NYE COUNTY NUCLEAR WASTE REPOSITORY PROJECT OFFICE

TECHNICAL PROCEDURE

TITLE: FIELD COLLECTION AND HANDLING OF WATER SAMPLES		Revision: 02 Date: 07-15-02 Page: 1 of 23
PROCEDURE No.: TP-8.1	SUPERSEDES: Rev. 01, 02-20-02	
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1.0 PURPOSE

This technical procedure (TP) provides instructions for the field collection, field testing, laboratory data validation, documentation, and handling of borehole water samples by the Nye County Nuclear Waste Repository Project Office (NWRPO) as part of the Yucca Mountain Project (YMP). 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).

2.0 SCOPE

This procedure includes activities required to collect, document, and maintain custody of borehole water samples gathered for the NWRPO's independent scientific investigation program.

2.1 APPLICABILITY

This procedure applies to the principal investigator (PI) and NWRPO field personnel performing collection, documentation, and packaging of borehole water samples as specified in the WPs. These individuals are referred to collectively as NWRPO field personnel.

2.2 TRAINING

NWRPO field personnel will be trained to this procedure before conducting work, will document that they have read and understand this procedure, and will demonstrate to the PI their competence in performing this procedure. Personnel performing collection and field analysis of water samples shall be professional geologists, engineers, or trained technicians with demonstrated field experience in performing these duties.

3.0 DEFINITIONS

3.1 Acceptable Materials – Acceptable materials are 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 bailer is 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 dedicated pump system is 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 – A groundwater sample is 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 negative-pressure pump is 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 – Non-dedicated sampling apparatus is 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 – Permissible pumps and bailers include 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 positive-pressure pump is 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. Nye County uses several different submersible impeller type pumps in wells equal to or larger than 4-in. I.D. and Bennett piston pumps in smaller diameter wells.

3.9 Sample Bottles – Sample bottles are 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 – Well-casing storage volume is the total volume of water present within the well casing prior to purging.

3.11 Work Plan (WP) – A WP is a document describing technical work to be performed by or for the NWRPO. For the purposes of this procedure, a WP will incorporate the specific plans for sample collection, handling, and curation.

4.0 RESPONSIBILITIES

The PI 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 Onsite Geotechnical Representative (OSGR) 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.

5.0 PROCESS

The PI 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 OSGR 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, *Drilling and Well Construction Work Plan* and WP-8, *Sample Management Plan*. Both plans describe monitoring wells and analytes for both vadose zone and saturated zone groundwater monitoring.

This technical procedure controls the collection, field testing, and handling of vadose and saturated zone water samples from the time the samples are gathered at the drill site until they are ready to be sent to the laboratory for chemical analyses. Transfer-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; any deviation and rational for changes in methods will be recorded in applicable WPs or in field scientific notebooks (referred to as the Field Geochemistry Notebook in the following sections). 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, *Procedures for Documentation of Scientific 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 project WPs.

Water levels shall be measured, well-casing storage volumes calculated and both will be documented in the Field Geochemistry Notebook. The well shall then be purged and field indicator parameters determined on purged groundwater samples. All instruments used for measuring field indicator parameters shall be calibrated in accordance with manufacturers' instructions, and controlled according to QAP-12.1, *Procedures for 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 summarized in Table 1 (see Section 5.1.5). Sample filtering requirements are also summarized in Table 1.

All samples shall be appropriately labeled and sealed and chain of custody shall be maintained and recorded on the Transfer-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 Field Geochemistry Notebook. 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.

2. Rinse at least four 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 project WPs.

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

5.1.3 First Occurrence Groundwater Sampling

Field and laboratory measurements to be made on first occurrence groundwater samples are described in WP-5. Sampling methods are briefly described below.

1. Upon detection of free water in the cuttings and/or water vapor or mist exiting the separator, cease drilling activity.

