation reading and the temperature. Barometric pressure was recorded at least once during the measurement process, either within the cell prior to irradiation, or outside of the cell during irradiation. The temperature and pressure measurements were made outside of the irradiation room. Because an ion chamber based instrument is used to characterize the radiation field emitted from the source assembly, the use of a specific ion chamber calibration factor, in combination with a temperature and pressure correction factor, is applied to the observed radiation dose rate reading to obtain the actual dose rate.

When asked by the inspectors why the readings were not taken in the irradiation room during the irradiation cycle, the SWRI staff stated that the radiation exposure rate caused premature failure of the thermometers they used, and that when they had tried a

different temperature measuring device, they had observed a prompt increase in indicated temperature that they attributed to direct radiation induced effects in the sensing element, and not the actual temperature profile in the irradiation room. Based on meteorological information available to the inspectors, outside air temperatures in the San Antonio area can range from below 32°F to above 105°F. These temperature changes could impact the accuracy of the radiation detectors.

Also, in two examples, SWRI failed to ensure that the components being irradiated received a uniform dose that was within the range of reported accuracy to its customers. With respect to Project No. 20460.01.001, the inspectors noticed that a number of similar components were being irradiated at the same time. The individual components were relatively small with respect to the size of the source frame assembly. Based on the arrangement of the source capsules in the source frame assembly there were areas of the exposure grid that potentially varied from 5.8 percent below the mean exposure rate to 6.3 percent above the mean exposure rate. The project description did not discuss any actions, such as component movement, to normalize the exposure to the minimally exposed component. The mean exposure rate was used to calculate the exposure to all of the individual components.

In the package for Project No. 19376.02.001, the stated purpose of the project was to provide irradiation to allow the client to evaluate the survivability of a Card File and the associated Cards (electronic circuit boards) after exposure. Based on the orientation of the source and the card file and enclosed cards, with respect to a single source rack assembly, as shown in photographs included in the project package, and the lack of any discussion about the rotation of the exposed components, it appears that the card file and associated cards were not uniformly irradiated. The project package did not identify the location, with respect to the radiation field, of the critical components.

SWRI procedure, TAP-01-0412-004, does not require that overall measurement uncertainty be determined as necessary to account for all errors that could impact the accuracy of the measured and reported radiation dose; however, the inspectors determined that SWRI typically exposed components with a 5 percent margin above the customer's specified dose to account for uncertainties in their process. However, the inspectors determined that this 5 percent margin may not be sufficient, to ensure meeting the minimum specified dose, when all uncertainties in the process are considered. The calibration uncertainty associated the Radcal 2025 and accompanying ion chamber detectors, is approximately 3 percent. Additional uncertainties in the process as described above would include the temperature changes in the hot cell environment and the non-uniformity of exposure due to variation in the dose rate fields.

These two factors when added to the known 3 percent could result in uncertainties in excess of the 5 percent margin typically applied. Also, the procedure does not contain sufficient instructions to address whether the reported dose applies only to surface or depth exposures. This was identified by the inspectors to be a Nonconformance of Criterion XI, "Test Control," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," and Criterion V, "Instructions, Procedures, and Drawings." Example 1 of Nonconformance 99900238/2014-01-01.

The inspectors noted that barometer model 4199 serial number 122708164, used during an observed irradiation cycle did not have a SWRI calibration sticker affixed. When asked for the calibration record for the barometer, the SWRI staff had to contact the barometer supplier to locate a copy of the calibration document. The vendor calibration record stated that the barometer was calibrated on December 7th, 2012 and was due for recalibration on December 7th, 2014. The normal calibration interval for instruments used at SWRI is one year. SWRI procedures include provisions for adjusting the calibration interval, provided that the performance history of the device supports the calibration interval. The SWRI staff stated that the barometer had been purchased approximately 3 months ago because the previously used unit was dropped. Based on a review of the SWRI calibration database, the inspectors were unable to establish a routine history of calibration by the SWRI metrology laboratory of thermometers or barometers used to perform radiation measurements. Since the performance history for these instruments was lacking, it was not clear whether the calibration interval that had been established was adequate. This was considered to be a minor issue.

c. Conclusions

The inspectors determined that SWRI procedure, TAP-01-0412-004, does not require that overall measurement uncertainty be determined as necessary to account for all errors that could impact the accuracy of the measured and reported radiation dose. This was identified to be a Nonconformance of Criterion XI, “Test Control,” of Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants,” to 10 CFR Part 50, “Domestic Licensing of Production and Utilization Facilities,” and Criterion V, “Instructions, Procedures, and Drawings.” Example 1 of Nonconformance 99900238/2014/201-01.

