DISTRIBUTION SHEET

To Distribution	From Nuclear Fuel Evaluations 8M710	Page 2 of 2
Project Title/Work Order Spent Nuclear Fuel Project		Date 3/03/95
		EDT No. 610163
		ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
------	------	-----------------------------	-----------	------------------------------	-----------------

Westinghouse Hanford Company

R. A. Anderson	X2-15	X
R. B. Baker	L5-01	X
D. W. Bergmann	R3-86	X
A. E. Bridges	L5-01	X
B. S. Carlisle	X3-71	X
S. A. Chastain	L5-01	X
R. G. Cowan	R3-86	X
J. R. Frederickson	R3-86	X
J. C. Fulton	R3-85	X
E. W. Gerber	R3-86	X
L. H. Goldmann	R3-86	X
S. L. Hecht	L5-01	X
A. T. Kee	R3-86	X
L. A. Lawrence	L5-01	X
*B. J. Makenas (3)	L5-01	X
R. L. McCormack	R3-86	X
C. R. Miska	R3-86	X
R. P. Omberg	R3-86	X
A. L. Pajunen	H5-49	X
J. Perez-Carter	L5-01	X
A. L. Pitner	L5-01	X
J. P. Schmidt	X3-73	X
J. A. Serles	X3-72	X
P. K. Shen	R3-87	X
D. W. Siddoway	R3-85	X
D. W. Smith	R3-85	X
D. J. Trimble	L5-01	X
M. J. Wiemers	R3-86	X
K. L. Woodard	L5-01	X
Central Files (2)	L8-04	X
OSTI (2)	L8-07	X

DISCLAIMER

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

DISTRIBUTION SHEET

To Distribution	From Nuclear Fuel Evaluations 8M710	Page 1 of 2
Project Title/Work Order Spent Nuclear Fuel Project		Date 3/03/95
		EDT No. 610163
		ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
------	------	-----------------------------	-----------	------------------------------	-----------------

U.S. Department of Energy,
Richland Field Office

S. S. Clark	R3-81	X			
J. L. Daily II	R3-81	X			
G. D. Trenchard	R3-81	X			
J. Shuen	R3-81	X			

Mac Technical Services Company

G. Baston	R3-82	X			
R. P. Denise	R3-82	X			

Pacific Northwest Laboratory

J. Abrefah	P7-14	X			
S. C. Marschman	P7-18	X			
T. A. Thornton	P7-18	X			

SAIC

3250 Port of Benton Blvd.
Richland, Washington 99352

J. R. Honekamp		X			
----------------	--	---	--	--	--

2. To: (Receiving Organization) Distribution	3. From: (Originating Organization) Nuclear Fuel Evaluations	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: Spent Nuclear Fuels Project	6. Cog. Engr.: B. J. Makenas	7. Purchase Order No.: N/A
8. Originator Remarks: N/A		9. Equip./Component No.: N/A
		10. System/Bldg./Facility: N/A
11. Receiver Remarks:		12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date: N/A

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-SNF-SM-002		0	Choices of Canisters and Elements for the First Fuel Shipment from K West Basin	N/A	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		1. Approved		4. Reviewed no/comment		
			2. Release		5. Post-Review		2. Approved w/comment		5. Reviewed w/comment		
			3. Information		6. Dist. (Receipt Acknow. Required)		3. Disapproved w/comment		6. Receipt acknowledged		
(G)	(H)	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.
1	1	Cog.Eng. B.J. Makenas	<i>[Signature]</i>	3/5/95	L5-01	Distribution Attached				2	
1	1	Cog. Mgr. R.P. Omberg	<i>[Signature]</i>	3/3/95	RPO						
		QA									
		Safety									
		Env.									

18. <i>[Signature]</i> B.J. Makenas Signature of EDT Originator Date <u>3/5/95</u>	19. Authorized Representative Date for Receiving Organization	20. <i>[Signature]</i> R.P. Omberg Cognizant Manager Date <u>3/3/95</u>	21. DOE APPROVAL (if required) Ctrl. No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments
---	---	--	--

