DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	Analytical Services	Date 01/5/95
Project Title/Work Order		EDT No. 600499
Estimates of Laboratory Accuracy and Precision on Hanford Waste Tank Samples		ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./Appendix Only	EDT/ECN Only
<u>U.S. Department of Energy-</u>					
<u>Richland Operations Office</u>					
R. P. Carter	S7-55				
<u>Pacific Northwest Laboratories</u>					
K. J. Kuhl-Klinger	P7-27				
<u>Westinghouse Hanford Company</u>					
H. Babad	S7-30				
D. R. Bratzel	S7-31				
T. H. Bushaw	T6-30				
J. L. Deichman	H4-19				
D. A. Dodd (5)	T6-50				
S. J. Eberlein	S7-31				
G. D. Forehand	S7-31				
V. W. Hall	H4-19				
E. J. Kosiancic	T6-16				
P. M. Morant	H4-25				
J. R. Prilucik	T6-24				
D. A. Sebelien	T6-16				
J. P. Sloughter	H5-27				
G. L. Troyer	T6-50				
W. I. Winters	T6-50				
Central Files	L8-04				
O.S.T.I. (2)	L8-07				

REC
 FEB 14 1995
 0511

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

<div style="display: flex; justify-content: space-between;"> 55 510.5 ENGINEERING DATA TRANSMITTAL </div>	Page 1 of <u>1</u> 1. EDT 600499
--	--

2. To: (Receiving Organization) Distribution	3. From: (Originating Organization) Analytical Services	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: 8E000	6. Cog. Engr.: D. A. Dodd	7. Purchase Order No.: N/A
8. Originator Remarks: Estimates of Laboratory Accuracy and Precision on Hanford Waste Tank Samples		9. Equip./Component No.: N/A
11. Receiver Remarks:		10. System/Bldg./Facility: 222-S Laboratory
		12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: N/A
14. Required Response Date:		

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Approval Designator	Reason for Transmittal	Originator Disposition	Receiver Disposition
1	WHC-SD-WM-ANAL-043	N/A	0	Estimates of Lab. Accuracy and Precision on Hanford Waste Tank Samples	N/A	1	1	

16. KEY					
Approval Designator (F)		Reason for Transmittal (G)		Disposition (H) & (I)	
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)		1. Approval 4. Review 2. Release 5. Post-Review 3. Information 6. Dist. (Receipt Acknow. Required)		1. Approved 4. Reviewed no/comment 2. Approved w/comment 5. Reviewed w/comment 3. Disapproved w/comment 6. Receipt acknowledged	

17. SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)										(G)	(H)
Reason	Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	Reason	Disp.
2	1	Cog.Eng. D. A. Dodd		T6-50							
2	1	Cog. Mgr. M. L. Bell		T6-03							
		QA									
		Safety									
		Env.									

18. D. A. Dodd Signature of EDT Originator Date <u>1/17/95</u>	19. M. L. Bell Authorized Representative Date for Receiving Organization Date <u>1-17-95</u>	20. M. L. Bell Cognizant Manager Date <u>1-17-95</u>	21. DOE APPROVAL (if required) Ctrl. No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments
---	---	---	---

MASTER

RELEASE AUTHORIZATION

Document Number: WHC-SD-WM-ANAL-043, REV.0

Document Title: Estimates of Laboratory Accuracy and Precision on Hanford Waste Tank Samples

Release Date: February 1, 1995

**This document was reviewed following the
procedures described in WHC-CM-3-4 and is:**

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Vicky Birkland

February 1, 1995

TRADEMARK DISCLAIMER. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.

This report has been reproduced from the best available copy. Available in paper copy and microfiche. Printed in the United States of America. Available to the U.S. Department of Energy and its contractors from:

U.S. Department of Energy
Office of Scientific and Technical Information (OSTI)
P.O. Box 62
Oak Ridge, TN 37831
Telephone: (615) 576-8401

Available to the public from: U.S. Department of Commerce
National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
Telephone: (703) 487-4650