2. Control of Test Equipment

a. Scope

The inspectors reviewed procedures and records, interviewed personnel, and inspected equipment utilized by SWRI to perform dose rate measurements. The purpose of the review was to evaluate the processes utilized by SWRI to ensure that instruments used to determine the exposure to tested components, had calibrations traceable to the applicable national standards, and that instruments used were handled in a manner that prevented damage or deterioration during use or storage.

b. Findings and Observations

During the review of the instruction manual for the Radcal 2025 and associated ion chambers, the inspectors noticed that the exposure rate dependence of the model 20x5-0.18 ion chamber was stated as ±2 percent, from 10 R/hr to 1000 kR/hr. This is the ion chamber with the highest exposure rate specification that is utilized by SWRI. Contrary to the requirement to use appropriately calibrated instruments, in several component irradiations, including Project 17669.16.001, Project 19347.01.001 and Project 17669.15.001, ion chamber radiation exposure rates exceeded 1000 kR/hr, without any

documented assessment of the impact on the survey instrument response. This was identified to be a Nonconformance of Criterion XII, “Control of Measuring and Test Equipment,” of Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants,” to 10 CFR Part 50, “Domestic Licensing of Production and Utilization Facilities.” Example 1 of Nonconformance 99900238/2014-201-02.

While reviewing the calibration records of a Radcal 2025 and accompanying ion chamber detectors, the inspectors noticed that calibration coefficients stated in K&S Associates, Inc., Calibration Report Number 140783 were different than the calibration coefficients provided in the calibration report included within Project No. 19347.01.001. Because an ion chamber based instrument is used to characterize the radiation field emitted from the source assembly, the use of a specific ion chamber calibration factor, in combination with a calculated temperature and pressure correction factor, is applied to the observed radiation dose rate reading to obtain the actual dose rate. Because the K&S Associates, Inc., Calibration Report stated that the “as found” condition was the same as the “as left” condition, SWRI staff had not evaluated the impact on reported dose due to changes in the listed calibration coefficients provided in the previous calibration report. Upon further review, it did not appear the change in ion chamber calibration coefficients, observed during the inspection, was significant with respect to the reported radiation dose.

During the review of SWRI Final Project Reports for irradiation services, and the instructions contained within SWRI procedure SOP-01-4.2.2, the inspectors noted that there were vendor requirements and a procedural requirement to identify the equipment used to perform the irradiation process. The inspectors determined that SWRI Final Reports for Irradiation Services failed to identify the model and calibration dates for thermometers and barometers required to perform dose rate measurements. Also, during the review of Project 17669.16.001 and Project 17669.09.001 irradiation reports, the inspectors noticed that customer specifications called for SWRI to provide the measurement uncertainty for the component irradiations. However, the measurement uncertainty for the irradiation was not included in these reports. The inspectors also noted that SWRI procedure TAP-01-0412-004 does not specify that measurement accuracy be determined, nor does it specify that the measurement uncertainty be provided as part of the final report. These were considered to be minor issues.

c. Conclusions

The inspectors identified that SWRI had failed to properly implement measures to assure that instruments, and other measuring and testing devices used in activities affecting quality were properly controlled, calibrated, and adjusted at specified periods to maintain accuracy within necessary limits. This was identified to as a Nonconformance to Criterion XII, “Control of Measuring and Test Equipment,” of Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants,” to 10 CFR Part 50, “Domestic Licensing of Production and Utilization Facilities.” Example 1 of Nonconformance 99900238/2014-201-02.

