NYE COUNTY NUCLEAR WASTE REPOSITORY PROJECT OFFICE

TECHNICAL PROCEDURE

TITLE: **FIELD COLLECTION AND HANDLING OF WATER SAMPLES**	Revision: 03 Date: 05-05-09 Page: 1 of 22
TECHNICAL PROCEDURE NUMBER: **TP-8.1**	SUPERSEDES: **Rev. 02, 07-30-02**
APPROVAL Director 5/4/09 Date	CONCURRENCE Geoscience Manager 5/4/09 Date Principal Investigator 5/4/09 Date Quality Assurance Officer 5/5/09 Date

1.0 PURPOSE

This technical procedure (TP) provides instructions for the field collection, field testing, laboratory data validation, 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 during and after Nye County's independent oversight drilling program 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 gathered for the NWRPO's independent scientific investigation program.

3.0 DEFINITIONS

3.1 Acceptable Materials – the sole materials allowed to contact groundwater samples, and are 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 groundwater from wells.

3.3 Dedicated Pump System – a permanently installed device for removing water from a well. Because the system is not removed from the well, it does not have the potential to become contaminated between uses. Although it can be a source of contamination if not made of acceptable materials.

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. The limitation for lifting water by suction is usually 20 to 25 ft. 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. Negative-pressure pumps are useful as purging devices for shallow groundwater wells.

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 and could potentially become contaminated.

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 the pressure fluid 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. Sample bottles are generally prepared and supplied by the analytical laboratory.

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 monitor wells to be sampled and analytes to be tested, validation of data from the testing laboratory, and technical oversight to ensure compliance with this procedure and applicable plans.

The NWRPO Geoscience Manager (GSM) or designee 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, documentation, and data validation. The GSM will ensure that appropriate QA procedures and plans are developed prior to beginning a field hydrogeologic characterization program involving the groundwater monitoring program. For example, WPs covering groundwater sampling and analyses for the Early Warning Drilling Program include WP-5.0, *Phase VI Drilling and Well Construction,* WP-8.0, *Sample Management, and* WP-11, *Groundwater and Surface Runoff Water Chemistry Sampling and Analysis*. These plans describe sampling procedures for both vadose zone and saturated zone groundwater monitoring.

This technical procedure controls the collection, field testing, and handling of groundwater samples from the time the samples are gathered at the well site until they are ready to be sent to the laboratory for chemical analyses. 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. In addition, this procedure describes the use of QA samples to validate laboratory testing data.

Sampling procedures will be performed in sequential order. If any deviation is required, the PI and GSM 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*. Rational for changes in methods will be recorded in the Field Geochemistry 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*.

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 GSM and specified in applicable WPs, and may include first occurrence groundwater samples collected during the drilling of new boreholes.

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 as specified in project WPs, 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 and contain the appropriate preservative as specified by laboratories performing analysis and recorded on the Sample Collection, Storage, and Shipping Information Form (Attachment C), in addition to the sample filtering requirements.

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/or GSM and documented in the Field Geochemistry Notebook and Field Change Approval Form. All known sources of contamination of samples should be documented in the Field Geochemistry Notebook.

QA sample results shall be evaluated to determine compliance with QA objectives, identify potential field and laboratory sources of error, and assign data qualifiers to original sample data if QA objectives are not met.

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 500 ft of 3.5-in. O.D. 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 Field Geochemistry 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

Following the completion and development of wells, groundwater samples shall be collected from either single or multiple screened intervals. 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). Obtain the total depth of the well and the well inside diameter from well completion diagrams posted on Nye County's web site (www.nyecounty.com). 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 (YSI, January 2002; Hach, December 2000) as summarized in Instructions For The Use, Storage, and Calibration of Field Water Quality Parameter Measurement Equipment (Attachment D) and record calibration data in the Field Geochemistry Notebook. Field water quality parameter measurements include water temperature; pH; EC; and; if possible, alkalinity. It is advisable to calibrate equipment prior to the sampling event to assure equipment is working properly.

3. Pump water to the surface with a permissible pump (e.g., Bennett pump [compressed air driven piston pump] or an electric submersible pump) 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.

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 each casing volume purged) all field water quality parameters, with the exception of alkalinity, following manufacturers' procedures (YSI, January 2002) or equivalent as summarized in Attachment D. Record field parameter measurements in the Groundwater Sampling Collection Form (Attachment B). If the EC (within 10 percent), pH (within 0.1 pH units), or temperature (within 0.5 ºC) 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 Field Geochemistry Notebook.