RELEASE AUTHORIZATION

Document Number: WHC-SD-SNF-SM-002. Rev. 0

Document Title: CHOICES OF CANISTERS AND ELEMENTS FOR THE FIRST FUEL SHIPMENT FROM K WEST BASIN

Release Date: 3/3/95

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

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Chris Willingham

C. Willingham

3/3/95

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 42
2. Title Choices of Canisters and Elements for the First Fuel Shipment from K West Basin	3. Number WHC-SD-SNF-SM-002	4. Rev No. 0
5. Key Words DQO, 105-K West, Fuel Examinations, SNFP	6. Author Name: B. J. Makenas Signature Organization/Charge Code 8M710, LD11D	
7. Abstract <p>Twenty-two canisters (10 prime and 12 backup candidates) in the K West Basin have been identified as containing fuel which, when examined, will satisfy the Data Quality Objectives for the first fuel shipment from this basin. These were chosen as meeting criteria such as containing relatively long fuel elements, locking bar integrity, and the availability of gas/liquid interface level measurements for associated canister gas traps. Two canisters were identified as having reported broken fuel on initial loading. Usage and interpretation of canister cesium concentration measurements have also been established and levels of maximum and minimum acceptable cesium concentration (from a data optimization point of view) for decapping have been determined although other operational cesium limits may also apply.</p> <p>Criteria for picking particular elements, once a canister is opened, are reviewed in this document. A pristine, a slightly damaged, and a badly damaged element are desired. The latter includes elements with end caps removed but does not include elements which have large amounts of swelling or split cladding that might interfere with handling tools.</p> <p>Finally, operational scenarios have been suggested to aid in the selections of canisters and elements in a way that utilizes anticipated canister gas sampling and leads to a correct and quick choice of elements which will supply the desired data.</p>		
8. RELEASE STAMP <div style="border: 1px solid black; padding: 10px; text-align: center;"> OFFICIAL RELEASE 21 BY WHC DATE MAR 03 1995 <i>Sta. 21</i> </div>		

CHOICES OF CANISTERS AND ELEMENTS FOR THE FIRST
FUEL SHIPMENT FROM K WEST BASIN

B. J. Makenas
Westinghouse Hanford Company

March 1995

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

ST

Document Title: CHOICES OF CANISTERS AND ELEMENTS FOR THE FIRST
FUEL SHIPMENT FROM K WEST BASIN

Approved by:

13pm 2/23/95
[Signature]
R. P. Smberg, Manager
Spent Nuclear Fuels
Characterization Program

2-28-95
Date

Approved by:

m 2/28/95
[Signature]
D. W. Smith, Manager
SNFP Quality Assurance

2-28-95
Date

Approved by:

[Signature]
G. D. Trenchard, Acting Manager
Interim Storage and Disposition Program
U.S. Department of Energy
Richland Office

2-28-95
Date

EXECUTIVE SUMMARY

Twenty-two canisters (10 prime and 12 backup candidates) in the K West Basin have been identified as containing fuel which, when examined, will satisfy the Data Quality Objectives for the first fuel shipment from this basin. These were chosen as meeting criteria such as containing relatively long fuel elements, locking bar integrity, and the availability of gas/liquid interface level measurements for associated canister gas traps. Two canisters were identified as having reported broken fuel on initial loading. Usage and interpretation of canister cesium concentration measurements have also been established and levels of maximum and minimum acceptable cesium concentration (from a data optimization point of view) for decapping have been determined although other operational cesium limits may also apply.

Criteria for picking particular elements, once a canister is opened, are reviewed in this document. A pristine, a slightly damaged, and a badly damaged element are desired. The latter includes elements with end caps removed but does not include elements which have large amounts of swelling or split cladding that might interfere with handling tools.

Finally, operational scenarios have been suggested to aid in the selections of canisters and elements in a way that utilizes anticipated canister gas sampling, and leads to a correct and quick choice of elements which will supply the desired data.

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.

CONTENTS

1.0	INTRODUCTION	4
2.0	PICKING CANISTERS	4
2.1	CRITERIA FOR SELECTING CANISTERS	4
2.2	CESIUM SAMPLING AS A GUIDE TO CANISTER SELECTION	7
2.3	ADDITIONAL INFORMATION AND LIST OF CANISTERS	8
3.0	SELECTING FUEL ELEMENTS	8
3.1	CRITERIA AND CONSTRAINTS	8
3.2	PICTURES OF EXAMPLE FUEL ELEMENTS	10
4.0	OPERATIONAL SCENARIO	10
4.1	GENERAL NOTES	10
4.2	SEQUENCE OF EVENTS	15
5.0	REFERENCES	16
APPENDIX A	PHOTOCOPIES OF AS-LOADED CANISTERS FOR THOSE CANISTERS LISTED IN TABLE 1	19