2. If possible, collect approximately 3 L of the "first occurrence" water by one or both of the following methods depending on the quantity of water available for sampling. Sample containers may be precleaned 1 L glass (for C, O, and H isotope analysis) and high density polyethylene plastic bottles for all other analytes.

    a. To ensure that a water sample is obtained even if the quantity of "first occurrence" water is limited, collect water draining from the separator or discharging directly from the drill pipe, if the latter is not connected to the separator.

    b. If feasible, collect samples from a permissible bailer lowered down the inside of the drill pipe. If perched water is depleted by bailing or because drilling activity failed to cease before zone was exhausted, wait to determine if this perched zone will recover.

    c. Field water quality parameter measurements include water temperature, pH, electrical conductivity (EC). Monitor these parameters by a field pH, EC and temperature meter and document the parameters in the Scientific Notebook for the borehole being drilled.

5.1.4 Groundwater Monitoring Sampling

Following the completion and development of wells, collect groundwater samples from either single or multiple screened intervals.

1. Measure the water level in each well screen following TP-9.9, *Measurement of Groundwater Levels*. Calculate the well casing storage volume from this measurement, the total depth of the well, and the well inside diameter. Obtain the latter data from well completion diagrams and/or the well summary tables posted on Nye County's web site (www.nyecounty.com). 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 Appendix A and record calibration data in the Field Geochemistry Notebook. Field water quality parameter measurements may include water temperature, pH, EC, turbidity, dissolved oxygen (DO), oxidation reduction potential (ORP), and alkalinity.

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

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) as summarized in Appendix A. Record field parameter measurements in the Groundwater Sampling Collection Form (Attachment B). If the EC (within 10 percent), pH (within 0.1 pH units), temperature (within 0.5 ºC), DO (within 10 percent) or turbidity (within 10 percent and less than 5 NTU) 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 an 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 Appendix A. Record data in the Field Geochemistry Notebook.

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.

5.1.5 Filtering, Bottling, Labeling, Preserving, and Shipping Water Samples

Table 1 summarizes typical container, filtering, and preservation requirements for a number of different analytes that may be included in WPs. These requirements may differ slightly between testing labs. If these requirements differ from Table 1, the PI shall communicate these requirements to field personnel prior to each sampling and analysis episode. Further details regarding these requirements as well as labeling and shipping procedures are described in the following sections.

Table 1. Summary of Possible Groundwater Samples

Analyte(s)	Minimum Container Size (ml)	Container Type	Filtered? (<0.45 μm)	Acidify? Below pH of 2 with ultrapure concentrated HNO_3)	Comments
Gross Alpha and Beta Activities	1000	HDPE	Yes	Yes	
Anions, EC, pH, TDS, Alkalinity	500	HDPE	Yes	No	
Dissolved Metals	500	HDPE	Yes	Yes	
Nutrients (NO_3, NO_2, PO_4, BOD)	250	HDPE	No*	No	48 hour holding time
Nutrients (NO_3 + NO_2, NH_4, Total P)	250	HDPE	No*	No	Acidify with a few ml of H_3SO_4
SIRA: O and H of Water	1000	HDPE	No*	No	
SIRA: S and O of Sulfate	1000	HDPE	No*	No	
SIRA: N and O of Nitrate	4 – 1000	HDPE	No*	No	Preserve with 10 drops of saturated mercuric chloride per liter
SIRA: C and TDIC	1000	HDPE	No*	No	
Tritium	1000	HDPE	No*	No	
Dissolved Cl, Cl-36	1000	HDPE	No*	No	Plus del Cl-35 (optional)
U/Pb/Sr Isotopic Ratios	1000	HDPE	Yes	No	

NOTES:
No* = Filter only if sample contains significant amount of suspended sediment
HDPE = high-density polyethylene
SIRA = Stable Isotope Ratio Analysis

5.1.5.1 Method for Filtering Samples

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.

   a. Ensure that at least a couple volumes (i.e. several hundred ml) of the sample fluid pass through each new tubing/filter combination before collecting samples.