Seismic Testing

a. Inspection Scope

The inspectors reviewed procedures and records and interviewed personnel utilized by SWRI to perform seismic testing. SWRI performs seismic testing which is required to show that nuclear safety-related components can withstand and/or operate during and after a seismic event. At SWRI the testing is performed using two different biaxial seismic testing systems which contain the excitation tables themselves (shake tables) plus all the associated control and data acquisition systems. The inspectors reviewed Purchase order 6000891113, dated 4/2/2014, from Thermo Fisher Scientific for the seismic testing of a Smartview SV100A/10AC paperless data recorder. The purchase order required testing to latest IEEE 344 standard and also required units to be monitored for proper operation during the tests. The inspectors reviewed the SWRI test plan developed to perform this testing, Test Plan 18.18196.18.100.TP1, Issue 1, "Qualification Testing for the Thermo Fisher Smartview 100A/10AC Paperless Data Recorder" and the associated test report, "Test Report, Qualification Testing for the Thermo Fisher Smartview 100A/10AC Paperless Data Recorder," 18.18196.18.100.FR1, dated June 19, 2014. The inspectors also reviewed Purchase Order 101673 from Ultra Electronics to SWRI, dated 8/31/2012, for vibration testing of RTDs.

b. Findings and Observations

The inspectors reviewed the latest (2004) edition of IEEE 344, "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Stations" which was the standard being utilized by SWRI to perform the testing. Paragraph 8.6.6.2 of the standard states in part that, "Biaxial tests should conservatively simulate the seismic event at the equipment mounting locations. They should account for the absence of motion in one orthogonal direction for independent input motions in the other two orthogonal axes or for the absence of motion in two orthogonal directions if dependent inputs are used."

During the inspection the inspectors asked SWRI personnel how the intent of the IEEE standard was being met, since the seismic testing performed at SWRI is done on biaxial tables. SWRI personnel indicated that SWRI's approach to this was to use a scaling factor, but they also indicated that a scaling factor was not always used and was used only when requested by or approved by SWRI's customers. The inspectors determined that SWRI did not have a procedure or instruction that described the use of the scaling factor, what the scaling factor should be, or when or how to alternatively account for differences in test methods associated with the use of biaxial versus triaxial seismic test equipment as required by the IEEE standard. This was identified to be a Nonconformance of Criterion XI, "Test Control" and Criterion V, "Instructions, Procedures, and Drawings," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." Example 2 of Nonconformance 99900238/2014-201-01.

The inspectors also determined that SWRI failed to ensure that the systems utilized to perform seismic testing of nuclear safety related equipment were properly calibrated. The inspectors identified that while portions (accelerometers and analog to digital converters) of the two seismic excitation systems (SWRI developed IEEE controller and Dactron Laser USB controller) were calibrated, there was no record that the portion of the systems that analyzed the resulting digital signals, including both vendor developed and in-house developed software was ever fully calibrated or verified. This was identified to be a Nonconformance of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." Example 2 of Nonconformance 99900238/2014-201-02.

c. Conclusions

The inspectors determined that SWRI did not have a procedure or instruction that described the use of the scaling factor, what the scaling factor should be, or when or how to alternatively account for differences in test methods associated with the use of biaxial versus triaxial seismic test equipment as required by the IEEE standard. This was identified to be a Nonconformance of Criterion XI, "Test Control" and Criterion V, "Instructions, Procedures, and Drawings," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." Example 2 of Nonconformance 99900238/2014-201-01.

The inspectors also determined that SWRI failed to ensure that the systems utilized to perform seismic testing of nuclear safety related equipment were properly calibrated. This was identified to be a Nonconformance of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." Example 2 of Nonconformance 99900238/2014-201-02.

Platinum Plating of Main Steam Relief Pilot Valve Internals

a. Inspection Scope

The inspectors reviewed procedures and records and interviewed personnel utilized by SWRI to perform a platinum plating operation on internal portions of the main steam safety relieve pilot valves. The inspectors reviewed Contract Number 722302, from Progress Energy Service Company, dated 2/10/2014, for the performance of platinum plating of 17 pilot discs for main steam for safety relief valves for the Brunswick Nuclear Power Plant. The contract required plating the discs with a coating of 2 to 3 microns of platinum by ion beam assisted deposition process. The plating was performed using a Progress Energy approved procedure # 1995, "Procedure for Ion Beam Assisted Deposition (IBAD) of Platinum on Safety Relief Valve Pilot Discs," Revision 7. The procedure required the platinum to be 99.9 percent pure.

b. Findings and Observations

The inspectors determined that the verification of plating thickness was performed using test coupons. No concerns were identified associated with that aspect of the process. The inspectors determined that the platinum utilized at SWRI is in the form of coins procured from local commercial coin dealers. SWRI then verifies the purity of the platinum in its internal laboratory by electro dispersive spectroscopy; however, after discussions with SWRI personnel during the inspection, it was determined that this method of determining purity was not acceptable, as the instrument has not been demonstrated to have sensitivity sufficient to detect impurities down to .1 percent. This was identified to be a Nonconformance of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." Example 3 of Nonconformance 99900238/2014-201-02.

