NYE COUNTY NUCLEAR WASTE REPOSITORY PROJECT OFFICE

TECHNICAL PROCEDURE

TITLE:	Revision: **0**
FIELD COLLECTION AND HANDLING OF WATER SAMPLES FOR THE NYE COUNTY TRITIUM SAMPLING AND MONITORING PROGRAM	Date: **10/3/2019**
	Page: **1 of 9**

TECHNICAL PROCEDURE NUMBER:	SUPERSEDES:
TP-11.2	**None**

APPROVAL	CONCURRENCE
Director — Date: 11/14/19	Principal Investigator — Date: 10/10/19 Quality Assurance Officer — Date: 10-9-19

1.0 PURPOSE

This technical procedure (TP) provides instructions for the field collection, field testing, documentation, and handling of groundwater samples by the Nye County Nuclear Waste Repository Project Office (NWRPO). Implementation of this procedure ensures that water samples collected as part of Nye County's Tritium Sampling and Monitoring Program (TSAMP) will be collected following industry standard procedures, correctly identified, and the data derived from samples will be traceable back to the origination point and time in the field. The user shall refer to the most current revision of all referenced NWRPO TPs, work plans (WPs), and Quality Administrative Procedures (QAPs).

1.1 APPLICABILITY

This procedure applies to the Principal Investigator (PI) and NWRPO field personnel performing collection, documentation, and packaging of groundwater samples as specified in the applicable WPs. These individuals are referred to collectively as NWRPO field personnel.

1.2 TRAINING

NWRPO field personnel will be trained on this procedure before conducting work and will document that they have read and understand this procedure. Personnel performing collection and field analysis of water samples shall be scientists, engineers, or technicians with demonstrated field experience in performing these duties.

2.0 SCOPE

This procedure includes activities required to collect, document, and maintain custody of groundwater samples collected for the scientific investigation's programs.

3.0 DEFINITIONS

3.1 Acceptable Materials – the sole materials allowed to contact groundwater samples, dependent on the analytes being tested. Acceptable materials that may contact any groundwater sample are stainless steel and fluorocarbon resin (e.g., Teflon™, PTFE, FEP, or PFA). Glass is an acceptable material for contacting samples except when silica or fluoride analyses are to be performed. Plastics (e.g., PVC, polyethylene, polypropylene, or tygon) are acceptable materials for contacting samples for the analysis of inorganic analytes (e.g., metals, radionuclides, anions, or cations).

3.2 Bailer – a tubular device with a check-valve at the top and/or bottom for collecting and removing water from a well.

3.3 Dedicated Pump System – a permanently installed device for removing water from a well.

3.4 Groundwater Sample – water acquired from a well for chemical analyses that is representative of groundwater within the aquifer or the portion of the aquifer being sampled.

3.5 Negative-Pressure Pump – a device for removing groundwater from a well by suction (i.e., negative pressure). Peristaltic and centripetal pumps are common types of negative-pressure pumps. These pumps are acceptable only for collection of samples for non-volatile analytes and/or analytes that are not affected by aeration or changes in pH.

3.6 Non-Dedicated Sampling Apparatus – equipment that may contact groundwater samples from more than one well. This term is also used to describe equipment that is used exclusively for sampling a single well but is removed from that well between uses.

3.7 Permissible Pumps and Bailers – sampling equipment that has minimal effect on water quality when used to obtain groundwater samples from wells. The parts of permissible pumps or bailers that contact the groundwater sample shall be comprised solely of acceptable materials. Bailers made of acceptable materials may be used to acquire any groundwater sample. The use of permissible pumps is dependent upon the analyses to be conducted on the acquired samples. Positive-pressure pumps may be used for acquiring any groundwater sample. The only exceptions are air/nitrogen pumps, which permit pressurized gas to contact the sample water directly. These pumps and all negative-pressure pumps may be used only for acquiring groundwater samples to be analyzed for analytes that are not volatile and are not affected by aeration or changes in pH.

3.8 Positive-Pressure Pump – a device for removing water from a well by forcing water to the surface through positive pressure when operated below the water level. A positive-pressure pump may be operated electrically, mechanically, or by air/nitrogen pressure. Submersible impeller, bladder, piston, and check-valve pumps are common types of positive-pressure pumps.