SUPPORTING DOCUMENT		1. Total Pages 17
2. Title Estimates of Laboratory Accuracy and Precision on Hanford Waste Tank Samples	3. Number WHC-SD-WM-ANAL-043	4. Rev No. 0
5. Key Words Laboratory Accuracy, Laboratory Precision, Waste Tank Analyses	6. Author Name: D. A. Dodd Signature Organization/Charge Code 8E000/W4B23	
7. Abstract <p>A review was performed on three sets of analyses generated in Battelle, Pacific Northwest Laboratories and three sets generated by Westinghouse Hanford Company, 222-S Analytical Laboratory. Laboratory accuracy and precision was estimated by analyte and is reported in tables. The sources used to generate this estimate is of limited size but does include the physical forms, liquid and solid, which are representative of samples from tanks to be characterized.</p> <p>This estimate was published as an aid to programs developing data quality objectives in which specified limits are established. Data resulting from routine analyses of waste matrices can be expected to be bounded by the precision and accuracy estimates of the tables. These tables do not preclude or discourage direct negotiations between program and laboratory personnel while establishing bounding conditions. Programmatic requirements different than those listed may be reliably met on specific measurements and matrices.</p> <p>It should be recognized, however, that these are specific to waste tank matrices and may not be indicative of performance on samples from other sources.</p>		

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

8. RELEASE STAMP

MASTER

CONTENTS

1.0	INTRODUCTION	1-1
2.0	OBJECTIVE OF TRANSMITTAL	2-1
3.0	DEFINITIONS	3-1
3.1	ACCURACY	3-1
3.2	PRECISION	3-1
3.3	MEASUREMENT SYSTEM	3-1
4.0	ASSUMPTIONS AND BASES	4-1
5.0	PROGRAMMATIC RESPONSIBILITIES	5-1
6.0	DESCRIPTION OF TABLES	6-1
7.0	EVALUATION OF DATA AGAINST HASQAP	7-1
8.0	SUMMARY AND CONCLUSIONS	8-1

LIST OF TABLES

6.1	222-S Analytical Laboratory Standards Performance	6-4
6.2	222-S/PNL Data Quality Summary	6-5
6.3	Improved Data Quality Achievable With Additional Effort	6-7

ESTIMATES OF LABORATORY ACCURACY AND PRECISION ON HANFORD WASTE TANK SAMPLES

1.0 INTRODUCTION

Single shell and double shell waste storage tank contents are to be subjected to analyses to measure concentrations of constituents identified in data quality objective (DQO) documents. Initial analyses are for measurements to demonstrate safe storage of the waste during interim storage. Later, more complete characterization will be performed on this sample material to determine concentrations of constituents of particular interest or concern to retrieval, pretreatment, vitrification, or other disposal processes. Analyses are necessary to meet facility permitting requirements and to provide data on which flowsheet conditions can be based. Flowsheets, and therefore analytical requirements for flowsheet monitoring, are not yet well known and therefore can not be adequately addressed.

Laboratory data quality deficiencies exist when program DQO documents requests are much more stringent than laboratory capabilities can provide. These quality differences may not be resolved before samples are received and analyses completed. On previously generated data packages, these differences frequently caused misunderstandings and data rejection during the data validation process. Excessive costs in time were also experienced in matching and negotiating laboratory capabilities with program needs.

The process of developing DQO documents provides a forum for negotiations to be completed before tank sampling occurs and analyses are performed. In this process stakeholders, including programs and laboratory representatives, develop baseline documentation which includes sample type, measurements requested, quality of results required, and special considerations for sample handling and analyses by tank or waste type.

2.0 OBJECTIVE OF TRANSMITTAL

Initial DQO documents were produced which requested accuracy and precision of analytical data more stringent than laboratories were able to produce without considerable effort and cost. This transmittal is intended to provide estimates and bases for the programs to use as guidance in delineating requests. These estimates should be used only as guidance; i.e., better precision or accuracy than stated can be attained, but cost in time and funding will be higher. If the program does not require better quality than is listed, data can be efficiently produced.

3.0 DEFINITIONS

3.1 ACCURACY

Accuracy is estimated from matrix spike recovery data where matrix spikes are used. On techniques where matrix spikes are not employed, an estimate of accuracy is made from standards and documented experience.

3.2 PRECISION

The precision expected on Tank Waste Remediation System samples is derived from reproducibility of results; i.e., relative percent difference of results from different aliquots of the same homogenized sub-segment. This definition includes factors beyond those normally encountered; i.e., homogeneity of sample aliquots used for analyses.