CHOICES OF CANISTERS AND ELEMENTS FOR THE FIRST FUEL SHIPMENT FROM K WEST BASIN

1.0 INTRODUCTION

The purpose of this document is to describe choices of canisters and elements for the first 1995 shipment of fuel from K Basins to the 300 Area hotcells for examination. Specifically the text delineates (1) the criteria for selecting from K West Basin certain canisters to open, (2) the recommended canister numbers, and (3) the criteria for selecting specific fuel elements once canisters are opened. The point of view taken here is the need for specific data from this initial shipment. It is recognized that other documents (for example safety related criteria) may further limit the choices made herein. The current plan is to ship three elements and recent questions on shipping limitations have restricted the effort to two outer elements and one inner element.

The Data Quality Objectives document for fuel shipping (Lawrence 1995) indicates that one pristine, one slightly damaged or cracked element, and one badly damaged element are desired for the first hotcell examination campaign. The choices made in this document are an attempt to identify canisters and elements which fulfill these needs while making the minimum number of canister openings and the minimum number for fuel moves. The criteria and choices herein were arrived at during a series of three meetings held during January of 1995. Topics and attendance for these meetings are identified in references (Makenas 1995a through Makenas 1995c). Throughout this document it is assumed that gas and liquid from candidate canisters will be sampled prior to opening and that these data will be available to experimenters prior to opening of canisters.

A schematic diagram of a canister barrel is shown in Figure 1. A canister consists of two barrels each of which can contain up to seven assemblies (i.e., up to seven inner plus seven outer fuel elements).

2.0 PICKING CANISTERS

2.1 CRITERIA FOR SELECTING CANISTERS

The starting point for evaluating canisters as potential sources of shippable fuel was a computerized data base originally constructed by James Schlosser. It derives from the K Basin accountability records but has additional data incorporated. For this exercise still more information was added to the data base including encapsulation dates, records of broken fuel, gas trap surveillance data, and locking bar integrity observations (Green 1991). Gas trap data consisted of ultrasonic measurements of the

Figure 1. Schematic Drawing of One Barrel from a Mark II K West Canister.

39411076.1

gas/water interface level in the traps and broken locking bar data consisted of the results of a visual survey of canisters made in 1983. The number of candidate canisters was whittled down based on repeated searches through the data base using ever more refined criteria.

It was assumed that operationally the effort would be limited to three canisters (six barrels) in process at any one time with an anticipated maximum of ten canisters opened in the entire campaign. It would then be prudent to identify at least 20 satisfactory candidate canisters to account for those canisters which would be rejected prior to opening due to some undesirable trait observed during handling or gas/liquid sampling.

Only Mark II canisters were considered as candidates since there is not a current decapping/recapping scenario for Mark I canisters. Fuel burnup level is not considered critical to the first shipment and the question of weapons grade versus fuel grade was likewise not used as a selection criterion. Elements which came to K West via the segregation run are not desirable since they have a K East Basin history and a most recent encapsulation date. "Chip cans" were adjudged to be undesirable canisters since their contents are not handable with current tools. It is not necessary to limit choices to non-fully loaded cans since the likelihood of the fuel being swelled to the point of jamming is considered unlikely.

For the first shipment, the longest possible elements, with endcaps not originally immersed in water, are desirable. This strategy addresses one of the more serious fuel issues: that of hydride production in fuel with limited access to water. Long fuel elements will contain portions of fuel which have access to water vapor but not to liquid water which might convert the hydride to relatively innocuous oxide. Fuel with some hydride content is desirable to assess the quantity and morphology of this potentially pyrophoric species. This leads to the choice of canisters which contain Mark IV E-length or Mark IV S-length fuel, 24 to 26 inches (61 to 66 cm) long. Since most of the original damage to elements is thought to have occurred at the endcaps, some damaged fuel may indeed be above the level of water with its potential to erase some evidence of hydride. This discussion is not meant to imply that there are no issues related to Mark I A-length and other short fuel, but only that one major issue is being addressed in the first shipment. Canisters with mixtures of short and long fuel were not a priori precluded from candidacy but the absence of such mixtures makes calculation of canister water volumes unambiguous.

Records of canister gas/liquid sampling, circa 1983, were reviewed but no Mark II canisters were part of that campaign, so that particular road did not lead to specific canister choices or rejections. Those canisters which were previously shown to have broken locking bars were rejected as candidates since canister flooding has at least the potential for data destruction and since all potentials for accidental opening during handling need to be avoided.

