APPENDIX E

Richland Operating Procedures

RICHLAND OPERATING PROCEDURE

ROP NO.	REV.		EFFECTIVE DATE	PAGE
46	5	AIR MONITORING	02/21/06	1 of 10

TECHNICAL CONCURRENCE Robert Hayth DATE 12/29/05

APPROVAL _____ DATE 29 Dec 05

1.0 INTRODUCTION

This procedure shall be used for environmental and operational air monitoring for alpha, iodine, gross beta-gamma and tritium activity, if applicable.

2.0 EQUIPMENT

2.1 Air samplers with a continuous capacity of 1 to 2.5 cfm and able to be equipped with an iodine vapor cartridge.

2.2 High volume air sampler capable of 4 cfm air (grab samples). Sampler shall have an airflow indicator.

2.3 Scaler instrument(s) capable of counting samples for alpha, iodine and beta-gamma activity.

2.4 High efficiency (99%) particulate air filters.

2.5 Iodine vapor cartridges.

2.6 Silica gel columns for tritium vapor collection.

2.7 Tritium Monitor.

2.8 Model 3 or equivalent with appropriate probes.

3.0 PRECAUTIONS

3.1 In areas of suspected airborne contamination, use of respiratory equipment shall be evaluated by the ARPM.

3.2 Iodine sampling is required whenever manifested activity exceeds one millicurie.

3.3 Counting system operation (check source and backgrounds) shall be verified at least daily whenever air samples are being counted.

3.4 Tritium monitoring of Package Inspections is required whenever a package contains one or more curies of unstable tritium or three or more curies of stable tritium.

4.0 PROCEDURE

4.1 Air Sampler Calibration

Air samplers shall be calibrated every six months. Calibration shall be performed in accordance with ROP 56.

4.2 Required Air Sample Data

4.2.1 The following information shall be recorded for each air sample taken:

Location,

Sampler Number,

Sample Type,

Flow rates,

Start and Stop times,

Field analysis data (If results exceed 2000 cpm B/G or 200 cpm Alpha)

Adjustments greater than 10%.

4.2.2 The air filter envelope may be used to initially record this information.

4.3 Environmental Air Samples (Taken at the nine environmental monitoring stations).

4.3.1 Environmental air samples shall be analyzed for the parameters listed in Table 6.1 of the Facility Standards Manual.

4.3.2 Environmental air sampling stations shall be inspected daily and, if required, flow rate adjustments made. Results of this inspection shall be documented on Attachment 46-2 (or equivalent).

4.3.3 Air samplers shall have a minimum capacity of one cfm of air and be set at 1.5 cfm. A standard 47-millimeter particulate filter shall be installed.

4.3.4 Particulate filters shall be changed weekly such that a minimum of five days (10800 cu. ft.) and a maximum of nine days of collection time have accumulated.

4.3.5 During waste handling (offload, handling of above ground packages) of packages containing at least one (1) millicurie of iodine, the downwind air sampler will be used to verify any environmental iodine releases.

The downwind iodine vapor cartridges shall be operated at 2.5 CFM for at least one hour.

4.3.5.1 The iodine vapor cartridges shall be operated at 2.5 CFM for at least four (4) hours if one or more mCi of I-129 is present.

4.3.6 Tritium cartridges, consisting of three silica gel columns in series, shall be installed in stations one, two and five. Each sampler shall be capable of collecting tritium vapors at a rate of 100 to 150 cc of air per minute. The tritium cartridges shall be changed approximately every 30 days.

4.4 Occupational Air Samples

4.4.1 Occupational air samples shall be taken:

1. Whenever personnel may be exposed to airborne radioactivity,
2. Within an active trench in the vicinity of personnel working in the trench,
3. Inside closed transport vehicles during waste handling,
4. Downwind of waste handling operations,
5. In close proximity of cask lid seating surfaces when a cask is opened,
6. In close proximity of personnel during, removal of waste from flat bed trailers,
7. During package Inspections.

4.4.2 Occupational air samples shall have a minimum flow rate of 2.5 CFM per minute and a minimum run time of 60 minutes.

4.4.3 Occupational air sampling shall include an iodine cartridge whenever the manifested activity (package activity for PIs) exceeds one (1) millicurie of iodine. The vent exhaust iodine vapor cartridges shall be operated at 2.5 CFM for at least at least one hour.

4.4.3.1 During package inspection of any package containing more than one (1) millicurie of I-129, the vent exhaust iodine sampler shall be operated at 2.5 CFM for at least at least four hours.

4.4.3.2 During package inspection of any package containing at least one (1) curie of tritium of unstable tritium or three (3) curies of stable tritium, the tritium monitor sampler will be used to detect tritium releases.

4.5 Grab Air Samples

Grab samples shall be taken when airborne contamination is suspected (e.g. broken container with high loose surface contamination), when required by radiation work procedure, or when required by the RPM/ARPM. At least a 50 ft^3 sample shall be taken through a standard 47 mm particulate filter; flow rate shall be as large as allowed by the sampler's capabilities and still be within the filters acceptable flow rates.

4.6 Field Counting of Air Particulate/Iodine Samples

Air filters and iodine cartridges shall be initially counted as soon as practical after removal from a sampler with an Model 3 (or equivalent) to determine if an immediate problem may exist. Should this count indicate greater than 200 counts per minute above background, check for alpha activity using a Model-3 (or equivalent).

4.6.1 Notify the ARPM immediately if the filter exceeds 2000 cpm beta/gamma, 200 cpm alpha or the iodine cartridge exceeds 1000 cpm beta gamma. Record field information with air sample data.

4.6.2 Store air samples for radon daughter decay. If results exceed the values listed in 4.6.1, proceed to step 4.7 for radon daughter determination.

4.7 Quick Radon Daughter Determination

Occasionally short-lived Rn-222 progeny particles cause high initial beta and alpha counts. These elevated results do not represent an actual release of airborne radioactivity from the waste but can be high enough to represent a significant release if the activity was not radon. Therefore, it is advantageous to verify the presence of radon daughters as quickly as possible. The following steps utilize the half-life and alpha/beta characteristics of the short lived Rn-222 daughter to quickly determine if significant radon was present during sampling. It should be noted that radon determination is only an interim step and does not eliminate the need for the 24 hour and 72 hour decay period detailed in Section 4.8 of this procedure.

4.7.1 Allow the sample to decay for approximately 30 minutes to eliminate Po-218 (3 min half life-alpha decay) from the air sample.

4.7.2 Count the sample for alpha and beta radiation. (May use either field or lab instruments for radon determination).

4.7.2.1 There should be a significant (approximately a factor of 2) decrease in both alpha and beta count rates - Notify ARPM if decrease not observed.

4.7.2.2 Determine the ratio of alpha to beta disintegration rates. (Note filter paper and dust particle shielding of alphas may reduce observed alpha count rates) and evaluate the alpha/beta disintegration rate ratio to the following criteria.

A. Alpha/Beta greater than 75% - release is probably an alpha emitter other than Rn-222 daughters. Notify the ARPM immediately if ratio is greater than 75%.

B. Alpha is less than 75% but greater than 50 % of Beta. May indicate the presence of alpha emitters other than Rn-222 daughters. Notify ARPM, but go to step 4.7.3 for further evaluation.

C. Alpha to beta ratio between 50% to 10%. Significant Rn-222 daughter probably present go to step 4.7.3.

D. Alpha to beta ratio less than 10%. Significant beta emitter other than Rn-222 daughter may be present. Notify ARPM. Go to step 4.7.3.

4.7.3 Allow the sample to decay for another 30 minutes.

4.7.3.1 Count the sample for alpha and beta radiation.

4.7.3.2 Compare decay rates to initial field count rates. There should be better than a factor of two (2) decrease from initial field results. Notify ARPM if decrease not observed.

4.7.3.3 Determine the ratio of alpha to beta disintegration rates. (Note filter paper and dust particle shielding of alphas may reduce observed alpha count rates) and evaluate the alpha/beta disintegration rate ratio to the following criteria.

A. Alpha/Beta ratio greater than 60% - release is probably an alpha emitter other than Rn-222 daughters.

B. Alpha/Beta between 60% - 20%. Activity is most likely Rn-222 daughters.

C. Alpha to beta ratio less than 20%. Significant beta emitter other than Rn-222 daughters is probably present.

D. Notify ARPM of radon determination results. Go to Step 4.8.

4.7.4 ARPM ensure radon determination information is documented with the appropriate Attachment 46-1 when completed.

4.8 Air Sample Analysis

4.8.1 Record the air sample information in appropriate space of Attachment 46-1 (or equivalent, spreadsheets may be used).