3.9 Sample Bottles – containers made of acceptable materials specifically designed and prepared for storing liquid samples. Sample bottle type, size, and added preservative are specific for particular analytes.

3.10 Well-Casing Storage Volume – the total volume of water present within the well casing prior to purging.

4.0 RESPONSIBILITIES

The PI or designee is responsible for the preparation of this procedure, preparation of test plans and/or WPs that specify wells to be sampled and analytes to be tested, and technical oversight to ensure compliance with this procedure and applicable plans.

The NWRPO Director is responsible for ensuring that applicable Quality Assurance (QA) WPs and procedures are in place prior to beginning an episode of groundwater sample collection and analysis.

NWRPO field personnel are responsible for implementing this procedure in the field. Tasks conducted by NWRPO field personnel include sample collection, sample custody in the field, field testing, completion of field data sheets, sample shipment, and delivery of data to the NWRPO QA Records Center (QARC).

5.0 PROCESS

The PI or designee will prepare and revise as necessary this procedure as well as applicable portions of WPs and/or test plans governing groundwater sampling, field testing, sample handling, and documentation associated with the TSAMP. The Director will ensure that appropriate QA procedures and plans are developed and current prior to beginning TSAMP activities. For example, the WP covering groundwater sampling and analyses for the TSAMP include WP-11, *Groundwater Chemistry Sampling and Analysis for the Nye County Tritium Sampling Program (TSAMP).*

This technical procedure controls the collection, field testing, and handling of groundwater samples from the time the samples are collected at the well site until they are sent to the laboratory for chemical analysis. Sampling procedures will be performed in sequential order. If any deviation is required, the PI and Director shall be notified of changes before implementation. If approved, the change shall be documented on a field change approval form found in QAP- 5.2, *Preparation of Work Plans, Test Plans, and Technical Procedures*. Rationale for changes in methods will be recorded in the Scientific Notebook. Field scientific notebooks and forms associated with this procedure will be used to document performance of the tasks in this procedure. Field notebooks will meet the requirements of QAP-3.2, *Documentation of Technical Investigations*.

The Water Sample Chain of Custody Form (Attachment A) will be used to document the transfer of samples from the collector in the field to the testing laboratory. Alternatively, a chain-of-custody form developed by the testing laboratory may be used to document transfer of samples.

5.1 COLLECTION AND HANDLING OF WATER SAMPLES

5.1.1 Overview

Groundwater samples shall be collected at locations and in quantities and types as directed by the PI and specified in applicable WPs.

Water levels shall be measured, well-casing storage volumes calculated and both will be documented on the Groundwater Sample Collection Form (Attachment B). The well shall then be purged and field indicator parameters determined on purged groundwater samples and recorded on the Groundwater Sample Collection Form (Attachment B). All instruments used for measuring field indicator parameters shall be calibrated in accordance with manufacturers' instructions, and controlled according to QAP-12.1, *Control of Measuring and Test Equipment*. If directed by the PI or applicable WP, purge water and decontamination fluids shall be captured and contained for disposal.

All non-dedicated sampling and measurement equipment shall be decontaminated before each use, where reasonably possible. Groundwater samples shall be collected using permissible pumps and/or bailers. Sample bottles for different analytes shall be the appropriate type and size as specified by laboratories performing analysis and recorded in the Scientific Notebook.

All samples shall be appropriately labeled and sealed and chain of custody shall be maintained and recorded on the Water Sample Chain of Custody Form (Attachment A) or the testing laboratory equivalent to this form. A Groundwater Sample Collection Form (Attachment B) shall be used to document sampling activities, field measurements, and sample collection at each sampling location. All variations from established procedures shall be approved by the PI and documented in the Scientific Notebook and Field Change Approval Form. All known sources of contamination of samples should be documented in the Scientific Notebook.

Laboratory QA reports will be reviewed by the QAO and PI and submitted with data package to the QARC by the PI. Any data points flagged by the laboratory will be documented in the metadata along with identification of potential field sampling errors or data limitations noted by field personnel in field scientific notebook.

5.1.2 Non-Dedicated Sampling Equipment Decontamination

Where it is reasonably possible, surfaces of non-dedicated sampling equipment that will be potentially exposed to groundwater should be decontaminated before being lowered into the well. Bailers and associated cable should be decontaminated before use in all cases. Moreover, submersible or piston pumps and associated flexible tubing on a reel should be decontaminated in all situations before use.