6. When directed by the PI, make field alkalinity measurements on a filtered water sample with a Hach® digital titration test kit. If field conditions are unfavorable for these measurements, they may be conducted indoors (e.g. NWRPO building in Pahrump) within 72 hours of sample collection. Perform the alkalinity titration in accordance with the manufacturers' instructions (Hach, December 2000) as summarized in Attachment D. Record data in the Field Geochemistry Notebook and on the Alkalinity Titration Data Sheet (Attachment E).

7. 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. Prior to collecting samples requiring filtering from each sampling interval, install a clean piece (at least 3 to 4-ft long) of silicone tubing on the peristaltic pump along with a new, unused, large-capacity 0.45 micron filter on the discharge end of the tubing or connect filter and tubing directly to discharge line if possible. Non-filtered sampling follows the same sampling procedure, excluding the connection of the filter.

   a. Ensure that at least two volumes of the sample fluid pass through each new tubing/filter combination before collecting samples. To help reduce the possibility of air being introduced into the filter, hold filter with the discharge end upright until filled completely with sample water.

   b. Use this combination of tubing and filter until the pump is changed to a new well, screened interval, or new packed-off interval of a Westbay® completion.

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. When filling containers that are preloaded with a preservative, do not pre-rinse containers with sample water and do not overfill containers with sample water. Pre-rinse all other containers with filtered or unfiltered 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.

4. If possible, do not preload sample bottles with preservative. Instead, add the preservative (e.g. acid) after sample bottles have been pre-rinsed. Aliquots of preservative may be added by breaking sealed ampoules into pre-rinsed bottles.

Table 1 summarizes typical analytes that may be analyzed during a sampling session. 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. Using Table 1 as a guideline for possible analytes, fill out the Sample Collection, Storage, and Shipping Information Form (Attachment C) after confirming requirements specified by PI and analytical laboratories. This table shall be completed prior to each sampling session.

Table 1
Summary of Possible Water Chemistry Analytes

Analyte	Detection Limit
Aluminum	0.03 milligrams per liter (mg/L)
Antimony	0.0004 mg/L
Arsenic	0.0005 mg/L
Barium	0.003 mg/L
Beryllium	0.002 mg/L
Boron	0.01 mg/L
Cadmium	0.005 mg/L
Calcium	0.2 mg/L
Chromium	0.01 mg/L
Cobalt	0.01 mg/L
Copper	0.01 mg/L
Iron	0.02 mg/L
Lead	0.0001 mg/L
Lithium	0.02 mg/L
Magnesium	0.2 mg/L
Manganese	0.005 mg/L
Molybdenum	0.01 mg/L
Nickel	0.01 mg/L
Potassium	0.3 mg/L
Selenium	0.001 mg/L
Silica	0.2 mg/L
Silver	0.00005 mg/L
Sodium	0.3 mg/L
Strontium	0.00005 mg/L
Thallium	0.0001 mg/L
Titanium	0.005 mg/L
Uranium	0.0001 mg/L
Vanadium	0.005 mg/L
Zinc	0.01 mg/L
Alkalinity as CaCO3	2 mg/L
Bromide	0.1 mg/L
Chloride	1 mg/L
Conductivity at 25 degrees centigrade (°C)	1 micromhos per centimeter (µmho/cm)
Fluoride	0.1 mg/L
Nitrate/Nitrite as N	0.02 mg/L
Nitrogen, ammonia	0.05 mg/L
pH (laboratory)	0.1 units
Phosphorus	0.01 mg/L
Sulfate	10 mg/L
Residue, filterable (total dissolved solids [TDS]) at180 °C	10 mg/L
Gross alpha	0.4 picocuries per liter (pCi/L)
Gross beta	0.1 pCi/L
Tritium	365 pCi/L
Radiocarbon (C-14)	300 micrograms carbon/liter (µg C/L) as DIC[a]
SIRA[b] of carbon in TDIC[c]	300 µg C/L as DIC
SIRA of oxygen and hydrogen in water	N/A
SIRA of nitrogen in nitrate	N/A

[a]Detection limit of total dissolved inorganic carbon in groundwater to obtain both 14C and 13C/12C.
[b]Stable isotope ratio analysis.
[c]Total dissolved inorganic carbon.

Sample bottles shall be of the appropriate size/type and contain preservatives as indicated by analytical laboratories and documented on Sample Collection, Storage, and Shipping Information Form (Attachment C).