Loading records were reviewed and only two of the Mark II canisters with Mark IV E-length or Mark IV S-length fuel were found to have indications of broken fuel. These are therefore among the top candidates for shipping. Only those canisters with gas trap interface level measurements were considered as candidates. Preference in canister selection was given to canisters with

mostly gas in their traps (i.e., those most likely to have corrosion and least likely to be flooded). Note, even a little corrosion should produce a large volume of gas. Furthermore it was assumed that those canisters with gas trap data were accessible to Basin Operations at one time and would stand a good chance of being accessible today.

2.2 CESIUM SAMPLING AS A GUIDE TO CANISTER SELECTION

All canisters considered for opening will be sampled for liquid and possibly gas. The results of the compositional analysis of the liquid samples will be used to determine whether particular canisters are likely to contain desired fuel types and whether canisters can be opened with safety parameters set by Basin Operations. A recent report (Mollerus 1995) projects, based on 1983 data, that 98 percent of the canister barrels will contain less than 3.7 Ci of cesium in the canister water. It is also noted that releases which exceed approximately 40 Ci could have unwanted consequences for the ion exchange modules. Therefore, in order that several barrels can be opened in succession, 3.7 Ci is taken as the upper limit on cesium content for canister barrels which are to be opened and barrels exceeding this level would not be decapped, at least initially. This level of cesium corresponds to approximately 500 grams (depending on burnup and other assumptions) of corroded uranium distributed in some unknown way among the several elements. For the 15 ml liquid sample which is anticipated to be taken, approximately 4.5 mCi in the vial corresponds to this 3.7 Ci canister barrel activity level.

A lower limit on the canister barrels of interest can be guided by the sampling measurements from 1983 which were performed on canisters known to contain broken fuel. These found a maximum of 0.3 Ci and an average of 0.07 Ci in the Mark I canisters with most values clustering toward the lower cesium values. The lower limit of cesium in the canister barrel should be initially set at 0.03 Ci to guard against the possibility that corrosion has proceeded no further than the 1983 data suggests. A canister barrel cesium content of 0.03 Ci corresponds to an approximate activity in a 15 ml sample of 0.05 mCi.

It should be noted that opening canisters with a range of cesium concentrations guards against opening exclusively canisters with disintegrated fuel or only canisters with completely pristine fuel. There is no known correlation between the 1983 data and the amount of broken fuel in the canisters, and it has been pointed out that initial recorded observations of broken fuel on canister loading may be incomplete. Therefore, with this considerable uncertainty (as well as large uncertainty in corrosion rate) it may become necessary after some initial canisters are opened, to expand the upper or lower cesium limits if all undamaged or all seriously damaged fuel is encountered.

All canister barrels should be flooded prior to the final cesium liquid sampling. This is because corrosion product, currently not covered by water, could cause a large release into the basin when canisters are opened. Such corrosion product may not be currently communicating with sampled water in a non-flooded canister barrel. If feasible, from a throughput and shipping viewpoint, it would be ideal if canisters could be sampled before and after

flooding to give indications of water levels in the canister barrels and of reactive sites which currently are not submerged. In any case the cesium sample from the flooded case should be used to determine canister barrel acceptability for decapping.

Krypton gas released from the canisters is not thought at this time to pose an immediate safety hazard. However, if timely analyses of gas can be obtained coincident with the initial cesium analyses, then this data should be obtained as an additional confirmation of corrosion and confirmation of safety related calculations.

2.3 ADDITIONAL INFORMATION AND LIST OF CANISTERS

Table 1 is a list of candidate canisters which meet the criteria described above. Two of these canisters were listed as containing some broken fuel during the canister loading operation. These two canisters have the highest priority. During the course of this selection process, candidate canisters were inspected for evidence of broken locking bars. Two previously unidentified broken bars were identified (Pitner 1995) and such canisters were deleted from further consideration. A series of video tapes from the early 1980's was also reviewed by A. L. Pitner and K. L. Woodard. These tapes document the as-loaded condition of the canister and canister contents. The tapes are not high quality, and in only one case (canister Number 4366 location 0823) could an as-loaded cladding breach be identified. Photocopies taken from these video tapes are presented in Appendix A.