Note that there may be cases where it is impractical to fully decontaminate sampling equipment. For example, when sampling equipment includes a large submersible pump attached to a length of steel pipe, it will not be possible to thoroughly decontaminate the sampling equipment. In these cases, the pumping of large volumes of purge water through the sampling system will replace partial or full decontamination. Decontamination procedures (or lack thereof) will be recorded in the Scientific Notebook.

Full decontamination of sampling equipment shall include the following steps:

1. Wash non-dedicated equipment with potable drinking water of known, acceptable chemistry and non-phosphate detergent (e.g. Liqui-Nox® or equivalent).

2. Rinse at least three times with potable drinking water.

3. Perform a final rinse with organic-free distilled/deionized water to complete the decontamination if specified by the PI and/or applicable WPs.

4. Capture and contain decontamination solutions for disposal if specified by the PI and/or applicable WPs.

5.1.3 Well Purging for Groundwater Monitoring/Sampling

The groundwater sampling and analysis plan in WP-11 shall be utilized when planning each sampling session. Purging prior to sampling shall be conducted as follows:

1. Measure the water level in each well (or zone if completed with multiple zones) following TP-9.9, *Measurement of Groundwater Levels Using Electric Well Sounders*, or obtain current water level from the Regional Groundwater Elevation Database (RGED). If possible, obtain the total depth of the well and the well inside diameter from well completion diagrams posted on the NWRPO web site (www.nyecounty.com), NDWR web site (http://water.nv.gov/), NWIS web site (https://waterdata.usgs.gov/nwis), or various publications. Calculate the well casing storage volume from these measurements. Record the casing storage volume on the Groundwater Sample Collection Form (Attachment B).

2. Prior to taking field water quality parameter measurements, calibrate the applicable instruments according to the manufacturers' instructions and record calibration data in the Scientific Notebook. Field water quality parameter measurements include water temperature, pH, and EC

3. Pump water to the surface with a permissible non-dedicated or a dedicated pump. A minimum of three casing storage volumes shall be purged from the well, unless specified otherwise by the PI or designee. If purging of the well is not possible, field measurements should be taken before the start of sampling and notes added to scientific notebook to describe why well was not purged and field parameters observed.

4. If a permissible pump is used to sample a well, it is preferable to measure field water quality parameters in a flow-through cell system attached directly to the pump outflow line. This type of flow-through system minimizes sample disturbance. Alternatively, collect discharged purge water in a large container (e.g., a 5-gal. bucket) into

which measurement probes may be placed for measurements during purging. Measurements also may be made on small subsamples (aliquots) taken from the large container.

5. While purging water from the well, periodically measure (e.g., once per casing volume purged) all field water quality parameters following manufacturers' procedures or equivalent. Record field parameter measurements on the Groundwater Sampling Collection Form (Attachment B). If the EC (within 10 percent), pH (within 0.1 pH units), or temperature (within 0.5 ^{o}C; it should be noted that temperature may not be an accurate during low flow pumping) of the water have not stabilized when a minimum of three casing volumes have been purged, purging shall continue until these parameters stabilize as specified above, or until the PI determines that purging is sufficient. Document data in the Scientific Notebook.

6. When the well screen and sandpack are completely below the water table, control the rate of purging so that the water level in the well is not drawn below 1 ft above the top of the well screen. When the well screen and sandpack are intersected by the groundwater level, avoid large drawdowns to the extent possible.

5.1.4 Collection and Handling of Water Samples

5.1.4.1 Sample Collection

1. Samples are collected directly from well discharge from dedicated installed submersible pumps and non-dedicated submersible pumps. Prior to collecting samples, install a clean length of silicone tubing on the peristaltic pump or discharge line of submersible pump. Ensure that at least two volumes of the sample fluid pass through new tubing before collecting samples.

2. Collect samples by transferring an aliquot of sample water from a larger collection vessel to the final collection container with a peristaltic pump or collect samples directly from pump discharge if possible.

3. Pre-rinse containers with sample water (as appropriate for that particular sample) by partially filling, shaking and turning container upside down, repeating three times, then draining container before finally filling it with sample water.

   Requirements for container size, container type, and preservation may differ slightly between testing labs. Details regarding these requirements as well as labeling and shipping procedures are described in the following sections.