4.8.2 The following information is required: Location, sampler number, sample start and stop time, elapsed time in minutes of sample, sample flow rate as averaged between the beginning and ending flow rates, sample volume.

4.8.3 Before starting particulate filter count, verify/obtain alpha/beta backgrounds and check source counts.

4.8.3.1 Alpha/Beta background counts are for a 30 minute count time with a clean filter and planchet.

4.8.3.2 All Scalers shall have daily background counts prior to initial use and whenever background fluctuations occur.

4.8.3.3 Gamma and Alpha/Beta Scintillators shall also have one (1) minute alpha/beta background checks at least every four hours that the system is being used or whenever background fluctuations are suspected.

4.8.4 Before starting Iodine cartridge count, verify/obtain background and check source counts.

4.8.4.1 A 30 minute unused cartridge background check will be taken within four hours of iodine air sample analysis.

4.8.4.2 Iodine cartridge backgrounds shall be less than 40 cpm. Iodine cartridge backgrounds are applicable only to the instrument used. However, backgrounds may be obtained for both iodine counters.

4.8.4.3 Iodine cartridges may be reused provided their background is less than 40 cpm.

4.8.4.4 Seal the cartridge in plastic bag. Record the date, instrument serial number and cpm on the bag. The cartridge may then be used for future iodine sampling.

4.8.4.5 Verify that the 30 minute iodine cartridge background is within +/- 10 cpm of the most recent unused iodine cartridge background obtained for the same iodine counter.

4.8.4.6 If a counting system is outside of allowed values, notify the ARPM.

4.8.5 Count the Samples and additional backgrounds as required for 30 minutes (Note: Longer counts may be directed by the ARPM depending on the instruments efficiency and background).

4.8.5.1 Record backgrounds and sample counts per minutes, on the Air Sample Log Sheet (Attachment 46-1).

4.9 Calculate Air Sample Activity

4.9.1 Obtain the Net count by subtracting the background CPM_b from sample count CPM_s and record this value as net sample CPM_{net}.

4.9.1.1 Field calculation, use net CPM and enter into equation Assume 10% efficiency. (Field calculations are not a substitute for lab analysis).

4.9.2 Calculate sample activity using the following formula.

$$\text{Activity (uCi/ml)} = \frac{CPM_{net} \times 1.59\text{ E-}11}{\text{volume} \times \text{efficiency}}$$

Where:

1.59 E-11 = Conversion factor - dpm to uCi and
- cubic feet to cubic centimeters

Volume = Sample volume in cubic feet

Efficiency = CPM/DPM

4.9.3 Calculate the Uncertainty at 95 Percent Confidence.

Calculate the uncertainty associated with environmental air samples using the following equation:

$$\text{Uncertainty CPM} = 1.96\ [C/T_b + C_b/T_b]^{1/2}$$

Where:

Uncertainty CPM = CPM used to calculate the error associated with the count

1.96 = Constant associated with the 95 confidence interval

C = CPM (gross) sample

C_b = CPM background

T_b = Time background count

Error term is then calculated by using uncertainty CPM for CPM_{net} in 4.9.2, and reported as sample activity $\pm$ error term on Attachment 46-1.

4.9.4 Calculate the Lower Limit of Detection (LLD) and Minimum Detectable Concentration (MDC) using the following equation:

4.9.4.1 Lower limit of detection (LLD), as follows:

$$LLD = 3/T_s + 3.29\ (C_b/T_s + C_b/T_b)^{1/2}$$

Where:

C_b = CPM background

T_s = Length of time the sample is counted (minutes)

T_b = Length of time background is counted (minutes)

3.29 = the factor which when multiplied by the standard deviation of the background count, and added to the result of $(3.0/T_s)$, will deliver the estimated lower limit of detection (LLD). The factor assumes a five percent risk of false detection and false non-detection. The factor is equal to 2k, where k = 1.645 (one-sided 95% confidence statistic).

3 = 5% probability that the Poisson distribution will yield a zero count rate.

4.9.4.2 Calculate the minimum detectable concentration (MDC) using the equation in 4.9.2, substituting LLD for CPM_{net}. Ensure the MDC is below the action level for the samples being analyzed.

4.9.5 Record the calculated concentration, error and MDC on Attachment 46-1.

4.9.5.1 The person counting the sample shall initial in the space provided and record the time the sample was counted.

4.9.6 If any airborne concentrations are greater than the limits specified in the FSM, Notify the ARPM.

4.9.6.1 Evaluate presence of short-lived isotopes such as radon and thoron daughters by recounting at approximately 24 hour intervals for a maximum of 72 hours. If still greater than the limits, inform the RPM in accordance with ROP 15.

4.10 Tritium Air Monitoring Samples

4.10.1 Silica Gel Cartridges used for the collection of tritium shall be collected monthly and sent to a vendor for analysis.

4.10.2 Special Tritium Monitoring is required whenever a package containing more than one (1) curie of unstable waste form tritium or 3 curies of stable waste form tritium is opened.

4.10.2.1 The maximum observed tritium reading shall be recorded and used to calculate tritium exposure and tritium releases.

4.10.2.2 Special tritium monitoring values that are less than the minimum sensitivity of the tritium monitor shall be documented as not detected (ND) with the instruments minimum sensitivity given in parentheses.

5.0 ACTION LEVELS

5.1 Any airborne radioactivity that exceeds the action levels of Table 6.1 of the FSM shall be brought to the immediate attention of the ARPM.

5.2 Any airborne tritium that exceeds 2 E-5 uCi/cc shall be brought to the immediate attention of the ARPM.

6.0 RECORDS

6.1 Air Sample Log Sheet (Attachment 46-1 or equivalent).

6.2 Vendor Report of Environmental Concentration in Air.

6.3 Environmental Field Log Book.

A field log book shall be maintained for environmental air samples and shall contain the following information:

- Location;
- Start and stop date and time;
- Flow rate;
- Total flow; and
- General weather conditions.
-Name of person collecting sample.

6.4 Environmental Air Sampling Daily Check Form (Attachment 46-2 or equivalent).

7.0 BIBLIOGRAPHY

The following documents or portions thereof were used to generate this section:

7.1 Washington State Radioactive Material License WN-I019-2.

7.2 US Ecology Facility Standards Manual.

7.3 Richland Operational Procedure (ROP) No. 15.

7.4 Richland Operational Procedure (ROP) No. 56.

7.5 Richland Operational Procedure (ROP) No. 59.

7.6 Counting Statistics, An Advanced Course, GP Courseware, p. 80-100.

ATTACHMENT	REV.		EFFECTIVE DATE	PAGE
46-1	5	AIR SAMPLE LOG	02/21/06	1 of 1

DATE ANALYZED

sample location sampler #	date and time start	stop	run time (min)	flow rate (cfm)	volume (ft^3)	gross counts	count time (min)	cpm	cpm bkgd	cpm corr (C_S)	inst eff	Cs X 1.59E-11 / (EFF)(VOL)	activity (uCi/cc)	type b,g,a iodine	by initials & time	INSTRUMENT DATA
																TYPE ______ SERIAL # ______
																CAL DUE DATE ______ SOURCE SAT______
																CHECK UNSAT____ B/G Efficiency ______
																a ______ IODINE
																TYPE ______ SERIAL # ______
																CAL DUE DATE ______ SOURCE SAT______
																CHECK UNSAT____ B/G Efficiency ______
																a ______ IODINE
																TYPE ______ SERIAL # ______
																CAL DUE DATE ______ SOURCE SAT______
																CHECK UNSAT____ B/G Efficiency ______
																a ______ IODINE