   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 filtered samples by transferring an aliquot of sample water from a larger collection vessel to the final collection container with a peristaltic pump that has a filter on the end of the discharge line.

3. When filling containers that are preloaded with a preservative (such as the 500-mL bottle for dissolved metals as noted in Table 1), 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, capping, 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.

5.1.5.2 Bottling, Labeling, Packing, Cooling, and Shipping Samples

Sample bottles shall be of the appropriate size/type and contain preservatives as summarized in Table 1.

1. 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. Also note this information on the Groundwater Sample Log (Attachment B).

   a. Time.

   b. Date.

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

d. Depth of vadose zone or saturated zone sample collected during drilling. Screened depth interval of sample collected following well completion and development.

e. Collector's initials.

f. Indication of analysis (such as ^{3}H 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, drillhole, and depth.

2. All samples with the exception of nutrient samples (e.g., phosphate, nitrate, and biological oxygen demand [BOD]) may be stored and shipped to the testing laboratory in ice chests without ice. However, care shall be taken to avoid excess heating of samples where possible. For example, store samples out of the direct sunlight (i.e., in the shade) in the field and during transport to the testing laboratory.

3. Samples that are to be analyzed for nutrients such as phosphate, nitrate, or BOD must be stored and shipped to the testing laboratory under ice and analyzed within 48 hours of collection. Immediately upon collection, pack these samples in an ice chest containing frozen plastic ice bottles. Ship these samples (chilled to approximately 4 °C) to the testing laboratory by a method that ensures the laboratory will receive the samples in time to permit completion of testing before the 48-hr holding time limit expires.

4. Carefully wrap all samples in bubble wrap or equivalent to prevent breakage during shipping.

NOTE: The specific types of water samples to be collected in the field are dependent on the requirements of the controlling WP.

5.1.5.3 Field QA Samples

1. Collect a complete set of duplicate (blind) samples (for all analytes specified by the PI in QA WPs) for every ten sets of water samples collected or for each week of a sampling party/event, 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. 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 party/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. 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.

5.1.5.4 Recording Information and Transporting Samples

1. Record all samples taken in the Groundwater Sample Collection Form (Attachment B). Summarize sample depths and analyses in the and Field Geochemistry Notebook.

2. NWRPO field personnel will transport samples from the drill site and ship to laboratories for 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 a Nye County Transfer 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 DATA ACQUISITION METHODOLOGY

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.

Hard 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, at the end of the contract, or at the end of the project, at the discretion of the OSGR.

5.4 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. A report 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 quality assurance records database of Nye County NWRPO.

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 < 20%, D_1 or $D_2 \leq 5$ RL, $\|D_1 - D_2\| \leq 2$RL
	Blind field duplicate	Field sampling and laboratory analyses	D_1 and D_2 > 5 RL, RPD < 30%, D_1 or $D_2 \leq 5$ RL, $\|D_1 - D_2\| \leq 3$RL
	Matrix spike duplicate	Laboratory analyses	D_1 and D_2 > 5 RL, RPD < 30%, D_1 or $D_2 \leq 5$ RL, $\|D_1 - D_2\| \leq 3$RL
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.
%R = Percent recovery.

6.0 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, *Procedures for Documentation of Scientific Investigations.*

QAP-12.1, *Procedures for 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.*

WP-5, *Drilling and Well Construction Work Plan*.

WP-8, *Sample Management Plan*.