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.

e. Collector's initials.

f. Indication of analysis (such as ^3H for tritium, Cl for chloride anion, etc.).

g. A sample number consisting of three letters and four numbers. For samples collected during drilling, use the letters "DWS" and number samples consecutively. For example, DWS0001 refers to the first drilling water sample. For samples collected following well completion and development, 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 on the Sample Collection, Storage, and Shipping Information Form which was completed prior to the sampling session. For samples being sent for Radiocarbon dating analysis, place a tape seal around the cap/bottle joint to help prevent loss or exchange of carbon dioxide from the water sample, unless the laboratory specifies differently.

Ship all samples to the appropriate testing laboratory within 7 days of sampling, or sooner if specified by laboratory, 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. All samples require cold packs in the coolers. Do not use free ice in the coolers; the water from melted ice can wash labels off, contaminate samples, and remove labeling tape. 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 the Sample Collection, Storage, and Shipping Information Form completed prior to sampling session, ship coolers to appropriate laboratories. To minimize the chance of contamination if a bottle breaks open, place samples with added preservatives into separate containers, to the extent reasonably possible. 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).

NOTE: The specific types of water samples to be collected in the field are dependent on the requirements as specified by the PI.

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. 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 Field Geochemistry Notebook, record the name of the actual well and associate it with the fictitious well name or zone.

2. If requested by PI, collect a sample of the final pump or bailer decontamination surface rinse (rinsate sample) for every ten sets of water samples collected or for each week of a sampling event, whichever results in more blind samples. Request the testing laboratory to analyze for anions, EC, pH, TDS, alkalinity, and dissolved metals.

3. 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 and preservatives, 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 the distribution of samples to testing laboratories is accompanied by the completion of the Water Sample Chain of Custody Form (Attachment A) or a laboratory generated equivalent.

3. Each time a sample is transferred, submit a copy of the form to the NWRPO QA Records Center.

5.3 Quality Assurance Samples and Data Validation

Potential field sampling and laboratory analytical error shall be estimated from an evaluation of both field and laboratory QA samples (Taylor, 1987). The field QA samples and types and sources of error are discussed below. Individual laboratories have their own QA procedures and the results of their additional analyses are included with their laboratory analytical reports.

Data validation shall consist of an evaluation by the PI (or designee) of the degree to which QA objectives are met. Metadata shall be prepared summarizing compliance of QA sample analytical results with QA objectives (Table 2). The original analyses, collected and analyzed in the same batch as the QA samples that do not meet QA objectives, shall be qualified with standard data qualifiers (EPA, 1986). The results of this data validation will become part of the data package submitted to the QARC.

The following field QA samples will be collected, or prepared, and analyzed at a rate of 1 set per 10 sets of groundwater samples collected. NWRPO field personnel will determine the monitoring well locations where these QA samples are to be collected.

1. Blind field duplicate samples will be used to estimate precision error associated with both field sampling and laboratory analysis.

2. Equipment or rinsate blanks will be used to identify contamination associated with field decontamination procedures.

3. Field blanks of reagent grade water will provide an indication of contamination from field sampling, handling, and shipping processes.

Table 2. Quality Assurance Sample Summary and Objectives

Quality Assurance Error Parameter	Quality Assurance Sample Type	Primary Source of Error	Quality Assurance Objective
Precision	Laboratory matrix duplicate	Laboratory analyses	D_1 and D_2 > 5 RL, RPD < 30%, D_1 or $D_2 \le$ 5 RL, $\|D_1 - D_2\| \le$ 2RL
	Blind field duplicate	Field sampling and laboratory analyses	D_1 and D_2 > 5 RL, RPD < 30%, D_1 or $D_2 \le$ 5 RL, $\|D_1 - D_2\| \le$ 3RL
	Matrix spike duplicate	Laboratory analyses	D_1 and D_2 > 5 RL, RPD < 30%, D_1 or $D_2 \le$ 5 RL, $\|D_1 - D_2\| \le$ 3RL
Accuracy	Matrix spike	Laboratory analyses	%R = 75 to 125
Cross-contamination	Methods blank	Laboratory equipment	< Laboratory reporting limit
	Rinsate blank	Field sampling equipment, laboratory equipment, bottles, preservatives, storage, shipping, etc.	< Laboratory reporting limit
	Field blank	Atmosphere, laboratory equipment, bottles, preservatives, storage, shipping, etc.	< Laboratory reporting limit

NOTES:
D_1, D_2 = Duplicate samples.
RL = Laboratory reporting limit equals the method detection limit.
RPD = Relative percent difference.
Where,

$$RPD = \left| \frac{D1 - D2}{\frac{D1 + D2}{2}} \right| \times 100.$$

%R = Percent recovery.