INST SER #	BACKGROUND CPM	TIME	BY	TYPE b,g,a,I	LLD	1 MIN BKGD CHECK TIME	BKGD	BY

REMARKS ______________________________

ACTION LEVELS: See Facility Standards Manual Table 6.1

* Denotes cumulative elapsed time based on intermittent run times

NOTE: Values shown are rounded, calculations are performed prior to rounding

REVIEWED BY ______________________
ARPM

RICHLAND OPERATING PROCEDURE

ATTACHMENT 46-2	REV. 5	ENVIRONMENTAL AIR SAMPLING DAILY CHECK FORM	EFFECTIVE DATE 02/21/06	PAGE 1 of 1

DATE	STATION #	FLOW RATE SAMPLE HEAD	TRITIUM	ADJUSTMENTS SAMPLE HEAD	TRITIUM	RC&ST INITIALS	COMMENTS
		(CFM)	(cc/min)	(CFM)	(cc/min)		
	1	1.5	150				
	2	1.5	150				
	3	1.5	N/A				
	4	1.5	N/A				
	5	1.5	150				
	6	1.5	N/A				
	7	1.5	N/A				
	8	1.5	N/A				
	9	1.5	N/A				
	1	1.5	150				
	2	1.5	150				
	3	1.5	N/A				
	4	1.5	N/A				
	5	1.5	150				
	6	1.5	N/A				
	7	1.5	N/A				
	8	1.5	N/A				
	9	1.5	N/A				
	1	1.5	150				
	2	1.5	150				
	3	1.5	N/A				
	4	1.5	N/A				
	5	1.5	150				
	6	1.5	N/A				
	7	1.5	N/A				
	8	1.5	N/A				
	9	1.5	N/A				
	1	1.5	150				
	2	1.5	150				
	3	1.5	N/A				
	4	1.5	N/A				
	5	1.5	150				
	6	1.5	N/A				
	7	1.5	N/A				
	8	1.5	N/A				
	9	1.5	N/A				

SPECIFICATIONS:
Main Sample Head 1.5 CFM
Tritium 150 CC/MIN

_______________________ ARPM REVIEW

_____________ DATE

RICHLAND OPERATING PROCEDURE

ATTACHMENT	REV.		EFFECTIVE DATE	PAGE
46-3	5	ENVIRONMENTAL AIR SAMPLING MONTHLY CHECK FORM	02/21/06	1 of 1

PARTICULATE

Date	Gage Number	Flow Rate (CFM) Gage	Flow Rate (CFM) Calibrator	% Error |(C-G)/C|	Tech Initials	Comments
		1.5				
		1.5				
		1.5				
		1.5				
		1.5				
		1.5				
		1.5				
		1.5				
		1.5				
		1.5				
		1.5				

TRITIUM

Date	Gage Number	Flow Rate (cc/min) Gage	Flow Rate (cc/min) Calibrator	% Error |(C-G)/C|	Tech Initials	Comments
		150				
		150				
		150				
		150				
		150				

CALIBRATORS USED

Type	Serial Number	Cal Due Date

ARPM Review Date

RICHLAND OPERATIONAL PROCEDURE

TITLE Vegetation Monitoring ROP NO. 47

TECHNICAL CONCURRENCE [signature] PAGE 1 OF 5

APPROVAL [signature] REV. 2 DATE 2-4-94

1.0 INTRODUCTION

This procedure shall be used for vegetation monitoring. Quarterly samples shall be taken at environmental monitoring stations and northeast and northwest facility corners. Annual vegetation samples shall be taken from over capped trenches.

2.0 EQUIPMENT

2.1 Heavy duty plastic bags or other suitable containers capable of holding 300 grams of foliage.

2.2 Shears or snips to cut foliage.

2.3 Protective gloves (recommended).

3.0 PRECAUTIONS

3.1 All foliage must come from live deep rooted plants.

3.2 Sampling equipment shall be designated for each sampling station, cleaned after sampling and protected from contamination.

3.3 Samples shall not be taken unless quantities of more than 300 grams can be collected. If samples cannot be collected, it shall be noted in the Field Log Book with the reason. The FRC&SO shall be informed.

3.4 A single set of clippers may be used for trench vegetation sampling provided they are thoroughly cleaned between each sample to prevent cross contamination.

4.0 PROCEDURE

4.1 If sampling from the environmental monitoring stations or northeast or northwest facility corners, all foliage must come from plants within 50 feet of the station area corner.

Trench vegetation samples shall be taken annually, if vegetation is present in sufficient quantities.

4.2 Cut foliage for sample, noting type and quantity of foliage in each sample.

4.3 Place foliage in container and seal when approximately 300 grams have been collected.

4.4 Mark container with date and sample location.

4.5 Record location, species and date for each sample in the Field Log Book.

4.6 If a single set of clippers is to be used to sample various sample points (as in the case of trench vegetation), then they shall be cleaned between samples by scrubbing with a stiff bristle brush and DI water until all visible foreign matter is removed. After a final rinse with DI water, the clippers may be allowed to air dry or can be wiped dry with a clean paper towel.

4.7 Upon completion of sampling, the sampler shall package the individual samples into a shipping container which can be sealed in such a way as to give evidence in case of any tampering with the contents. After verifying the sample are enclosed, the sampler shall seal the container and apply the security seal. The seal must contain:

4.7.1 The words "US Ecology Seal #_____.

4.7.2 The seal number entered in the blank.

4.7.3 The typed or printed name and date of the sampler and the sampler's signature.

5.0 ACTION LEVELS

Per the FSM Table 6.1

6.0 RECORDS

6.1 Field Log Book

A field log book shall be maintained for vegetation samples and shall contain the following information:

6.1.1 Sample date and time

6.1.2 General weather conditions

6.1.3 Name of sampler

6.1.4 Sample location

6.1.5 Species of vegetation

6.2 Chain of Custody Forms (Attachment 47-1)

6.2.1 A work request must accompany the C of C form and the samples. The request form is a cover letter and must contain the following:

6.2.1.1 Purchase order number.

6.2.1.2 Work order number, issued from the work order log.

6.2.1.3 Within the text of the request, it must refer the vendor to the specifications, and limits set forth in the purchase order.

6.2.1.4 Current vendor address, including the name of the contact person.

6.2.1.5 A request of the work to be performed with a general description of the samples which refers the vendor to the C of C for specific sample numbers.

6.2.2 The Chain of Custody form will be filled out as follows:

6.2.2.1 Project name - in block provided after "Richland Facility", type in reason for sample, i.e. "grab sample", "quarterly vegetation", or "annual capped trench vegetation".

6.2.2.2 Work order number - same as on the cover letter.

6.2.2.3 Sample number -1. For quarterly vegetation, the number will be year-qtr-station, i.e."92-2-1", "92-1-NE"...

2. For grab samples, the number will be YR-QTR-location, i.e. "92-4-grab sta.2", "93-1-grab T16"...

3. For annual capped trench vegetation, "93-T4" or "92-T7"...

6.2.2.4 Date - date of sample.

6.2.2.5 Time - time of sample.

6.2.2.6 Sample location - as specific as possible.

6.2.2.7 Total No. of Cont. - the number of containers for that sample.

6.2.2.8 Analysis/Parameters - check the blocks appropriate to the sample and write in any extra analysis in spare blocks. Normal analysis are as follows:

1. Routine Quarterly - Blocks 1,2,3,4, and 6.
2. Annual capped trench - Blocks 1 through 6.
3. Grab samples - as directed by FRC&SO.

6.2.2.9 Security seal number - shall be the work order number.

6.2.2.10 Samplers - signature of person who took the sample(s).

6.2.2.11 Relinquished by - signature of person who sends samples, (verifying that samples have left site enroute to vendor by mail or some other authorized carrier).

6.2.2.12 Certification of seal and receipt block is to be filled out by vendor upon receipt.

6.2.3 Routing of cover letters and C of Cs.

6.2.3.1 Cover letters:

1. Original to vendor.
2. To billing (our front desk).
3. To work order book.
4. Attached to the third copy of the C of and placed in C of C log.

6.2.3.2 Chain of Custody:

1. Original to vendor, to be signed and returned to this site.
2. Vendor's copy.
3. Removed at site prior to shipping, after "relinquished by" signature, and is attached to the fourth copy of the cover letter and placed in the C of C log. (Replace with original upon return from vendor).

7.0 BIBLIOGRAPHY

The following documents or portions thereof were used to generate this section:

1. Washington State Radioactive Material License WN-I019-2
2. US Ecology Facility Standards Manual

ATTACHMENT 47-1

VEGETATION
CHAIN OF CUSTODY RECORD

PROJECT NAME: RICHLAND FACILITY

WORK ORDER NO._____

ANALYSIS/PARAMETERS

SECURITY SEAL NO._____

SAMPLERS:_____
(SIGNATURE)

SAMPLE NUMBER	SAMPLE DATE	SAMPLE TIME	SAMPLE LOCATION	TOTAL NO. OF CONT.	1 GAMMA SPEC.	2 GROSS BETA	3 ISOTOPIC URANIUM	4 ISOTOPIC PLUTONIUM	5 TRITIUM	6 DRY TO WET RATIO	7	8	9	REMARKS

RELINQUISHED BY: DATE/TIME

REMARKS:

I HEREBY CERTIFY THAT SEAL NO._____ WAS INTACT UPON RECEIPT OF ABOVE DESCRIBED SAMPLES.