3.3 MEASUREMENT SYSTEM

The term Measurement System includes all laboratory aspects controlled to determine the concentration of an analyte in a sample. Operations include the following: initial sample handling from receipt at the laboratory door; sample preparation for analyses; personnel performing these activities; procedures for operations; instrumentation used for quantitation; and personnel calculating, verifying, and approving results.

4.0 ASSUMPTIONS AND BASES

Data used to derive precision and accuracy statements in the tables in Section 6.0 were produced on several data packages of single shell tank samples analyzed in the 222-S Analytical Laboratory and Analytical Chemistry Laboratories (325) in 1992 and 1993. Statistically evaluated data generated on chemical standards at 222-S Analytical Laboratory are provided in Table 6.1 (Section 6.0) for comparative purposes only.

Analytical accuracy and precision of organic, inorganic, and to less extent radiochemistry measurement systems are affected by the concentration of the analyte. Therefore, two statements are made for each analyte, the first value is valid if the analyte concentration in the sample is greater than 5 times the minimum detection level of that analyte. The second value is valid if the analyte concentration is detectable but less than 5 times the detection level. A concentration value within this range may be important even though accuracy and precision are of poorer quality.

5.0 PROGRAMMATIC RESPONSIBILITIES

It is incumbent on the program requesting analyses that a threshold value (action concentration level) be established and the measurement accuracy and precision required at that concentration be documented. That threshold value may be established based on process control parameters, action-required levels, regulatory driven (by reference citation), or other bases.

Measurement systems are calibrated and operated to incorporate an optimum instrument working range which includes the expected or threshold concentrations of importance to the program. By matching the measurement system operating parameters to programmatic needs, data of acceptable quality are more likely to result. Controllable parameters (i.e., sample size, methodology, etc.) are adjusted to bring the sample concentration within this optimum range. If the analyte concentration is significantly different from that threshold, either higher or lower, the risk is low that the program will make incorrect decisions based on the data even if precision and absolute accuracy do not meet quality requirements of the threshold concentration. Significant efficiencies can be realized if data quality requirements are specified at different analyte concentrations.

Without these threshold values, the laboratory is expected to provide the same quality of data at all concentrations. This results in high operating costs for analyses at concentrations of no significance to the program. These threshold values must reflect the needs of the data end user; i.e., Safety Program threshold values will be significantly different from Pretreatment flowsheet development measurement data. Regulatory compliance data may have different threshold values and may require additional sample handling requirements; e.g., observance of full Hanford Analytical Services Quality Assurance Plan (HASQAP) requirements.

Radiochemistry instrumentation has inherent counting statistics dependent on count rate. Parameters (i.e., sample size taken, separation methodology, etc.) can be chosen to optimize measurement statistics at the threshold values. As the sample concentration approaches this value, the accuracy and precision improves.

6.0 DESCRIPTION OF TABLES

Table 6.1 presents the 222-S Analytical Laboratory performance on blind, chemical standards analyzed by that laboratory. Each analytical method is monitored with blind standards. The standard is analyzed by the same personnel, the same instrument(s), and results are calculated the same as a sample. Although the standard is not matched to the matrix of the sample, it contains materials which can interfere with the analysis if the method is not performing its intended role. Results of these standards are archived and are retrievable. If the results are outside the warning or control limits set up for the method, the method anomaly is investigated and corrective action taken and documented before the method is considered to be back under control. Performance on a measurement system can be evaluated at any time by requesting the information. This information identifies each person who performed standards during the period of time under evaluation.

The minimum standard analysis frequency is established to provide adequate control for "process control" sample types, but the customer may request additional frequency based on programmatic justification, such as one standard with each batch of samples. These additional datum are included in the data base and therefore included in the annual evaluation.

Annually, data generated from analyses of chemical standards are statically evaluated and results are documented. New control limits are determined for each method and effected if there is justification for a change. Warning limits, used for administrative control, are established at two standard deviations from the mean; control limits are set at three standard deviations. All results outside the warning limits are investigated and corrective action taken to return the measurement system to provide data within the established limits. These limits are nonconverging, other than for conformance with customer requirements. Even if all annual data falls within the limits, the limits are not necessarily changed. Calculations are made to test for outliers of the data and control limits are calculated with both the outliers included and excluded. Reports are generated and issued which document these annual evaluations of data.