   Sample bottles shall be of the appropriate size/type as indicated by analytical laboratories and detailed in *TPN-11.8 Groundwater Sampling and Analysis for Nye County Tritium Sampling and Measurement Program.* If possible, pre-label bottles before collecting water samples. Complete labeling consists of writing directly on glass or plastic bottle or a water-proof label with an indelible "Sharpie" type marker with the following information:

   a. Time.

   b. Date.

   c. Well designation (e.g., NC-EWDP-1DX).

   d. Depth of saturated zone sample collected during sampling. Screened depth interval of sample collected following well completion and development, if applicable.

   e. Collector's initials.

   f. Indication of analysis (such as ^{3}H for tritium).

   g. A sample number consisting of three letters and four numbers. Use the letters "GWS" and number samples consecutively. For example, GWS0001 refers to groundwater sample number 1. Assign the same number

to all samples collected at the same date, time, well, and depth. A groundwater sample log shall be maintained and transmitted to the QARC for purposes of tracking sample numbers.

Also note this information on the Groundwater Sample Collection Form (Attachment B).

5.1.4.2 Sample Storage and Shipping

In the field, minimize the exposure of samples to heat and direct sunlight, and transport samples to the NWRPO office at the end of each sampling day. When possible, store samples in the field in coolers with ice packs.

Upon returning to the NWRPO, store each sample as indicated by testing laboratory and detailed in *TPN-11.8 Groundwater Sampling and Analysis for Nye County Tritium Sampling and Measurement Program*.

Ship all samples to the appropriate testing laboratory according to laboratory specifications, in coolers with NWRPO chain-of-custody forms and any forms required by the lab. Place all samples in the coolers with the caps up; do not place them on their sides. Pad the sides of the box or cooler with bubble wrap and pack samples so that they are held snugly in place. Use additional bubble wrap to prevent the samples from moving during shipping; pack the top of the box or cooler with bubble wrap so that samples cannot move vertically. Include the signed and dated Chain of Custody forms in a waterproof Ziploc bag and place in cooler. Ensure that boxes or coolers are securely closed and will not open during shipping. If boxes are used, label box sides with arrows pointing upward towards the box top and clearly label the top of the box "THIS SIDE UP".

Referring to TPN 11.8 *Groundwater Sampling and Analysis for Nye County Tritium Sampling and Measurement Program*, ship coolers to appropriate laboratories. Ship all samples by overnight carrier (i.e., Federal Express). Do not ship samples on Friday (i.e., hold samples that would ship Friday over the weekend and ship them Monday).

5.1.5 Field QA Samples

1. Collect a complete set of duplicate (blind) samples (for all analytes specified by the PI) for every ten sets of water samples collected or for each week of a sampling session, whichever results in more blind samples, unless otherwise specified by PI. Note that one set of samples corresponds to a single well, or zone of a well.
   a. Code these samples with the name of a fictitious well or zone.
   b. In the Scientific Notebook, record the name of the actual well and associate it with the fictitious well name or zone.
2. In addition to the blind field duplicates, collect an additional duplicate from every well or zone sampled. Store these samples in the NWRPO sample refrigerator until needed. Duplicates will be disposed of only after the original samples have been analyzed by a certified laboratory, and the results have been verified by the PI. These duplicate samples will be sent to the laboratory in the event that verification of results are required or if original sample is contaminated or destroyed prior to analysis. If directed by the PI and/or applicable WP, prepare a set of field blanks in the field from reagent grade water supplied from selected laboratories or approved laboratory supply vendor. The reagent grade water shall be shipped to and from the field with other samples. These samples provide a test of contamination from atmospheric contaminants (e.g. dust) as well as from bottle preparation, storage, shipping and analyses.

5.2 Chain of Custody

1. Maintain water samples under chain-of-custody control at all times. The samples must be in view of the current holder or secured in locked storage.

2. Ensure that samples sent to testing laboratories are accompanied by a completed Water Sample Chain of Custody Form (Attachment A) or a laboratory generated equivalent. Prior to shipment of samples, Chain of Custody Forms shall be signed by Nye County personnel releasing samples to lab. In addition, completed Chain of Custody forms shall include lab personnel signature upon receipt of samples. Once received from the laboratory, the form will

be checked for completeness and signed by the Nye County PI, or designee, to confirm it is ready for transmittal to QARC. Each time a sample is transferred, submit a copy of the form to the NWRPO QA Records Center.