The inspectors also determined that sufficient procedures had not been developed to perform the platinum verification testing. It was unstated as to how to specifically perform the testing, how many points on a given coin were to be analyzed, or the basis for assuming that any impurities contained within the coin would be distributed in a homogeneous manner. This was identified to be a Nonconformance of Criterion XI, "Test Control" and Criterion V, "Instructions, Procedures, and Drawings," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." Example 3 of Nonconformance 99900238/2014-201-01.

c. Conclusions

The inspectors determined that the instrument being utilized by SRWI to measure platinum purity did not have sensitivity sufficient to detect impurities down to .1 percent. This was identified to be a Nonconformance of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." Example 3 of Nonconformance 99900238/2014-201-02.

The inspectors also determined that sufficient procedures had not been developed to perform the platinum verification testing. This was identified to be a Nonconformance of Criterion XI, "Test Control" and Criterion V, "Instructions, Procedures, and Drawings," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." Example 3 of Nonconformance 99900238/2014-201-01.

Chemical Analysis

a. Inspection Scope

The inspectors reviewed policies, procedures and records, and interviewed personnel associated with SWRI's performance of chemical analysis services to verify that activities associated with chemical testing and analyses met applicable regulatory

requirements. The inspectors reviewed SWRI's procurement records for different types of chemical analyses to verify the evaluations identified the associated safety functions of the items or that the scope of the testing plan, laboratory technician training, test procedures, and documentation of results properly captured the requirements of the PO and, Criterion XI, "Test Control" and Criterion XII, "Control of Measuring and Test Equipment" of Appendix B to 10 CFR Part 50. The inspectors also assessed whether the equipment that had been used for analysis (i.e. spectroscopy, chromatography, titration) was adequate for the analysis of diesel generators fuels. In conjunction with laboratory equipment review, the inspectors assessed the use of industry standards and guides (i.e. American Society for Testing and Materials [ASTM]) in addition to SWRI's procedures to ensure they met the test requirements for the POs reviewed. The inspectors assessed the adequacy of the test methods chosen by the SWRI to verify the acceptance criteria adequacy for the reviewed tests and analyses.

The inspectors reviewed measuring and test equipment (M&TE) policies and procedures to determine if SWRI controls were in compliance with the regulatory requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50. In addition, the inspectors interviewed personnel associated with control of test equipment for observed testing activities, compared observations related to M&TE to the related procedures, and reviewed associated M&TE documentation to verify appropriate program implementation.

The inspectors reviewed the above information associated with the following specific purchase orders (POs):

- 500576706 APS-Palo Verde: Testing for Trisodium Phosphate , Anhydrous
- 000161526 STP Nuclear Operations Company: Graphite Content Analysis
- 4500167750 Nebraska Public Power District: Tolytriazole Analysis
- 176386/176392 STP: Identification of Foreign Material
- 000653194 TVA: Analysis of Samples (i.e. viscosity, emulsion, flash point, moisture, acid, etc.)
- APC32783-0001 Alabama Power: Analysis for Sulfur, Lubricity, Cetanes
- 4500152921 Nebraska Public Power District: Suite of Tests for Grease , Diesel Fuel Analysis, Diesel Fuel Oil
- 4500164416 Nebraska Public Power District: Analysis of Essential Diesel Fuel Oil
- 4600015539 PG&E: FAME Content Analysis by IR (biodiesel)

b. Findings and Observations

The inspectors determined that the testing activities observed complied with the established testing plans. The reviewed testing plans provided the necessary guidance to determine the tested components met the applicable acceptance criteria. The sampling methods, response to failures, knowledge of acceptable values and tolerances, and documentation of results were done in accordance with established procedures. The QC inspectors and laboratory technicians that used spectroscopy and chromatography instruments demonstrated they were knowledgeable on the test scope and expected actions for acceptance. The inspectors reviewed documentation for the spectrometric analysis of sulfur in diesel products and determined that ASTM D2622