3.0 SELECTING FUEL ELEMENTS

3.1 CRITERIA AND CONSTRAINTS

The DQO process for fuel shipping (Lawrence 1995) has identified three types of elements for the first shipment to hotcells from K West Basin. These are: a pristine element, an element with a limited visible crack, and a badly cracked element (deformed or separated endcap with visible corrosion product). Either inner or outer elements are acceptable for shipping but outer elements are more likely to be damaged if most damage was caused by impacts during reactor discharge. Elements with split cladding or large amounts of swelling are not desired since they can adversely affect the ability of current tools to lift elements. Cracks away from endcaps are acceptable.

It should be noted that in some cases the inner element from the center assembly in a given canister barrel was removed (and deposited elsewhere in the canister) to make room for the dip tube attached to the canister cover plate. However the recent review of video loading records shows that this is by no means a universal observation. Where this has occurred it may be of advantage in removing particular candidate outer elements which fortuitously are in the center location.

Table 1. Candidate Canisters for Gas and Water Sampling and Fuel Retrieval.

Key	Location	Canister Number	Fuel Model	Fuel Type	Number Outer Elements	Number Inner Elements	Percent ²⁴⁰ Pu	Interface Location in Inches from Bottom of Trap		Canister Type	Encap. Date	Broken Fuel
								Gas Trap 1	Gas Trap 2			
13858	0804	1990	BXE BXS	MKIV MKIV	13 1	13 1	12 12	1	1	MKII	11/17/83	1 broken outer
13858	0823	4366	BXE	MKIV	14	14	12	8	1	MKII	11/02/83	1 broken outer
13858	0843	4573	BXE	MKIV	14	14	12	1	0	MKII	11/02/83	
13858	0844	4432	BXE	MKIV	14	14	12	1	0	MKII	11/02/83	
13858	0835	4378	BXE	MKIV	14	14	12	1	0	MKII	11/01/83	
13858	0821	4685	BXE	MKIV	14	14	12	1	1	MKII	11/02/83	
13858	0831	4246	BXE	MKIV	14	14	12	1	1	MKII	11/01/83	
13858	0834	4368	BXE	MKIV	14	14	12	1	1	MKII	11/01/83	
13858	0838	4556	BXE	MKIV	14	14	12	1	1	MKII	11/02/83	
13858	0840	4576	BXE	MKIV	14	14	12	1	1	MKII	11/02/83	
13858	0845	4655	BXE	MKIV	14	14	12	1	1	MKII	11/02/83	
13858	0825	4302	BXE	MKIV	14	14	12	2	1	MKII	11/02/83	
13858	0839	4340	BXE	MKIV	14	14	12	3	1	MKII	11/02/83	
13858	0842	4379	BXE	MKIV	14	14	12	3	2	MKII	11/02/83	
13015	5225	6601	BXE	MKIV	14	14	13	2	2	MKII	08/25/84	
13015	5254	6680	BXE	MKIV	14	14	13	2	3	MKII	08/25/84	
13858	5409	913	BXE	MKIV	14	14	12	3	3	MKII	03/07/83	
13858	5410	989	BXE	MKIV	14	14	12	2	3	MKII	03/07/83	
13858	5420	1531	BXE	MKIV	14	14	12	3	3	MKII	03/07/83	
13858	5424	1512	BXE	MKIV	14	14	12	2	2	MKII	03/06/83	
13858	5427	91	BXE	MKIV	14	14	12	3	3	MKII	03/06/83	
13858	5432	974	BXE	MKIV	14	14	12	4	3	MKII	03/06/83	

Underwater video cameras will be used to guide the initial selection of fuel from canisters which have been opened. This may be followed by a boroscope examination which will examine sides and bottom ends of the elements which are seriously being considered for removal. Elements with extensive bottom damage or those which might be deeply buried in sludge are undesirable. Large amounts of sludge may hide bottom end damage or make reinsertion impossible.

Reinsertion of elements into a different canister from its original "home" canister is not possible due to accountability problems. Elements also probably may not be swapped between a canisters two barrels but, an inner element may be reinserted by itself elsewhere in a barrel without its associated outer element.

It is recognized that an outer element may or may not lift when an inner element is lifted. The current tools will engage and remove the inner element before engaging the outer element. This will affect element choices since one may be forced to ship an inner element which is attached to a desired outer element. Inner elements which appear to be centered in their outer element are probably locked in place, while off-centered inner elements can probably be removed independent of their outer companion element.

3.2 PICTURES OF EXAMPLE FUEL ELEMENTS

The following Figures 2 through 5 show the types of elements which correspond to the pristine, damaged, badly damaged, and rubble (unwanted) candidates. These were taken from the video survey of K East Basin performed in 1995.