(SIGNATURE AND TITLE) (COMPANY) (DATE)

PLEASE SIGN AND RETURN ORIGINAL FORM TO US ECOLOGY, P.O. BOX 638, RICHLAND, WA 99352
SECOND COPY IS FOR YOUR OWN RECORDS.

RICHLAND OPERATIONAL PROCEDURE

TITLE Soil Monitoring ROP NO. 48

TECHNICAL CONCURRENCE [signature] PAGE 1 OF 4

APPROVAL [signature] REV. 3 DATE 7/14/95

1.0 INTRODUCTION

This procedure is to be used for quarterly soil monitoring. Samples shall be taken at the environmental monitoring stations and the northeast and northwest site corners.

2.0 EQUIPMENT

2.1 Two liter containers (or equivalent)

2.2 Small digging utensil

2.3 1/4" Grid (screen)

3.0 PRECAUTIONS

3.1 Care should be taken to avoid introducing vegetable or animal matter into the soil sample.

3.2 Sampling equipment shall be designated for each sampling location, cleaned after each sampling, and protected from contamination.

3.3 Samples should be taken within 50 feet of each environmental monitoring station or site corner.

4.0 PROCEDURE

4.1 An undisturbed area within the environmental monitoring station shall be selected for sample collection.

4.2 The sample shall be taken from undisturbed soil from an area of 12 inches by 12 inches by one inch. Additional areas adjacent to the first may be designated, as required, to obtain required sample volume.

4.3 Pass the sample through a one-quarter inch mesh screen to remove debris of greater size.

4.4 Place sifted soil into sample container(s) and cap.

4.5 Label or mark the container with the date and time of sample, location and sampler's initials. Record this information in the Soil and Vegetation Sample Field Log Book.

4.6 The sampler shall package the samples for shipment and after verification that all the samples are included, shall apply a security seal to each shipping container (per 6.2.2.9) to prevent sample tampering and shall then sign the sampler's block of the Chain of Custody (per 6.2.2.10).

5.0 ACTION LEVELS

Per the FSM Table 6.1

6.0 RECORDS

6.1 Field Log Book

A Field Log Book shall be maintained for soil samples and shall contain the following information:

6.1.1 Sample date and time

6.1.2 General weather conditions

6.1.3 Name of sampler

6.1.4 Sample location

6.2 Chain Of Custody (C of C) Record - Attachment 48-1

6.2.1 A work request must accompany the C of C form and the samples. The request form is a cover letter and must contain the following:

6.2.1.1 Purchase order number

6.2.1.2 Work order number, issued from the work order log.

6.2.1.3 Within the text of the request, it must refer the vendor to the specifications, and limits set forth in the purchase order.

6.2.1.4 Current vendor address, including the name of the contact person.

6.2.1.5 A request of the work to be performed with a general description of the samples which refers the vendor to the C of C for specific sample numbers.

6.2.2 The chain of custody form will be filled out as follows:

6.2.2.1 Project name - in block provided after "Richland Facility, type in reason for sample (e.g. quarterly, backup grab, etc.)..."

6.2.2.2 Work order number - same as on the cover letter.

6.2.2.3 Sample number -
1. For quarterly soil, the number will be year-qtr-station-SS i.e. "92-2-1-SS", "92-1-NE-SS"...
2. For grab samples, the number will be year-qtr-location-SS i.e. "92-4-grab station 2-SS", "93-1-grab T16-SS"...

Note: The SS defines the sample as a Soil Sample.

6.2.2.4 Date - date of sample

6.2.2.5 Time - time of sample

6.2.2.6 Sample location - as specific as possible and write in any extra analysis in spare blocks. Normal analysis are as follows:

6.2.2.7 Total No. of Cont. - the number of containers for that sample.

6.2.2.8 Analysis/Parameters - check the blocks appropriate to the sample and write in any extra analysis in spare blocks. Normal analyses are as follows:

1. Routine Quarterly - Blocks 1,2,3,4 and 5
2. Grab samples - as directed by FRC&SO

6.2.2.9 Security seal number - Shall be the work order number.

6.2.2.10 Samplers - Signature of person who took the sample(s).

6.2.2.11 Relinquished by - Signature of person who sends samples (verifying that samples have left site enroute to vendor by mail or some other authorized carrier).

6.2.2.12 Certification of seal and receipt block is to be filled out by vendor upon receipt.

6.2.3 Routing of cover letters and C of C's

6.2.3.1 Cover letters:

1. Original to vendor
2. To billing (our front desk)
3. To work order book
4. Attached to the 3rd copy of C of C, and placed in C of C log.

6.2.3.2 Chain of Custody:

1. Original to vendor, to be signed and returned to this site
2. Vendor's copy
3. Removed at site prior to shipping, after "relinquished by" signature, and is attached to the 4th copy of the cover letter and placed in the C of C log. (Replace with original upon return from vendor).

7.0 BIBLIOGRAPHY

The following documents or portions thereof were used to generate this section:

1. Washington State Radioactive Material License WN-I019-2
2. US Ecology Facility Standards Manual

ATTACHMENT 48-1

SOIL CHAIN OF CUSTODY AND REQUISITION RECORD

Please analyze the following soil samples for the designated parameters per Requisition # 233-REQ-006 and Specification # 233-Q-005.
Please include the purchase order and work order numbers on all reports and invoices.

FRC&SO

PURCHASE ORDER #: _____
WORK ORDER #: _____

ANALYSIS / PARAMETERS

SECURITY SEAL # _____
TECHNICIAN _____
(SIGNATURE)

SAMPLE NUMBER	SAMPLE DATE	SAMPLE TIME	SAMPLE LOCATION	TOTAL # OF CONT.	1 GAMMA SPEC	2 GROSS BETA	3 ISOTOPIC URANIUM	4 ISOTOPIC PLUTONIUM	5 WET TO DRY RATIO	6	7	8	9	REMARKS

RELINQUISHED BY: DATE/TIME

REMARKS:

I HEREBY CERTIFY THAT SEAL # _____ WAS INTACT UPON RECEIPT OF ABOVE DESCRIBED SAMPLES.

(SIGNATURE AND TITLE) (COMPANY) (DATE)

PLEASE SIGN AND RETURN ORIGINAL FORM TO US ECOLOGY, P.O. BOX 638, RICHLAND, WA 99352
SECOND COPY IS FOR YOUR RECORDS.

RICHLAND OPERATING PROCEDURE

ROP NO.	REV.		EFFECTIVE DATE	PAGE
49	6	GROUNDWATER MONITORING	5-8-2014	1 of 14

TECHNICAL CONCURRENCE _____ DATE 5/12/2014

APPROVAL _____ DATE 12 May 14

1.0 INTRODUCTION

Groundwater samples are taken and analyzed to determine the presence of possible contamination from facility or other operations on the Hanford Reservation. Required sampling frequencies are found in Section 6 of the Facility Standards Manual (FSM). This procedure prescribes correct sampling, pretreatment, and shipping methods to be used.

Acronyms

VOC - Volatile Organic Chemical, also used VOA

VOA - Volatile Organic Chemical Analysis

TOX - Total Organic Halides

TDS - Total Dissolved Solids

TOC - Total Organic Carbon

Conductivity or cond. - Specific Conductance

Cr+6 - Hexavalent Chromium

S - Siemens, unit of electrical conductivity, synonymous with mho

2.0 EQUIPMENT

The following equipment is required for sampling:

2.1 Sample bottles with required labels and preservatives as supplied by the laboratory,

2.2 Water level measuring tapes, dedicated to each well (if available),

2.3 Two-way radio, for immediate communications with the Assistant Radiation Protection Manager (ARPM) or Radiation Protection Manager (RPM),

2.4 Portable pH, conductivity and temperature instruments,

2.5 Security seals,

2.6 Field Log Book,

2.7 Deionized water, provided by vendor,

2.8 AC power source,

2.9 Source of regulated compressed air or nitrogen,

2.10 Ice chests and ice for transport of samples to the laboratory,

2.11 Variable speed pump controller,

2.12 Containers for well evacuation water storage,

2.13 Well evacuation pump discharge hose,

2.14 Clear glass beaker,

2.15 Safety glasses and disposable gloves,

2.16 Combustible gas meter,

2.17 Dedicated sample line extensions for each well,

2.18 Sounding tape protection bushing, and

2.19 Valve manifold.

3.0 PRECAUTIONS

3.1 Precautions shall be taken to prevent the contamination or cross-contamination of samples. This shall include, but is not limited to using dedicated sampling equipment on each well, and using a new pair of gloves for sampling.