was adequately implemented. The documentation showed that the sample was placed in the X-ray beam, and the peak intensity of the sulfur Kα line at 0.5373 nm was properly measured. SWRI technicians ensured the background intensity was measured at a recommended wavelength of 0.5190 nm and that it was subtracted from the peak intensity. The resultant net counting rate was correctly compared to a previously prepared calibration curve or equation to obtain the concentration of sulfur in mg/kg or mass. The inspectors observed that all instrumentation used for the different tests reviewed was used properly and noted they was all calibrated.

c. Conclusions

For the chemical analysis testing reviewed, the NRC inspectors determined that SWRI had established a program that adequately controls Tests and M&TE in accordance with the regulatory requirements of Criterion XI and Criterion XII of Appendix B to 10 CFR Part 50. No findings of significance were identified.

Procurement and Supplier Control Programs

a. Inspection Scope

The NRC inspectors reviewed procurement and supplier related procedures, a sample of purchasing records, qualification of suppliers' audits, and interviewed related personnel to determine if SWRI procurement and supplier controls were in compliance with the regulatory requirements of Criterion IV, "Procurement Document Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50.

The inspectors reviewed the above information associated with the following specific suppliers' audits:

- 2013-AR-0030Specialized Chemical Services, Global Chemicals, Thermo Fisher Scientific
- 2013-AR-0029 SPEX CertiPrep Group
- 2013-AR-0028 Environmental Research Associates
- 2011-AR-0008 Sigma-Aldrich

b. Findings and Observations

The inspectors verified that the technical requirements of SWRI transferred to related POs and were issued to suppliers. The inspectors confirmed that technical requirements were transferred to the relevant POs without modification or amendment. The inspectors found that all sampled supplier qualifications were conducted by SWRI survey or audit. The inspectors found that the lead auditor and supply chain personnel were knowledgeable of supplier control and purchasing control procedures and appropriately implemented SWRI purchasing requirements.

c. Conclusion

The NRC inspectors determined that SWRI has established a program that adequately controls procurement of equipment and services in accordance with the regulatory requirements of Criterion IV and VII of Appendix B to 10 CFR Part 50. Based on the limited sample of procurement documents reviewed, the NRC inspectors determined that SWRI is effectively implementing its procurement program in support of safety-related services. No findings of significance were identified.

Mechanical Failure Analysis

a. Inspection Scope

The inspectors reviewed policies, procedures and records, and interviewed personnel associated with SWRI's performance of mechanical failure analysis services to verify that activities associated with failure analysis met applicable regulatory requirements. The inspectors reviewed Contract No. 10381381 from Entergy Operations, Inc. to SWRI, dated April 24, 2013, for the performance of a detailed examination and fatigue testing of bellows and associated piping. The bellows had been removed from the River Bend Nuclear Station.

b. Findings and Observations

The inspectors determined that the examination and fatigue testing had been performed adequately and no findings of significance identified.

c. Conclusion

The inspectors reviewed policies, procedures and records, and interviewed personnel associated with SWRI's performance of mechanical failure analysis services to verify that activities associated with failure analysis met applicable regulatory requirements. No findings of significance identified.

Entrance and Exit Meetings

On October 6, 2014, the inspectors presented the inspection scope during an entrance meeting with Mr. Michael Lewis, Executive Director for Environmental, Safety, and Quality Systems and other SWRI personnel. On October 9, 2014, the inspectors presented the inspection results during an exit meeting with Mr. Lewis and other SWRI personnel.