It is obvious and expected that both precision and accuracy are heavily dependent on the concentration of the analyte in the sample. Therefore, Tables 6.2 and 6.3 list analytes with estimates of measurement system performance at each of two concentrations. When an analyte concentration is near (less than 5 times) the minimum detectable quantity for the measurement system, the precision and accuracy may have a greatly expanded range. If a programmatic need exists for highly accurate or precise data within this low concentration level, extra laboratory steps can be performed to provide closer tolerances on the analysis. These additional operations include recalibration of the instrument to incorporate the low concentration threshold and exclude the high concentration range. Better data may be obtained by chemical separations to remove chemical interferences from the sample for quantitation. These steps may be costly and should only be requested if they are required to meet programmatic objectives or reduced risk.

Table 6.2 presents consolidated performance indicators from both 222-S Analytical Laboratory and Analytical Chemistry Laboratory, of Pacific

Northwest Laboratories (PNL). These data were generated from summary data packages of single shell tanks received by the laboratories during 1993. Data from only three data packages in each laboratory were used to generate the statements. These data did, however, include the various phases from sample preparation; i.e., drainable liquor, water and acid soluble fractions, and fusion dissolution fractions.

Data included in the tables are not intended to represent a rigorous statistical evaluation and presentation of data. As a first approximation and consistent with accepted practice, the accuracy statement in Table 6.2 bounds matrix spike recovery results reported in summary tables of inorganic data packages. These summary tables present data that have been evaluated for meeting customer requirements. The data therefore may present the results from multiple attempts to meet requested performance.

Values for radionuclide analyses were derived by estimating performance of the methodology evolving from elements of procedures not directly measured by use of tracers or carriers. These elements may include sample preparation performed prior to inclusion of the tracer and those methods which do not use tracers (e.g., gamma energy analyses, alpha, and beta). It should be recognized that these are "a priori" estimates. Interferences and sample anomalies may change these accuracy and precision estimates. The uncertainty due to counting statistics, which is usually the largest single error source, is reported with each measurement in the data package.

If there is significant reason and benefit, a more in-depth study can be performed to determine the accuracy and precision statements for each analyte, which would include all data generated. An analysis of data could be prepared for estimation of error if single analyses were performed, estimation of error without any reruns (first effort data) to improve data quality, or for estimation of error if quality assurance requirements were relaxed. This effort would be significant and require an individual to glean information from the raw data included in data packages. These "first effort data" would include results which are clearly outside normal performance for cause; e.g., analyte concentration outside instrument operating range. For many months the rerun rate for certain measurements is almost 50%, with the greatest single cause being improper sample dilution. Evaluations of the raw data would have to be performed such that only data which met primary technical requirements would be included. For these reasons, it is believed that entries in Table 6.2 would not be changed significantly. In most cases, there was one sample measurement made and reported that increased the range of precision and/or accuracy for the analyte. No attempt was made to exclude these data from Table 6.2.

Sample precision data presented in Table 6.2 was generated in much the same way as accuracy was accumulated. The relative percent difference of the mean of replicate analyses of a sample was calculated and used as the basis for the reported value. These data were generated by preparing two aliquots of tank material, performing all operations and quantitation on each aliquot. This method of data generation provides an overall estimate of precision with regard to concentration level. The values incorporated below include the values reported in single shell tank summary tables. This can again present a tighter precision statement than is reasonable to request if not needed by a programmatic requirement, since these estimates do not include data which did not meet good science standards or programmatic requirements.

An attempt was made in Table 6.3 to estimate the quality of data that could be attained with some additional effort expended by the laboratories. The accuracy and precision data reported in Table 6.3 excludes a result that appears to have a much wider variance than other data for the same analyte. No statistical flier test was performed; only observations were used for this estimation. To perform analyses and meet all these performance standards, the laboratory would be required to perform additional reruns to bring one parameter or another within requested limits, generate additional data to statistically determine a mean value with the desired characteristics, or develop more robust and reliable analytical methods. Limited analytical methods development is in progress but is not sufficient to generally improve the quality of all analytes. Development work is in progress to assist in primary screening of core segments as a precursor to analyses. When these improvements are implemented, it is anticipated that subsampling can be expedited and dilutions can be made more efficiently to be within the dynamic range of the quantitation instrumentation.

Table 6.1. 222-S Analytical Laboratory Standards Performance.