3.2 No smoking during well sampling, or in the vicinity of monitoring wells.

3.3 The samples can be collected in any order, as operational needs dictate.

3.4 Never start the evacuation pump while the evacuation line cap is still in place. Personal injury and/or equipment damage may result.

3.5 Chemical samples shall be sent to the appropriate laboratory such that samples can be analyzed in the required time frame.

3.6 Do not operate the variable speed pumps at no flow condition, either by closing the discharge valves completely or by reducing the speed to a no flow condition. This will damage the pump.

3.7 Do not allow the evacuation or sample hose to contact standing water or debris. A large siphon will be developed if the pump stops, potentially contaminating the well.

4.0 PROCEDURE

4.1 Prior to the scheduled sample event, the sampling technician should inspect the sample bottle inventory. If sufficient materials/containers are not on hand, the

technician shall order the needed items.

4.1.1 Upon receipt, all sample bottles and shipping containers shall be inspected as follows:

4.1.2 Check each sample bottle for cleanliness, integrity and presence of preservatives (if required). NOTE: Gloves and safety glasses should be worn and proper care taken when handling pre-preserved sample bottles or the preservatives themselves (especially during receipt inspection).

4.1.3 Shipping containers must each have an individual trip blank (usually a 40 ml. VOC bottle) which shall not be separated from its shipping container.

4.1.4 The results of these inspections shall be logged in the Field Log Book. If extra or replacement containers are ordered they shall also be inspected upon receipt and logged.

4.2 Prior to sampling the first well of the day, calibrate the pH, conductivity, temperature and combustible gas meter(s) per manufacturer's operating instructions. Record completion results in the Field Sampling Form.

4.3 Pre-sample well inspection

Inspect the well cap and standpipe to ensure that it has not been tampered with or damaged. Remove the security seals, and remove any protective cap or cover. Note in the Groundwater Field Log Book any unusual conditions (for example: if the standpipe has unusual odor) and record the numbers of any seals removed. The air above the well water level shall be sampled in accordance with the manufacturer's instructions of the combustible gas meter to determine the potential for fire or explosion. (See action levels in section 5.0)

4.4 Water level measurement

NOTE: Sounding tape dedicated to each well should be used.

4.4.1 Rinse with deionized water any portion of the water level measuring device that will come into contact with the well water, and wipe with a clean dry towel. The device may be rinsed in the lab in preparation for sampling, and kept clean (for example: bagged, or under direct control of the sample technician). If these devices are prepared in such a manner it should be logged in the Field Sampling Form, with all other pre-sample preparations.

4.4.2 Thread the tape protection bushing on top of the sounding tube.

4.4.3 Begin measurement of depth to water (DTW) inside the sounding tube in accordance with the manufacturer's instructions (audible alarm and/or visual display). The distance from the top of the stainless steel coupler to

the water is the DTW in feet. Log this level in the Field Sampling Form to the nearest tenth of a foot.

4.4.4 During first quarter sampling, a depth to bottom (DTB) reading will be taken using a sounding tape or equivalent instrument.

4.4.5 Calculate casing volume (CV) as follows:

DTB - DTW = water casing height (WCH)

CV = either 2.61 or 1.47 x WCH

NOTE: Use 1.47 for wells number 4, 5, 6, 7, 9 and 9A (6" casings). Use 2.61 for wells 3, 8, 10, and 13 (8" casings).

CV X 2 = gallons of water to be evacuated for two casing volume (2 CV) analysis.

CV X 3= gallons of water to be evacuated for three casing volume (3 CV) analysis.

Record these calculations in the Field Sampling Form.

4.5 Well casing evacuation and sample pump operation

4.5.1 Remove evacuation line cap seal and record seal number in the Field Log Book (as applicable). Remove evacuation line cap. This step may be performed concurrently with step 4.3 pre sample well inspection.

4.5.2 Connect the purge hose to discharge fitting and direct the open end to a container to store the water.

4.5.3 Start generator and let it warm up.

4.5.4 Evacuation and sample pump operation (**single speed evacuation** and bladder pumps)

4.5.4.1 Connect pump to the 240 volt power supply with the extension cable and start pump using switch inside sampling trailer.

4.5.4.2 As the pump is energized, note indication of generator loading (a momentary drop in revolutions per minute). Record pump start time on the Field Sampling Form, then monitor the discharge hose. If no flow occurs within 10 minutes, verify electrical connections and notify the ARPM or RPM if flow cannot be achieved.

Note: Collect a small amount of water for wetting the pH probe.

4.5.4.3 Pump 2 casing volumes. Using the markings on the collection tank, determine when 2 well casing volumes have been purged.

4.5.4.4 Sample discharge with a clean glass beaker. First, inspect the sample for visual clarity, immiscible layers of fluid in the sample, or any odors or colors. If any such abnormalities exist, notify the ARPM or RPM immediately. Record the results in Field Sampling Form.

4.5.4.5 Sample discharge water and analyze for pH, conductivity and temperature and record the results on the Field Sampling Form.

If the pH varies more than 1.0 pH unit or conductivity varies more 100 µmhos/cm from the previous quarter's sample results inform the ARPM or RPM immediately. (Note: Previous quarter's data is found in the Field Sampling Form)

If a pH is greater than 8.5 or less than 6.0 or conductivity is greater than 1000 µmhos/cm, the ARPM or RPM shall be notified immediately.

4.5.4.6 Rinse glassware and probes with deionized water and place sample and rinsate in collection tank.

4.5.4.7 Pump a third casing volume, then draw another purge water sample. Analyze for pH, temperature and conductivity and log results.

If results are within 0.5 pH units and 50 µmhos/cm of the 2 CV sample values, evacuation is complete. If not, resample and call the ARPM or RPM for guidance.

4.5.4.8 Stop the pump when evacuation is complete. Log the time on the Field Sampling Form.

NOTE: Step 4.5.4.9 and 4.5.4.12 may be performed while well purge is still in progress.

4.5.4.9 Connect the bladder pump pressure regulator to a nitrogen tank and connect the hose from the regulator to the sample trailer at the port marked IN. Connect the tube from the sample pump with the male quick connect fitting to the port marked OUT on the sample Trailer. The other tube is the sample line. Connect the dedicated sample line extension, and direct the line into a container so the sample line water purged prior to sampling can be consolidated with the water collected during well evacuation.

4.5.4.10 Connect the bladder pump logic unit to either the 12 V DC

supply cable, or the 110 outlet using the appropriate connections and switch settings. Rotate the charge knob to 25 seconds, and the exhaust knob to 25 seconds. Adjust the pressure regulator to 180 psi. (Caution: Damage to the bladder pump may occur if pressure is greater than 200 psi.).

4.5.4.11 Start bladder pump with the on/off switch. After water begins to flow, the knobs may need to be adjusted (per manufacturer's directions) to obtain maximum flow rate. Log the time the sample pump was started on the Field Sampling Form.

4.5.4.12 Pump at least three gallons of sample line water into a container for consolidation with purge water. Log the time the purge was complete on the Field Sampling Form.

4.5.4.13 Go to 4.6 to obtain a sample.

4.5.5 Evacuation and Sample pump operation (for the **variable speed** pumps)

4.5.5.1 Connect motor lead cable from controller to the pump at the well head.

4.5.5.2 Position manifold valve in the evacuation position.

4.5.5.3 Turn on the variable speed pump controller switch located on side of cabinet.

4.5.5.4 Observe controller powering up and look for "SPE" to indicate proper pump being used for the controller.

4.5.5.5 Press "FWD" button on controller to initiate forward rotation of the motor which will start pump.

4.5.5.6 Press arrow up key until 100Hz is achieved. Start at minimum speed and gradually increase to desired speed.

4.5.5.7 Record pump start time in the Field Sampling Form, then monitor the discharge hose. If no flow occurs within 10 minutes, verify electrical connections and notify the ARPM or RPM if flow cannot be achieved.

Note: Collect a small amount of water for wetting the pH probe.

4.5.5.8 Pump 2 casing volumes. Using the markings on the collection tank, determine when 2 well casing volumes have been purged.