ATTACHMENT

1. PERSONS CONTACTED AND NRC STAFF INVOLVED

Name	Title	Affiliation	Entrance	Exit	Interviewed
Kent Coulter		SWRI			x
Richard Page	Scientist	SWRI			x
Michael Dammann	Director, Analytical and Environmental Chemistry Department	SWRI	x	x	
Rick Pitman		SWRI			x
Daniel Pomerening		SWRI			x
Jenny Ferren	Manager Structural Engineering Department	SWRI	x	x	x
Jo Ann Boyd	Manager, Quality Assurance	SWRI		x	
Ronald LaVera	Inspector	NRC	x	x	
Jeffrey Jacobson	Inspection Team Leader	NRC	x	x	
Jose Jimenez	Inspector	NRC	x	x	
Faye Brockwell	Group Leader, Institute Quality Systems	SWRI	x	x	
Mark Ehnstrom	Principal QA Technologist	SWRI	x	x	
Thomas Trbovich	Technical Advisor	SWRI	x	x	
Michael Macnaughton	Vice President, Chemistry and Chemical Engineering Division	SWRI	x		
Mike Lewis	Executive Director, Institute Quality Systems	SWRI	x		

2. INSPECTION PROCEDURES USED:

IP 43002, “Routine Inspections of Nuclear Vendors”
IP 43004, “Inspection of Commercial-Grade Dedication Programs”
IP 36100, “Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance”

3. ITEMS OPENED, CLOSED, AND DISCUSSED:

Item Number	Status	Type	Description
99900238/2014-201-01	OPEN	NON	Criterion XI and V
99900238/2014-201-02	OPEN	NON	Criterion XII

4. DOCUMENTS REVIEWED:

Purchases Orders:

- SWRI Final Report Project No. 19376.02.001 – Irradiation Services for a Card File, Dated: October 1, 2013, Prepared for Rosemount Nuclear Instruments Inc., Purchase Order 4252001951
- SWRI Final Report Project No. 19376.01.001 - Irradiation Services for 3155N Pressure Transducers, Dated: September 4, 2013, Prepared for Rosemount Nuclear, Purchase Order 4252001834
- SWRI Final Report Project No. 20460.01.001 - Irradiation Services for Four Enclosures, Dated: June 16, 2014, Prepared for Fluid Components International, Purchase Order DL00045151
- SWRI Final Report Project No. 17669.16.001 - Irradiation Services for an Electrical Feed Through, Dated: February 12, 2014, Prepared for QualTech NP, Purchase Order HP00004172
- SWRI Final Report Project No. 17669.15.001 - Irradiation Services for Squib Valve Fixture and Connector Assemblies, Dated: March 18, 2014, Prepared for QualTech NP, Purchase Order HP00004134
- SWRI Final Report Project No. 17669.09.001 - Irradiation Services for Two Electrical Feed Throughs, Dated: August 12, 2013, Prepared for QualTech NP, Purchase Order HP00002600
- SWRI Final Report Project No. 17669.08.001 - Irradiation Services for Four Electrical Feed Throughs, Dated: May 23, 2013, Prepared for QualTech NP, Purchase Order HP00002384
- SWRI Final Report Project No. 19150.01.001 - Irradiation Services for Liquid Tight Conduit Samples, Dated: April 23, 2013, Prepared for Delphi Control Systems, Purchase Order 38179-03 and Revision 1
- SWRI Final Report Project No. 19347.01.001 - Irradiation Services for Nine Proximity Switches, Dated: July 22, 2013, Prepared for Danaher Sensors and Controls, Purchase Order PRM7709
- SWRI Final Report Project No. 19376.01.002 - Irradiation Services for 3155K Pressure Transducers, Dated: April 8, 2013, Prepared for Rosemount Nuclear, Purchase Order 4252001834 Rev 4
- SWRI Final Report Project No. 19376.01.002 - Irradiation Services for 3155K Pressure Transducers, Dated: April 8, 2013, Prepared for Rosemount Nuclear, Purchase Order 4252001834 Rev 4, Correspondence dated June 4, 2014 12:23 PM

Non Conformance Reports:

- SWRI Non-Conformance Report 2013-NCR-0395 Dated July 22, 2013 – Delinquent Training – Closed August 15, 2013
- SWRI Non-Conformance Report 2014-NCR-0027 Dated January 17, 2014 – Delinquent Training – Closed February 12, 2014
- SWRI Non-Conformance Report 2014-NCR-0193 Dated May 21, 2014 – Final Report Certificate of Conformance Error – Closed June 4, 2014
- SWRI Non-Conformance Report 2014-NCR-0415 Dated October 9, 2014 – SWRI Calibration Laboratory assigned calibration due dates based on the date the Vendor reviewed the calibration report, and not the actual date the instrument was calibrated.