4.0 OPERATIONAL SCENARIO

4.1 GENERAL NOTES

All operations associated with canister opening and element movement should be video taped. Canisters should be raised as necessary to afford a better view. Video camera coverage is essential also to ensure that interference between elements being removed and the lip protection plate (if issued) is avoided and to ensure that any necessary shuffling of assemblies is accomplished and documented.

It is anticipated that failures have occurred most often in the outer fuel elements. Therefore failed fuel elements should be chosen first since the inner and outer elements may lift together. Thus, an associated inner element could become the pristine element by default.

Since two candidate canisters are known to have broken fuel, they should be opened among the first set of canisters if they meet the upper cesium limit. When choosing fuel elements, the pictures shown in Section 3.2 should be used as a guide.

Figure 2. Example of Pristine Elements. (If inner elements are chosen for shipping they need not be centered within the outer element as these are)

Figure 3. Examples of Damaged Fuel.

Figure 4. Examples of Badly Damaged Fuel.

Figure 5. Example of Fuel Which is Too Badly Damaged
and is Unacceptable as a Shipping Candidate.

If three canisters are in process at one time, some of the six barrels may remain unopened after three fuel elements are chosen. It would be desirable to open the remaining barrels and video tape the elements to compare fuel condition to the gas/liquid sample results.

4.2 SEQUENCE OF EVENTS

The processing of canisters should proceed generally as follows. Steps 1, 2, and 3 are summarized in Figures 6 and 7. Note that it is currently expected that ten canisters will complete the gas/liquid sampling step prior to any fuel being chosen. However nothing here precludes an operational decision to move canisters through the complete process in smaller groups.

1. Gas and liquid sampling
 - Retrieve next canister on list of candidates
 - Sample gas and liquid
 - Vent gas and flood canister
 - Sample liquid.
2. Choosing a previously sampled canister for decapping (based on data from Step 1)
 - Determine if cesium for each barrel is under maximum cesium limit
 - Determine if cesium value is over the minimum acceptable cesium concentration for each barrel or if this is one of the prime two candidates (i.e., one of those with known broken fuel)
 - If cesium concentration window is met for at least one barrel then go to decapping.
3. Element choices after barrel opening
 - Video tape barrel opening and condition of fuel (look for evidence of on-going reaction as well as preexisting corrosion)
 - Ascertain whether a cracked or badly damaged fuel element is visible. If not, return canister to basin or try another barrel
 - If a damaged element is identified check for lower end damage or massive sludge surrounding candidate element with video camera or boroscope
 - Remove candidate element with or without its inner/outer companion
 - Repeat for another damaged candidate element
 - Repeat for pristine element if no pristine element is clinging to one of the damaged elements
 - If all candidate elements in all six barrels in process are damaged, start a new batch of three canisters and strive for low cesium content canisters only
 - If all candidate elements in all barrels are pristine, start a new set of three canisters through the process and strive for higher cesium levels (but not exceeding safety limits).

5.0 REFERENCES

- Lawrence, L. A., 1995, Data Quality Objectives for the Initial Fuel Shipment, to be published, WHC-SD-SNF-DQO-001.
- Mollerus, F.J., 1995, An Assessment for K Basin Radionuclide Activity While Opening SNF Canisters, WHC-SD-SNF-SE-006.
- Makenas, B. J., 1995a, cc:Mail, Minutes from Sampling Strategy Meeting, January 4, 1995.
- Makenas, B. J., 1995b, cc:Mail, Actions and Minutes, Sampling Strategy Meeting, January 11, 1995.
- Makenas, B. J., 1995c, cc:mail, Minutes, Third Meeting for Canister/Element Sample Strategy, January 18, 1995.
- Pitner, A. L., 1995, K West Locking Bar Survey, WHC Internal Memo, January 6, 1995.
- Street, G. L., 1991, Locking Bars on Mark II Canisters, WHC-ISR-R91-148.

Figure 6. Flowchart for Gas and Water Sampling.

kwflow2.ch3
2/15/06

Figure 7. Flowchart for Selection of Elements from Canisters.

kwf0w1.ch3
2/10/95

A P P E N D I X A

PHOTOCOPIES OF AS-LOADED CANISTERS FOR THOSE CANISTERS LISTED IN TABLE 1

by
A. L. Pitner and K. L. Woodard

(Photocopies are in order as listed in Table 1. These data are from video tapes made in the early 1980's. The canister in location 5420 has no known video tape record and therefore no photograph is included.)