4.5.5.9 Sample discharge with a clean glass beaker. Inspect the sample for visual clarity, immiscible layers of fluid in the sample, or any odors or colors. If any such abnormalities exist,

notify the ARPM or RPM immediately. Record the results in the Field Sampling Form.

4.5.5.10 Sample discharge water and analyze for pH, conductivity and temperature and record the results in the Field Sampling Form.

If the pH varies more than 1.0 pH unit or conductivity varies more 100 µmhos/cm from the previous quarter's sample results inform the ARPM or RPM immediately. (Note: Previous quarter's data is found in the Field Sampling Form)

If a pH is greater than 8.5 or less than 6.0 or conductivity is greater than 1000 µmhos/cm, the ARPM or RPM shall be notified immediately.

4.5.5.11 Rinse glassware and probes with deionized water and place sample and rinsate in collection tank.

4.5.5.12 Pump a third casing volume, then draw another purge water sample. Analyze for pH, temperature and conductivity and log results. If results are within 0.5 pH units and 50 µmhos/cm of the 2 CV sample values, evacuation is complete. If not, resample and call the ARPM or RPM for guidance.

4.5.5.13 After evacuation has been completed use arrow key down to reduce flow (approximately 82Hz is a trickle on most pumps). Log the time the evacuation was complete on the Field Sampling Form.

4.5.5.14 Switch valve manifold at well head from evacuation position to sample position. Log the purge start time on the Field Sampling Form.

4.5.5.15 Use the Arrow keys up and down to acheive the flow desired.

4.5.5.16 Pump at least 600 ml of sample line water into a container for consolidation with purge water, to purge the sample line. Log the time the purge was comlete on the Field Sampling Form.

4.6 Obtain Samples

NOTE: For volatile analysis bottle filling (VOC and Cr+6), reduce the sample stream using the pump controller to a velocity that does not cause bubbling or air entrainment.

4.6.1 Carefully fill the sample bottles (VOC bottles shall have zero head space; all others should have minimal head space). See 4.6.2 for Cr+6 sampling.

The samples should be pumped directly into each bottle. It is not an acceptable practice to pump samples into a wide-mouth container and transfer them to a sample bottle (except for field blanks). The samples should be taken in the order of their volatility (Cr+6, VOC, TOX, TOC, Phenols and Metals, Cl/Sulfates/Nitrate/TDS/Conductivity, Radionuclides, pH). Cap each sample bottle securely. The following label information shall be noted:

Date of sample;

Time of sample;

Analysis requested;

Sample location;

Sample number, a unique number. (i.e. YYYYMMDD; well number (MW06); and aliquot number). Sample numbers generated by the data base are also acceptable;

Preservatives (If required and not already noted on the label);

4.6.2 Cr+6 sample must be preserved with lab provided NaOH.

4.6.2.1 Collect the sample.

4.6.2.2 Add NaOH (6-11 drops for ground water samples, 1 drop for deionized water). Close sample bottle and shake.

4.6.2.3 Open sample bottle and check pH with the pH meter. pH must be between 9.3 and 9.7. If the pH is too high, resample. If the pH is too low, repeat adding drops of NaOH until correct pH is reached.

4.6.2.4 Cap the bottle.

4.6.3 Place all samples in an ice chest or a chilling device to cool to 4° C and to maintain sample security. Samples shall be packed to eliminate the chance of breakage during shipment. As the samples are packed, verify the sample type and number have been recorded on the chain of Custody form. When all the samples have been packed, the ice chest shall be security sealed per step 6.5, and the seal number recorded on the chain of custody form. Temporary security seals may be employed if the samples must be left unattended prior to final packing for shipment.

4.6.4 Obtain field instrument readings

4.6.4.1 Fill a glass beaker with well water for pH, conductivity, and

temperature readings.

NOTE: If both instruments are automatically temperature compensating, then the temperature result serves only for trend analysis. If either instrument displays the temperature, its reading may be used instead of employing a separate thermometer to obtain the reading.

4.6.4.2 Analyze for conductivity a follows:

a Rinse the probe with deionized water. Insert the probe into the sample.

b Hold the probe vertically and at least 1/2" from the surfaces of the beaker. Allow the reading to stabilize and record the results in the Field Sampling Form.

c Remove, rinse, and store the probe.

4.6.4.3 Analyze for pH as follows:

a Rinse the probe(s) with deionized water and insert the probe(s) into the sample.

b Holding the probe(s) vertically and at least one-half inch from all surfaces of the beaker. Allow the reading to stabilize and record the results in the Field Sampling Form.

c Rinse the probe(s) in deionized water and store.

4.6.4.4 Analyze for temperature (can be performed simultaneously with pH or conductivity measurement).

a Rinse the thermometer with deionized water.

b Insert the thermometer into the sample.

c Record the result in the Field Sampling Form.

d Remove, rinse, and store the thermometer.

4.6.5 Retain the water collected in Steps 4.6.3 with the sample line purge, and rinse the beaker for the next set of measurements.

4.6.6 Perform the steps of 4.6.1- 4.6.5 for four separate sets of analysis with four separate sets of results.

4.6.7 Field blank samples are collected after completion of the last well.

4.6.7.1 Field blanks shall consist of deionized water provided by the vendor. The deionized water shall be poured from the original

container into the provided sample containers. This shall take place in the field after the last well has been sampled, and before leaving that sample station. They shall then be stored with the actual samples and accompany the samples to the vendor. The lab should not know which samples are QA samples. QA samples should be given fictional well numbers and sample times.

4.6.8 When all samples have been collected, stop the sample pumps (see 4.7).

4.6.9 Connect waste water hose to fitting on sample trailer. Place discharge end into the purge water collection container and start waste pump by using the starting switch inside sampling trailer.

Note: Waste discharge hose can be connected at any time during sampling.

4.7 Stop the sample pumps, record the time on the Field Sampling Form.

Caution: When stopping the pumps, be sure that the hose end is not submerged in water, or near dirt. A siphon will be produced, sucking any water or debris into the well.

4.7.1 The bladder pump is stopped by:

4.7.1.1 Shutting the gas bottle valve;

4.7.1.2 Allow the logic controller to cycle until the pressure is relieved;

4.7.1.3 Turning off the logic controller power;

4.7.1.4 Disconnecting the gas lines.

4.7.2 The single speed evacuation pumps are stopped by switching the power supply switch in the trailer to the off position.

4.7.3 The variable speed evacuation and sample pump is stopped by:

4.7.3.1 Pressing 'stop' on the controller,

4.7.3.2 Switching the variable speed pump controller power supply switch in the trailer to the off position.

4.8 Cap and security seal the well to assure its integrity for the next sampling. Record seal numbers in field log book.

4.9 Review Field Log Book and Field Sampling Form for completeness prior to moving to the next sample point.

4.10 Assure instrumentation is turned off and probes stored prior to moving to next sampling event.

5.0 ACTION LEVELS

5.1 Field Observation

Parameter	Action Level	Action
Explosive gas	10 % LEL	Move to fresh air, notify ARPM
Oxygen	19.5-20.8 %	Move to fresh air, notify ARPM
Odor	Unusual	Notify the ARPM.
pH	< 6 or >8.5 or change from last of >1.0	Notify ARPM, investigate contamination
Conductivity	>1000 µmho/cm or >100 from last.	Notify ARPM, investigate contamination

5.2 Routine parameters: Explosive gas, odor, pH, specific conductance (conductivity) and temperature.

5.3 Lab results - See Table 6.1 of the FSM. If levels of greater than the investigation levels are reported, the ARPM or RPM shall be notified immediately per ROP 15.

5.4 Routine parameters: Gross alpha, gross beta, tritium, C-14, total Uranium, Pu 238, Pu 239/240, Co-60, Cs-137, Gamma spec, Phenols, hexavalent Chromium, Metals (Barium, Cadmium, Calcium, Chromium, Iron, Magnesium, Manganese, Mercury, Potassium, Silver, Sodium), TDS, VOC, TOX, TOC, Chloride, Sulfate, and Nitrate.