ANALYTE	STANDARD RECOVERY - PERCENT (1)	STANDARD PRECISION - PERCENT (2)
Inorganic:		
Ammonium	99.78	15.08
Chloride	102.38	8.46
Cyanide	97.08	5.22
Fluoride	99.20	10.12
Nitrate	101.00	9.10
Nitrite	101.91	7.84
Phosphate	101.63	9.22
Sulfate	103.24	6.90
Acid H^+	103.58	8.66
Hydroxide OH^-	101.02	5.30
AA Metals As, Se, Hg	100.33	27.13
ICP Metals, major Na, Al, Fe, Ca, Cr, Bi	98.98	6.89
ICP Metals, trace Ag, Ba, Be, Cd, Ni, Sr	99.11	6.07
TIC, (CO_3)	101.10	8.10
TOC	97.26	5.72
Water, gravimetry	99.97	9.14
Radiochemistry:		
Uranium, total	99.89	17.08
Americium-241	93.72	21.64
Neptunium-237	79.97	62.26
Plutonium-239/240	94.74	41.02
Total Beta	101.60	32.02
Strontium-90	94.38	12.08
Technetium-99	100.68	46.62
Gamma Energy, Cs-137	103.12	20.74

(1) = Mean value based on annual review of 222-S standards data only.

(2) = Warning limit value, twice standard deviation of annual 222-S standards.

ICP = Inductively coupled plasma.

TOC = Total organic carbon.

TIC = Total inorganic carbon.

Table 6.2. 222-S/PNL Data Quality Summary. (sheet 1 of 2)

ANALYTE	SAMPLE ACCURACY		SAMPLE PRECISION	
	HIGH CONCENTRATION	LOW CONCENTRATION	HIGH CONCENTRATION	LOW CONCENTRATION
Inorganic:				
Ammonium	10	25	10	20
Chloride	10	25	10	15
Cyanide	10	20	15	30
Fluoride	15	35	15	30
Nitrate	10	25	10	15
Nitrite	10	25	10	15
Phosphate	10	25	10	25
Sulfate	10	30	10	15
Acid, H^+	5	100	10	50
Hydroxide, OH^-	5	100	10	50
AA Metals, As, Se, Hg	15	25	10	30
Major ICP Metals:				
Al	10	25	10	20
Bi	25	60	10	25
Ca	10	25	10	25
Cr	10	25	10	25
Fe	25	25	15	30
Na	10	10	10	15
Mg	10	15	15	50
Mn	25	35	15	50
Si	10	15	15	40
Minor ICP Metals:				
Ag	Not established	100	Not established	25
B	Not established	10	20	30
Be	Not established	30	Not established	Not established

Table 6.2. 222-S/PNL Data Quality Summary. (sheet 2 of 2)

ANALYTE	SAMPLE ACCURACY		SAMPLE PRECISION	
	HIGH CONCENTRATION	LOW CONCENTRATION	HIGH CONCENTRATION	LOW CONCENTRATION
Cd	15	25	15	20
La	5	25	10	35
Li	10	25	10	30
Ni	20	20	10	30
P	Indication only	Indication only		
Pb	10	25	15	35
S	Indication only	Indication only		
Sm (222-S data only)	20	20	15	35
Sr	5	30	10	25
Zr	10	25	15	30
Radiochemistry:				
Uranium, total	10	30	10	30
Americium-241	10	25	15	40
Neptunium-237	30	70	20	40
Plutonium-239/240	10	20	20	35
Total Alpha	5	35	15	25
Total Beta	10	20	15	20
Carbon-14	20	25	25	100
Strontium-90	10	15	15	30
Technetium-99	30	50	10	25
Tritium	20	30	25	75
Gamma Energy Analyses (GEA):				
Cesium-137	5	20	10	30
Iodine-129	30	50	50	50

ICP = Inductively coupled plasma.

Notes: 1.) Not established indicates sufficient measurements have not been made to establish an accuracy or precision value at that concentration.
 2.) The concentration of phosphorus and sulfur are not usually measured by ICP, however the value obtained should be used in conjunction with ion chromatographic analyses in the evaluation of species that may be present in the sample.