Calibration Records:

- Control Company, Traceable Certificate of Calibration for Dial Barometer Cert. No. 4199-4796692, Barometer Model 4199 S/N 122708164 – Calibration date December 7, 2012, Due Date December 7, 2014
- Control Company, Traceable Certificate of Calibration for Dial Barometer Cert. No. 4199-3507990, Barometer Model 14-648-51 S/N 111386150 – Calibration date March 15, 2011, Due Date March 15, 2013
- Control Company, Traceable Certificate of Calibration for Therm./Clock/Humidity Monitor Cert. No. 4040-3481538, Therm./Clock/Humidity Monitor Model 06-662-4 S/N 111346610 – Calibration date February 24, 2011, Due Date February 24, 2013
- K&S Associates, Inc., Calibration Report Number 140783, Report Date March 24, 2014, for RadCal Electrometer Model 2025 #3017, Ion Chamber 20x5-0.6 #9527, Ion Chamber 20x5-0.18 #20535, Ion Chamber 20x5-60 #8406

Instrument Instruction Manuals:

- MDH Industries Inc. Monitor (a.k.a., Radcal), Instruction Manual for Model 2025-Series X-Ray
- Radcal Corporation, The Accu-Series, Accu-Pro, Accu-Dose, Accu-kV, Radiation Measurement Systems User Guide, Radcal Part # MCD/9096 Printed Feb 2013
- Seismic Simulator Digital Control and Analysis System Manual for the “IEEE Controller”, SWRI Project No. 02-9290, dated January 1982

SWRI Procedures:

- SWRI Chemistry and Chemical Engineering Division, SOP-01-4.2.2 Revision 6 dated November 2011, “Data Control and Reporting”
- SWRI Chemistry and Chemical Engineering Division, SOP-01-5.4.1 Revision 2 dated September 2009, Reviewed with No Changes January 2013, “Quality Management System”
- SWRI Chemistry and Chemical Engineering Division, SOP-01-7.6.1 Revision 6 dated March 2014, “Control of Measuring and Test Equipment”
- SWRI Chemistry and Chemical Engineering Division, SOP-01-8.2.4 Revision 2 dated September 2009, Reviewed with No Changes January 2013, “Monitoring and Measurement”
- SWRI Chemistry and Chemical Engineering Division, SOP-01-8.3.1 Revision 5 dated July 2011, “Nonconformance Reporting”

- SWRI Chemistry and Chemical Engineering Division, TAP-01-0412-004 Revision 0, dated April 2013, “Irradiation Testing Working Instructions”
- SWRI Institute Quality Systems Institute Calibration Laboratory, LOP-02 dated September 2009, “Work Request Review”
- SWRI Institute Quality Systems Institute Calibration Laboratory, LOP-03 dated February 2013, “Purchasing”
- SWRI Institute Quality Systems Institute Calibration Laboratory, LOP-18 dated October 2009, “Quality Assurance”
- SWRI SOP-760-01, Revision 7, dated 4/18/2012, “Control of Measuring and Test Equipment”
- Test/Analytical Procedure (TAP) 01-0406-042, “Inorganic Anions and Disinfection by-products using Ion Chromatography” July 2012, revision 6
- TAP 01-0406-034, “Perchloric Acid Digestion Sample Preparation for Trace Metal Determination in Biota” August 2008, revision 4
- TAP 01-0406-130, “Method 6010B and 601C- Inductively Coupled Plasma-atomic Emission Spectrometry” February 2013 revision 10
- Standard Operating Procedure (SOP) 01-4.2.1, “Preparation and Revision of Documented Procedures” August 2013, revision 5

Standards Reviewed

- ASTM D6079 “Standard Test Method for Evaluating Lubricity of Diesel Fuels by the High-Frequency Reciprocating Rig”
- ASTM D0613 “Standard Test Method for Cetane Number of Diesel Fuel Oil”
- ASTM D1319 “Standard Test Method for Hydrocarbon Types in Liquid Petroleum Products by Fluorescent Indicator Adsorption”
- ASTM D0240 “Standard Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter”
- ASTM D0093 “Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester”
- ASTM D2622 “ Standard Methods for Sulfur in Petroleum Products by Wavelength Dispersive X-Ray Fluorescence Spectrometry