6.0 DATA ACQUISITION METHODOLOGY AND LIMITATIONS

Groundwater sampling and chemical analyses data may be used at U.S. Nuclear Regulatory Commission proceedings to evaluate the U.S. Department of Energy (DOE) license application. Detailed sampling related data will be recorded in Groundwater Sample Collection Form (Attachment B) and summarized in the Field Geochemistry Notebook by NWRPO field personnel. Authors will initial and sign any and all forms used for this procedure.

Hardcopy and electronic versions of analytical reports from designated labs will be submitted to the NWRPO Quality Assurance Records Center for capture and preservation in the project files. Copies of applicable pages of the Groundwater Sample Collection Form and the Field Geochemistry 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 GSM.

7.0 REFERENCES

EPA. 1986. *Test Methods for Evaluating Solid Waste (SW-846).* U.S. EPA/Office of Solid Waste, Washington, D.C.

Hach, December 2000, *Digital Titrator Model 16900-08 (Manufacturers Instructions),* Hach Company, P.O. Box 369, Loveland, CO 80539-0389, (800) 227-4224.

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.*

Taylor, J.K. 1987. *Quality Assurance of Chemical Measurements.* Lewis Publishers, Inc., Chelsea, Michigan.

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

WP-5.0, Phase VI *Drilling and Well Construction*. Nye County Nuclear Waste Repository Project Office (NWRPO). Pahrump, Nevada.

WP-8.0, *Sample Management*.

WP-11, *Groundwater and Surface Runoff Water Chemistry Sampling and Analysis.*

YSI, January 2002, *YSI 6 Series Environmental Monitoring Systems Operations Manual*, YSI Inc., 1700/1725 Brannum Lane, Yellow Springs, OH 45387, (800) 765-4974.

8.0 RECORDS

Alkalinity Titration Data Sheet (Attachment E)

Field Geochemistry 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

Sample Collection, Storage, and Shipping Information Form (Attachment C)

9.0 ATTACHMENTS

Attachment A: Water Sample Chain of Custody Form

Attachment B: NWRPO Groundwater Sample Collection Form

Attachment C: Sample Collection, Storage, and Shipping Information Form

Attachment D: Instructions For The Use, Storage, and Calibration of Field Water Quality Parameter Measurement Equipment

Attachment E: Alkalinity Titration Data Sheet

Attachment A
Water Sample Chain of Custody Form

Nye County Nuclear Waste Repository Project Office					Form TP 8.1-1 Rev 0
Water Sample Chain of Custody Form					05-05-09
Sample Number	Well Name or Location	Date Collected	Date Shipped	Analysis	Number of Containers

Lab Name:	_ _		**Recipient**: Please acknowledge receipt of this shipment and return completed within 10 working days to:
Recipient:			Nye County Nuclear Waste Repository Project Office
Telephone			Quality Assurance Records Center (QARC)
Address		Address:	
		Phone:	
Person Accepting Custody:			Person Releasing Custody for Nye County :
Date/Time:			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

				Purge Volume Calculations/Measurements				Field Water Quality Parameters			
Initials	Date	Clock Time	Elapsed Time (min, sec)	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

Attachment C
Sample Collection, Storage, and Shipping Information Form

Wells to be Sampled:										
Analyte Group	**Sample Type**	**Filter (Yes/ No)**	**Fill Level**	**Preservative**	**Bottle Type**	**Bottle Size**	**Bottles Per Sample**	**Type of Storage**	**Laboratory**	**Special Shipping Instructions**

Attachment D
Instructions for the Use, Storage, and Calibration of Field Water Quality Parameter Measurement Equipment

YSI 6-Series Environmental Monitoring Equipment Use (YSI, January 2002)

1. Connect the 6820 Sonde to the flow cell and replace the sonde's flat gasket with an O-ring.
2. Connect the 6820 Sonde to the 650 MDS hand held meter using the field cable.
3. Turn the 650 MDS on.
4. Select Run and then Discrete Sample, once the measurements have stabilized record them on the Groundwater Sample Collection Form (Attachment B).
5. Log the data point if desired for QA purposes.

Short Term Storage (less than two weeks)

1. Fill the calibration cup with 1/4 of an inch of water.
2. Humidity in the cup must be 100% so a good seal between the probe and the cup must be present.
3. Make sure the water does not touch any of the probes.
4. Store in a secure area where it will not get tipped over.