6.0 RECORDS

6.1 Field Log Book. Information that is pertinent to the well should be recorded in the Field Log Book. It should be a book which can be easily carried into the field and must have consecutively numbered pages. The Field Log Book(s) shall be maintained and filed chronologically, when full. Standard well sampling log entries shall contain at a minimum the following information (in addition to any entries required to be recorded, as stated elsewhere in this procedure):

6.1.1 Location of sampling;

6.1.2 Name of collector;

6.1.3 Date and time of sampling;

6.1.4 Security seal numbers removed;

6.1.5 Security seal numbers applied.

6.1.6 Field observations - sampling situations vary widely, so no general rule can be given for the amount of information required. The best guideline is to record sufficient information, including dates and times, as necessary so that someone could reconstruct the entire sampling event without relying on the collector's memory;

6.1.7 Any abnormal conditions, such as a security breach, oil in the water, pump problems, sampling problem, should be included in the Field Log Book.

6.2 Field Sampling Form (attachment 49-2) The following information should be recorded:

6.2.1 Location of sampling;

6.2.2 Metrological data;

6.2.3 Date of sampling;

6.2.4 Purpose of sampling;

6.2.5 pH, conductivity and temperature readings, and calibration records;

6.2.6 Depth to water and depth to bottom reading;

6.2.7 2 and 3 casing volumes (CV);

6.2.8 Explosive gas meter readings;

6.2.9 Time of sampling;

6.2.10 Number and volume of sample(s).

6.3 Chain of Custody Record (attachment 49-1 or equivalent)

6.3.1 A work request (cover letter) must accompany the Chain of Custody form and the samples. The cover letter must contain the following:

6.3.2 Purchase order number,

6.3.3 Work order number, issued from the work order log,

6.3.4 Within the text of the request, it must refer the vendor to the specifications, and limits set forth in the purchase order,

6.3.5 Current vendor address, including the name of the contact person (if known);

6.3.6 A request of the work to be performed with a general description of the samples which refers the vendor to the C of C for specific sample numbers.

6.4 The chain of custody form will be filled out as follows:

6.4.1 In the space provided after "US Ecology Washington Groundwater. Enter the reason for sample (i.e. "grab sample" or "quarterly").

6.4.2 Work order number -the same as on the cover letter.

6.4.3 Sample number - a unique number. (i.e. YYYYMMDD; well number (MW06); and aliquot number). Sample numbers generated by the data base are also acceptable, but they must be unique;

6.4.4 Sample date - date of sample.

6.4.5 Sample time - time of sample.

6.4.6 Sample location - number of well sampled.

6.4.7 Total number of containers for that sample.

6.4.8 Analysis/parameters - check the blocks appropriate to the sample and write in any extra analysis in "Remarks". Normal analyses are as follows:

6.4.8.1 Routine - FSM table 6.1

6.4.8.2 Grab samples - as directed by the ARPM or RPM.

6.4.9 Security seal number - shall be the work order number (issued in step 6.2.1.2) followed by the well number.

6.4.10 Samplers - signature of person who took the sample(s).

6.4.11 Relinquished by - signature of person who sends samples, (verifying that samples have left site for delivery to the vendor).

6.4.12 Certification of seal and receipt block is to be filled out by vendor upon receipt.

6.4.13 The C of C shall be accessible on the outside of the shipping container so that the receiving party (and in the event of an accident - the shipping handlers) may have access to a complete list of the package contents. This also allows review of the C of C prior to breaking the security seal.

6.5 Requirements for security seals

6.5.1 Each shipping container shall have its own seal. All samples requiring analysis from a single well must be packaged in the same shipping container. Samples for radioactive analysis may be packaged separately

from the samples for chemical analysis. More than one well's samples may be placed in a single shipping container so long as shipping weight permits.

6.5.2 The Seal number shall consist of the work order number followed by the well number (see 6.2.2.9)

6.5.3 The sample technician shall sign the seals certifying that all those samples are present and packaged for shipping.

6.6 Routing of Cover Letter and C of C:

6.6.1 Original cover letter and C of C (to be signed and returned to site by vendor) will be sent to the vendor with the samples.

6.6.2 Two copies of the cover letter and C of C will be forwarded to the ARPM for placement in the appropriate log books.

6.6.3 The vendor shall sign and return the C of C. (The vendor may use their own equivalent form in lieu the US Ecology Chain of Custody.)

7.0 BIBLIOGRAPHY

7.1 Washington State Radioactive Material License WN-I019-2.

7.2 US Ecology Washington Facility Standards Manual.

RICHLAND OPERATIONAL PROCEDURE

TITLE Environmental TLD Monitoring ROP NO. 50

TECHNICAL CONCURRENCE [signature] PAGE 1 OF 5

APPROVAL [signature] REV. 3 DATE 10/30/95

1.0 INTRODUCTION

This procedure is to be used for monthly and quarterly TLD environmental monitoring.

2.0 EQUIPMENT

Thermoluminescent dosimeters (TLDs)

3.0 PRECAUTIONS

3.1 Ensure TLDs are not bent when securing in place.

3.2 Ensure TLD faces radiation area and is not shielded by holder.

3.3 Ensure the proper TLD is placed at each position.

3.4 Ensure continuous monitoring is provided by placing new monthly or quarterly TLD when old one is removed.

3.5 Control TLDs shall be stored in the same shielded storage location as the environmental TLDs that are awaiting posting or shipment to vendor for processing.

4.0 PROCEDURE

4.1 TLDs will be placed in accordance with Table 6.1 of the Facility Standards Manual. The following locations currently meet Table 6.1 requirements.

4.1.1 Monthly TLDs AB001, AM006 through AM011 and AM015 through AM026 will be placed as noted on Figure 50-1.

4.1.2 Quarterly TLDs AB002 and AM101 through AM109 will be placed as noted on Figure 50-1 in accordance with the schedule provided by WDOH.

4.2 For TLD change-outs, remove the previous TLD and attach the new TLD for that position. Ensure TLD will not fall or shift. Take care to avoid bending the TLD. Upon completion of change-out, record the date and type of change in the TLD field log book.

4.3 Chain of Custody Forms (Attachment 50-1)

4.3.1 A work request must accompany the Chain of Custody Form. The request form is a cover letter and must contain the following:

4.3.1.1 Purchase order number.

4.3.1.2 Work order number issued from the work order log.

4.3.1.3 Within the text of the request, it must refer the vendor to the specifications and limits set forth in the purchase order.

4.3.1.4 Current vendor address, including the name of the contact person.

4.3.1.5 A request of the work to be performed with a general description of the TLDs which refers the vendor to the Chain of Custody for specific TLD numbers.

4.3.2 The Chain of Custody Form will be filled out as follows:

4.3.2.1 Fenceline Monitoring: Enter quarterly, monthly or special.

4.3.2.2 Exposure Period: Enter the month, name or number of quarter or for special samples, enter period as appropriate, i.e., for IF-300 enter IF-300 and bates number.

4.3.2.3 Purchase Order No.: Enter current purchase order.

4.3.2.4 Work Order No.: The number from the accompanying work request and enter it here. Note: Work order number will also serve as seal number.

4.3.2.5 Shipped To: Enter proper name, address, etc. of the dosimeter vendor.

4.3.2.6 TLD Information: Enter dates the TLDs were posted on and removed from the fenceline. This data can be found in the soil, vegetation and TLD field log book. Enter the numbers of all TLDs being shipped including background, station and corners.

4.3.2.7 Other Block: Enter any additional information, reports of damage to TLDs being shipped or information for special TLDs.

4.3.2.8 Sealing Verification: Name, signature and date of person sealing shipping container, attesting that all listed TLDs are present.

4.3.2.9 Shipping Verification: Enter method used (normally US Mail) name and signature of person relinquishing custody to carrier and date of shipment.

4.3.2.10 Receipt Acceptance: To be signed by person at the vendor who receives and inspects contents of shipping container, seal number is recorded as well as title of receiver, the company name and date of receipt/inspection.

4.3.3 Routing cover letters and Chain of Custody Forms.

4.3.3.1 Cover letters as follows:

1. Original to vendor
2. Copy to billing (our front office).
3. Copy to work order book.

4.3.3.2 Chain of Custody (3 parts) copies are distributed as follows:

1. Original to vendor to be signed and returned to this site.
2. Vendor's copy.
3. Removed prior to shipping after "Relinquished By: Signature" and is placed with the environmental TLD results to be replaced by original upon its return.

4.4 Upon receiving the vendor's results, the environmental TLD graphs and log shall be filled out as follows:

NOTE: Computers may be used for data graphing and storage.

4.4.1 For the monthly TLDs, subtract the background dose from the dose for each location.

4.4.2 Add previous total and current value. Record this result under the appropriate month/quarter on the graph.

4.4.3 Draw a line from previous total on graph to the new total.

4.4.4 Note the trend shown on graph. Should any trend appear to jeopardize the 400 mrem/year limit, action to reduce radiation levels should be taken as necessary. It should be noted that transient operations may cause the rate to appear excessive without endangering the 400 mrem/year limit. Take this into account during log review.