5.3 Quality Assurance Samples and Laboratory Reports

Individual laboratories have their own QA procedures and the results of their analyses are included with their laboratory analytical reports. These reports shall be submitted to the QARC with the entire data package. Any data points flagged by the laboratory will be documented in the metadata and included with the data package. Blind field duplicate QA samples will be collected, or prepared, and analyzed as specified in Section 5.1.5. The PI will determine the monitoring well locations where these QA samples are to be collected.

6.0 DATA ACQUISITION METHODOLOGY AND LIMITATIONS

Detailed sampling related data will be recorded on the Groundwater Sample Collection Form (Attachment B) and summarized in the Scientific Notebook by NWRPO field personnel. Laboratory results from designated labs will be obtained in both PDF and Excel formats, and submitted to the NWRPO Quality Assurance Records Center (QARC) for capture and preservation in the project files. QC data reports will also be supplied by laboratories and submitted to the QARC. Copies of applicable pages of the Groundwater Sample Collection Form and the Scientific Notebook will be submitted with the analytical reports. The notebook will be submitted to the QA Records Center when it is filled, or at the end of the project, at the discretion of the Director.

7.0 REFERENCES

QAP-3.2, *Documentation of Technical Investigations.* Nye County Nuclear Waste Repository Project Office (NWRPO). Pahrump, Nevada.

QAP-5.2, *Preparation of Work Plans, Test Plans, and Technical Procedures.*

QAP-12.1, *Control of Measuring and Test Equipment.*

TP-9.9, *Measurement of Groundwater Levels Using Electric Well Sounders.* Nye County Nuclear Waste Repository Project Office (NWRPO). Pahrump, Nevada.

WP-11, *Groundwater Chemistry Sampling and Analysis for the Nye County Tritium Sampling and Analysis Program.*

8.0 RECORDS

Scientific Notebook

Groundwater Sample Collection Form (Attachment B)

Laboratory Analytical Reports (hard and electronic version)

Nye County Nuclear Waste Repository Project Office Water Sample Chain of Custody Form (Attachment A) or a chemical testing laboratory equivalent

9.0 ATTACHMENTS

Attachment A: Water Sample Chain of Custody Form

Attachment B: NWRPO Groundwater Sample Collection Form

Attachment A
Water Sample Chain of Custody Form

Nye County Nuclear Waste Repository Project Office

TP-8.1-1 Rev.1 01-19-2012

Water Sample Chain of Custody Form

Sample Number	Well Name or Location	Date Collected	Date Shipped	Analysis	Number of Containers

Lab Name:	
Recipient:	
Telephone	
Address	

Recipient: **Please acknowledge receipt of this shipment and return completed within 10 working days to:**

Address: Nye County Nuclear Waste Repository Project Office
Quality Assurance Records Center (QARC)
2101 E. Calvada Blvd. Ste. 100
Pahrump, NV 89048

Phone: _____

Person Accepting Custody: _____

Date/Time: _____

Person Releasing Custody for Nye County: _____

Date/Time: _____

Checked By _____ Date: _____

Attachment B
Groundwater Sample Collection Form

Form TP 8.1-2 Rev 0 05-05-09

Well Data

Sheet ____ of ____

Sampling Episode Description	Sandpack Interval(s) (ft bgs)		Depth to Water (ft bgs)	
			Total Depth (ft bgs)	
Well ID	Water Level before Purging (ft bgs)	Water Level After Purging (ft bgs)	Casing Diameter (ID, ft)	
Sampler			Water-filled Casing Volume (ft^3)	Water-filled Casing Volume (gallons)

Purging Data

Initials	Date	Clock Time	Elapsed Time (min, sec)	Purge Volume Calculations/Measurements				Field Water Quality Parameters			
				Pump Rate (gpm)	Purge Volume (gallons)	Number of Casing Volumes	Cumulative Number of Casing Volumes	Temp (°C)	pH	EC (µmhos/ cm)	Comments

Groundwater Sample Collection Data

Initials	Sample Number	Analyte Group	Testing Laboratory	Bottle	Filtered (yes/no)	Preservative	Analyte Group	Testing Laboratory	Bottle	Filtered (yes/no)	Preservative