Table 6.3. Improved Data Quality Achievable
With Additional Effort. (sheet 1 of 2)

ANALYTE	ACCURACY		PRECISION	
	HIGH CONCENTRATION	LOW CONCENTRATION	HIGH CONCENTRATION	LOW CONCENTRATION
Inorganic:				
Ammonium	5	15	5	15
Chloride	10	20	5	10
Cyanide	10	20	10	20
Fluoride	15	25	10	15
Nitrate	10	20	5	10
Nitrite	10	20	5	15
Phosphate	10	30	5	15
Sulfate	10	30	5	15
Acid H ⁺	5	10	5	30
Hydroxide OH ⁻	5	10	5	30
TIC	10	20	10	15
TOC	10	25	10	30
Water, gravimetry	Not established			
AA Metals As, Se, Hg	10	25	10	30
ICP Metals:				
Ag	Not established	20	Not established	20
Al	10	20	10	15
B	Not established	10	10	25
Be	Not established	15	Not established	
Bi	20	30	10	25
Ca	5	20	10	25
Cd	10	10	10	30
Ce	5	10	Not established	
Cr	5	20	5	20
Fe	15	20	10	25
La	10	15	5	30

Table 6.3. Improved Data Quality Achievable
With Additional Effort. (sheet 2 of 2)

ANALYTE	ACCURACY		PRECISION	
	HIGH CONCENTRATION	LOW CONCENTRATION	HIGH CONCENTRATION	LOW CONCENTRATION
Li	10	15	5	20
Mg	10	10	15	35
Mn	15	25	10	35
Na	10	10	5	15
Ni	10	15	5	25
P	Indication only	Indication only		
Pb	10	20	10	30
S	Indication only	Indication only		
Si	10	15	10	30
Sm	Not established	Not established		
Sr	5	30	5	20
Zr	10	15	10	15
Radiochemistry:				
Uranium, total	10	20	5	20
Americium-241	10	20	10	25
Neptunium-237	20	35	15	25
Plutonium-239/240	10	20	10	25
Total Beta	5	15	5	15
Strontium-90	5	10	10	20
Technetium-99	20	30	10	20
Carbon-14	20		20	50
Tritium	20		20	35
Gamma Energy, Cesium-137	5	20	5	30

TIC = Total inorganic carbon.

TOC = Total organic carbon.

ICP = Inductively coupled plasma.

Notes: 1.) Not established indicates sufficient measurements have not been made to establish an accuracy or precision value at that concentration.
 2.) The concentration of phosphorus and sulfur are not usually measured by ICP, however the value obtained should be used in conjunction with ion chromatographic analyses in the evaluation of species that may be present in the sample.

7.0 EVALUATION OF DATA AGAINST HASQAP

Although calculated differently, it can be seen that certain analyte precision and accuracy statements in Tables 6.2 and 6.3 (Section 6.0) do not fall within the ranges recommended in the HASQAP. When analyses are being performed under the provisions of the HASQAP document, negotiation will be required to specify project specific detection limits and precision statements required by the work if they are different from those listed in the HASQAP. No attempt has been made in this estimation to reconcile the HASQAP provisions with estimates of data quality presented in this communication.

8.0 SUMMARY AND CONCLUSIONS

It can be seen upon examination and comparison of Tables 6.2 and 6.3 (Section 6.0) that there are wide variations in the accuracy and precision of analytical data attainable and these variations are dependant on individual analytes within the same sample. There are many reasons for these differences, including the following:

1. Sensitivity of the measurement system to the analyte (e.g., minimum detection level)
2. Chemical or radiological interferences to the measurement of the analyte, which are not removed by normal sample handling procedures
3. Energy and type of radio-emission of the isotope to be measured.

A single accuracy and precision value therefore can not be defined, which provides a realistic statement of the laboratory capabilities to produce data. The tables in Section 6.0 attempt to provide "a priori" estimates of the quality to be expected; data may be different on a sample by sample basis.

Between-sample differences can be more significant since tank wastes have characteristics which may add or diminish chemical interferences by the concentration of species present. For example, Redox wastes and cladding removal wastes will have high aluminum which may cause high background for certain other ICP metals and thereby increase the minimum detection level of the measurement. Many examples can be described, and each may be specific for an analyte that can not be completely described here. This type evaluation is incorporated into each methodology to produce "a posteriori" statements included in data packages.

Data in these tables should not limit quality of data requested in DQO documents if the need is justified. DQO documents should present the actual quality needed as well as measurements not included in the tables in Section 6.0. The laboratory has responsibility to respond with statements for producing the information, cost and time required to become prepared, and schedule for the work to be done. Without the requests being presented, the laboratory has little incentive or justification for including development work on a priority list.