4.4.5 A copy of the vendor's output results shall be sent to the CRC&SO.

4.5 A summary of TLD doses in mrem per day shall be retained in the environmental TLD graph log book (or be accessible by computer). Mrem per day shall be based on actual number of days the TLDs were posted (see field log book for posting dates).

5.0 ACTION LEVELS

Action levels and required actions per Table 6.1 of FSM and ROP 15.

6.0 RECORDS

NOTE: Computer generated equivalents may be used for records 6.1, 6.2 and 6.3.

6.1 Environmental TLD Graphs Log.

6.2 Environmental Data - Monthly TLDs.

6.3 Environmental Data - Quarterly TLDs.

6.4 Vendor generated reports.

6.5 Site map with TLD placement locations.

6.6 Field Log Book.

7.0 BIBLIOGRAPHY

The following documents or portions thereof were used to generate this section:

1. Washington State Radioactive Material License WN-I019-2
2. US Ecology Facility Standards Manual

ATTACHMENT 50-1

TLD CHAIN OF CUSTODY RECORD

US Ecology Richland Facility

Fenceline Monitoring:_____ Purchase Order No.___

Exposure Period:_____ Work Order No._____

Shipped To:

_____

Name

_____

Address

_____

City State Zip Code

TLD Information:

Date Posted: _____ Date Removed:_____

TLD Numbers:_____

_____

Other:_____

Sealing Verification:

I, _____ attest that the accompanying materials are
(Printed Name)

representative of those listed above:_____

(Signature) (Date)

Shipping Verification:

Method Shipped:_____

Relinquished By:_____

(Printed Name/Signature) (Date)

Receipt Acceptance:

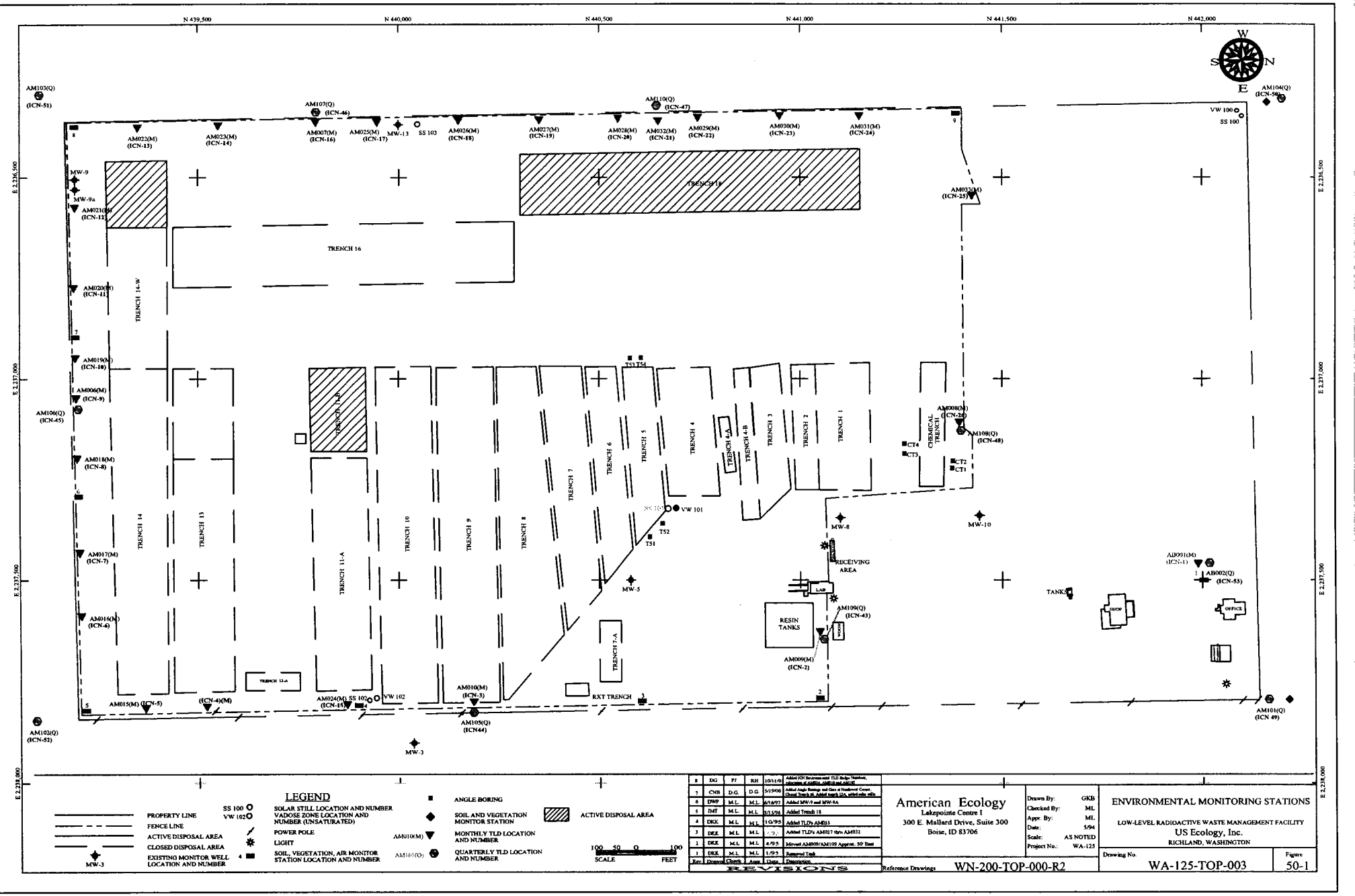
I hereby certify that security seal number_____ was intact upon receipt of the above described materials and the contents have been verified.

_____

(Signature and Title) (Company) (Date)

NOTE: If any discrepancies are noted, please notify the sender by telephone immediately. Contact the US Ecology Richland Facility Radiological Control and Safety Officer, 509/377-2411.

Vendor please return original upon receipt to US Ecology, Inc., P. O. Box 638, Richland, Washington 99352.



LEGEND

- PROPERTY LINE
- FENCE LINE
- ACTIVE DISPOSAL AREA
- CLOSED DISPOSAL AREA
- EXISTING MONITOR WELL LOCATION AND NUMBER (MW-3)
- SS 100 — SOLAR STILL LOCATION AND NUMBER
- VW 102 — VADOSE ZONE LOCATION AND NUMBER (UNSATURATED)
- POWER POLE
- LIGHT
- 4 — SOIL, VEGETATION, AIR MONITOR STATION LOCATION AND NUMBER
- ANGLE BORING
- SOIL AND VEGETATION MONITOR STATION
- AM010(M) — MONTHLY TLD LOCATION AND NUMBER
- AM5(Q) — QUARTERLY TLD LOCATION AND NUMBER
- ACTIVE DISPOSAL AREA

SCALE: 100 50 0 100 FEET

Rev	Drawn	Check	Appr	Date	Description
8	DG	PT	RH	10/11/0	Added HCN Environmental TLD Badge Numbers, relocation of AM010, AM018 and AM19E
7	CNB	D.G.	D.G.	5/19/00	Added Angle Borings and Gate at Southwest Corner. Closed Trench 14. Added Trench 12A, added radio relay
6	DWP	M.L.	M.L.	6/16/97	Added MW-9 and MW-9A
5	JMT	M.L.	M.L.	5/15/96	Added Trench 18
4	DKK	M.L.	M.L.	10/95	Added TLDs AM033
3	DKK	M.L.	M.L.	?/95	Added TLDs AM027 thru AM032
2	DKK	M.L.	M.L.	4/95	Moved AM009/AM109 Approx. 50' East
1	DKK	M.L.	M.L.	1/95	Removed Tank

REVISIONS

American Ecology
Lakepointe Centre I
300 E. Mallard Drive, Suite 300
Boise, ID 83706

Reference Drawings: WN-200-TOP-000-R2

Drawn By:	GKB
Checked By:	ML
Appr. By:	ML
Date:	5/94
Scale:	AS NOTED
Project No.:	WA-125

ENVIRONMENTAL MONITORING STATIONS

LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT FACILITY
US Ecology, Inc.
RICHLAND, WASHINGTON

Drawing No. WA-125-TOP-003

Figure 50-1