Long Term Storage (greater than two weeks)

1. Remove pH probe and plug the ports in the 6820 Sonde.
2. The pH probe should be stored in the 2 M potassium chloride solution in the storage bottle.
3. Fill the calibration cup with water and attach it to the 6820 Sonde, ensuring a good seal so that the water will not evaporate.
4. Store in a secure area.

Calibration Frequency

1. Calibrate pH before every use.
2. Calibrate Conductivity once before a sampling event.
3. Record all calibrations and maintenance to the equipment in the Field Geochemistry Notebook.

Conductivity Calibration

1. Add 200 ml of the appropriate conductivity standard (e.g. 1000 μS/cm) into the clean, dry, DI rinsed calibration cup.
2. Remove the probe cover from the 6820 Sonde.
3. Rinse the probe with a small amount of the standard that is to be discarded.
4. Carefully attach the calibration cup to the probe gently shaking the 6820 Sonde to remove bubbles from the probe.
5. Allow at least 1 minute for the temperature to equilibrate.
6. From the Calibrate menu select Cond, and enter 1000 μS/cm, when the reading shows no significant change for 30 seconds press enter.
7. The screen will display that the calibration was accepted and press enter.
8. Remove the calibration cup, rinse it with DI, and dry.
9. Rinse the 6820 Sonde in DI and dry.

pH Calibration

1. Add 100 ml of the pH 7 buffer standard into the clean, dry, DI rinsed calibration cup.
2. Remove the probe cover from the 6820 Sonde.
3. Attach the calibration cup to the 6820 Sonde and allow one minute for the temperature to equilibrate.
4. From the Calibrate menu select ISE1 pH and select 2- 2-Point.
5. Press enter and input the value of the buffer (7) at the prompt.
6. Press enter and when the pH reading shows no change for 30 seconds press enter again.
7. The screen will display that the calibration was accepted, then press enter to finish the calibration.
8. After the calibration for pH 7 press enter.
9. Remove the calibration cup, rinse it with DI, and dry.
10. Rinse the 6820 Sonde in DI and dry.
11. Add 100 ml of the pH 10 buffer standard into the clean, dry, DI rinsed calibration cup and repeat steps 3 – 9 for the pH ten buffer.

Hach Digital Titrator Model 1690 Use (Hach, December 2000)

1. Insert a clean delivery tube into the .16 N titration cartridge. Slide the .16 N cartridge into the body of the titrator.

2. Turn the delivery knob until a few drops of sulfuric acid is ejected. Reset the counter and wipe the tip.

3. Using the graduated cylinder measure out 100ml of the sample and transfer it into the 250 ml graduated cylinder.

4. If measuring alkalinity in a chlorinated water supply, add one drop of 1N Sodium Thiosulfate and swirl to eliminate chlorine from the sample.

5. Titrate the sample by holding the delivery tube in the sample and turning the delivery knob, while monitoring pH with a clean pH probe and stirring.

6. Every 0.2 – 0.3 pH record the pH and digits added.

7. Titrate until a pH of 3 is reached.

8. After each titration rinse the delivery tube and wipe it clean with a chem wipe or replace it with a clean one.

9. Dispose of the sample in an appropriate manor.

10. Rinse all glassware four times with tap water and once with DI or sample water.

11. For more titrations at the same site return to step 3.

12. After all titrations are finished at the site, remove the cartridge and delivery tube by depressing the plunger release button and sliding it all the way back.

13. Remove the delivery tube, cap the cartridge, and store.

14. Clean the delivery tube by rinsing 4 times with tap water and once with DI water.

15. Clean all glassware used by rinsing 4 times with tap water and once with DI water.

16. The titrator requires no washing.

Titrator Calibration

1. Calibrate the Hach Alkalinity titrator before a sampling event.

2. Titrate a sample of tap water to pH 3 using the method above.

3. Using a pipet add 0.1 ml of the 0.5 N Alkalinity Standard Solution Voluette Ampule.

4. Resume titrating to the end point of 3 pH and record the digits added.

5. Repeat steps 2 and 3 twice.

6. Each 0.1 ml should require 250 digits of the 0.16 N titrant; if not, refer to the Hach titrator manual (Hach, December 2000).

Attachment E
Alkalinity Titration Data Sheet

Form TP 8.1-4 Rev 0 05-05-09

Well Name:	**Testing Date/Time:**
Sample Collection Date/Time:	**Person Titrating:**
Total Digits of Acid Added	**pH**
Initial Reading	

Signature: ______________________

Checked By: ______________________