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

7.0 RECORDS

Field Geochemistry Notebook

Groundwater Sample Collection Form (Attachment B)

Laboratory Analytical Reports (hard and electronic version)

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

8.0 ATTACHMENTS

A: NWRPO Transfer of Custody Form

B: NWRPO Groundwater Sample Collection Form

9.0 APPENDIXES

A: Instruction For The Use, Storage, and Calibration of Field Water Quality Parameter Measurement Equipment

Attachment A
Transfer of Custody Form

NYE COUNTY NUCLEAR WASTE REPOSITORY PROJECT OFFICE

TRANSFER OF CUSTODY FORM

Borehole ID:

Packaging:

Recipient Name

Organization

Telephone

Address

Receipent Please Acknoledge Receipt Of This Shipment And Return Completed With In 10 Working Days To:

Nye County Nuclear Waste Repository Project Office
Quality Assurance Records Center (QARC)
1210 E. Basin Road, Suite 6, Pahaump, Nevada 89048
(775) 727-7727

Person Accepting Custody :

Date / Time : ----------------------------------

Person Releasing Custody For Nye County :

Date / Time : ----------------------------------

Checked By

Date

R3.

Attachment B

Nye County Nuclear Waste Repository Project Office

Groundwater Sample Collection Form

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)	Turbidity (NTU)	Dissolved Oxygen (mg/L)	Oxygen Reduction Potential (mv)	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

Appendix A
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 and turbidity probes and plug the ports in the 6820 Sonde.

2. The turbidity probe should be stored dry in the box it came in.

3. The pH probe should be stored in the 2 M potassium chloride solution in the storage bottle.

4. Fill the calibration cup with water and attach it to the 6820 Sonde, ensuring a good seal so that the water will not evaporate.

5. Store in a secure area.

6. When removing the 6820 Sonde from long term storage remove the membrane from the DO probe and fill with new electrolyte solution and replace the membrane. This is described in the YSI manual on pages 2 – 5 (YSI, January 2002).

Calibration Frequency

1. Calibrate pH and Dissolved Oxygen before every use.

2. Calibrate ORP, Turbidity, and Conductivity once before a sampling event.

3. Record all calibrations and maintenance to the equipment in the Field Geochemistry Notebook.

4. Note that it is important to make sure all gaskets and O-rings are in good condition and lubricated. Do not allow the DO solution to contact any rubber it will corrode it.

Conductivity Calibration

1. Add 200 ml of the 1000 µS/cm conductivity standard 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.

Dissolved Oxygen Calibration

1. Add 3 mm of water to the bottom of the clean calibration cup.

2. Remove the probe cover from the 6820 Sonde.

3. Make sure that the DO probe is not immersed in the water.

4. Engage only 1 or 2 threads of the calibration cup to ensure that it is vented.

5. Wait ten minutes for the air to become saturated with water.

6. Select Dissolved Oxy from the Calibrate menu and then select 1-DO %.

7. Enter the current barometric pressure in mm of Hg.

8. Press enter and when the DO reading shows no change for 30 seconds press enter again.

9. The screen will display that the calibration was accepted, then press enter to finish the calibration.

10. Remove the calibration cup, rinse it with DI, and dry.

11. 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.

Turbidity Calibration

1. Add 40 ml of the 0 NTU 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.
4. From the Calibrate menu select Optic T-6026 and select 2- 2-Point.
5. Press enter and input the value of the standard (0) at the prompt.
6. Activate the wiper by selecting Clean Optics.
7. After the reading shows no changes for 30 second press enter.
8. The screen will display that the calibration was accepted, then press enter to finish the calibration.
9. Remove the calibration cup, rinse it with DI, and dry.
10. Rinse the 6820 Sonde in DI and dry.
11. Add 40 ml of the 800 NTU standard into the clean, dry, DI rinsed calibration cup and repeat steps 3 – 9 for the 800 NTU buffer.

ORP Calibration

NOTE: The Zobell's solution contains cyanide, is hazardous, and should be disposed of properly.

1. Add 100 ml of the Zobell's 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 ISE2 ORP.
5. Enter in the Redox potential of the solution and press enter, and when the ORP reading shows no change for 30 seconds press enter again.
6. The screen will display that the calibration was accepted, then press enter to finish the calibration.

7. Remove the calibration cup, rinse it with DI, and dry.

8. Rinse the 6820 Sonde in DI and dry.

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).

Alkalinity Titration Data Sheet

Total Digits of Acid Added	**pH**
Initial	

NWRPO TP-8.1