



Safety Analysis Report for the West Valley Melter Package

SARWVMP-01

**Revision 1
April 2015**

[References for Chapters 1 through 3]

USNRC Docket Number 71-9797

Submitted by the:
U.S. Department of Energy
West Valley Demonstration Project
10282 Rock Springs Road
West Valley, NY 14171

Prepared by:
Savannah River National Lab
[Under IEWO M14-WV-0001]
&
CH2M Hill-B&W West Valley, LLC
[Under Contract DE-EM0001259]



U.S. Steel Corporation Metallurgical Test Report

Gary Works
Gary, IN 46402

ORDER: UE55761-01

PART:

LOAD: H04202

INVOICE: 154-239192

SHIP DATE: 11/20/02

PO NBR: JCR-3497

VEH ID: EJE 006257

H4202

SOLD TO:

SHIP TO:

SERIAL HEAT: M47470 I/C: 55W1 STEEL TYPE = CAST REDUCTION RATIO = 4.0 TO 1
C9170A00 3.0" X 96.0" X 360.0" 1 PC 29404.00 LBS

SPEC: PLATE CARBON ASME SA 516 01-JUL-2001 2001 EDITION 2002 ADDENDA GR 70 APPROVED ASTM A516
01-JAN-2001 GR 70 APPROVED PVQ NORMALIZED PLATE KILLED FINE GRAIN MILL EDGE

INSP: 01 MILL INSPECTION RA/SN ALSO RA/LT CERTIFY THAT ALL MELTING AND MANUFACTURING TOOK PLACE
IN THE USA.

HEAT M47470 MELTED AND MANUFACTURED IN THE USA. FINE GRAIN
C=.26 MN=.099 P=.017 S=.010 SI=.22 CU=.02 NI=.02 CR=.04 MO=.01 AL=.025 V=.001 TI=.001 CB=.001

TRANSVERSE *YIELD: 44.0 KSI TENSILE: 77.0 KSI 2" % ELONGATION: 29.0
44000 PSI 77000 PSI

TENSILE TEST WAS TAKEN ON INGOT/CUT: 55W 1

PRODUCT AND TEST SPECIMENS WERE NORMALIZED AT 1660 DEG F. FOR 02 HR 48 MIN. COOLING COMPLETED
IN STILL AIR.

- YIELD STRENGTH @ 0.5% E.U.L.

** END OF TEST RESULT DATA **

TEST RESULTS WERE CONDUCTED AND RECORDED IN ACCORDANCE WITH TEST METHODS ACCREDITED BY A2LA.
THIS REPORT SHALL NOT BE REPRODUCED OR ALTERED WITHOUT THE PRIOR WRITTEN APPROVAL OF UNITED
STATES STEEL.

THIS PRODUCT WAS MANUFACTURED IN ACCORDANCE WITH THE QUALITY MANAGEMENT SYSTEM WHICH COMPLIES
WITH ISO 9002:1994.

BDWdx

The American Tank & Fabricating Co.
MEETS THE REQUIREMENTS OF

ASTM A516-70, 03a
REVIEWED BY: *B. K...* DATE: 7/17/03

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MANUFACTURED, TESTED AND/OR INSPECTED
IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECT.
PREP. BY THE OFFICE OF D.M. BORMET, MGR, PLATE TECH BY: *John...* DATE: 11/22/02

1611 PCN NNN 1 0 0 0087972002A PKE JAL 1 0 0 PAGE 1 OF 1

Heat Treat Number M47470

Grade

A516-70

Size

3.0

Metallurgical Test Report

USX, USX-111111
are the trademarks of USX Corp.



GARY WORKS
GARY, INDIANA 46402

A M CASTLE & CO
3400 NORTH WOLF ROAD
FRANKLIN PARK IL 60131-1319

NO. DATE
11/21/97 01-74317

SHIPMENT NO. ORDER NO. INVOICE NO.
704917 04 28 98 UM85692 154-485488
28 IL 57957

THIS IS TO CERTIFY THAT THE
PRODUCT DESCRIBED HEREIN WAS
MFGD., SAMPLED, TESTED AND/OR
INSPECTED IN ACCORDANCE WITH
THE SPECIFICATION AND FUL-
FILLS REQUIREMENTS IN SUCH
RESPECT.

PREPARED BY THE OFFICE OF:
S.C. PAPE GEN. MGR. Q.A.

** MELTED AND MANUFACTURED IN THE USA **

A M CASTLE & CO
3400 NORTH WOLF ROAD
BAY #4
FRANKLIN PARK IL

PART NO: PTX A.C. 26135--

** NAFTA CERTIFIED AS NORTH AMERICAN DOMESTIC **

SPEC. & NBR. PLATE CARBON ASTM A516-90 GRADE 70 ASME B516-1995 EDITION, 96
ADDENDA, DECEMBER 31, 1996 GRADE 70 A M CASTLE AND CO SPEC
K02700-67 REV 5 DATED 8/2/96 PRESSURE VESSEL QUALITY NORMALIZE
BEST FLATNESS TOL 1/2 STD
INSP: 01 MILL RA/SM ALSO RA/LT CERTIFIED T/R WITH LOAD ANALYSIS MERCURY
FREE STATEMENT REQUIRED

ITEM NO.	MATERIAL DESCRIPTION	QUAN- TITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTIFY	YIELD ST.	TENSILE ST.	ELONGATION %	RED. OF AREA	BEND
	MERCURY OR MERCURY BEARING COMPOUNDS ARE NOT USED IN THE MANUFACTURE OF THIS MATERIAL. ***END OF DATA***									

THIS REPORT SHALL NOT BE REPRODUCED WITHOUT THE PRIOR WRITTEN APPROVAL OF THE USX CORPORATION.

HEAT NO.	TYPE	C	AN	P	S	B	CU	NI	CR	MO	SI	AL	N	V	B	TI	CA	CO

END OF DATA

ALL TEST RESULTS WERE CONDUCTED AND RECORDED IN ACCORDANCE WITH TEST METHODS ACCREDITED BY A2LA
MATRIX DECIMAL POSITIONS FOR ELEMENTS ARE INDICATED BY THE LEFT MARGIN, VERTICAL DOTTED LINE OR DECIMAL POINT.

No. 4062 P. 1

USX, USX-111111

11:48AM 2007-11-20

09/15/2004 From: AMERICAN ALLOY STEEL
P.O.# :054337-00
Item :1 (1 PC) 3" X 96" X 60"
:ISG HEAT# U0624 ALREADY APPROVED

To: AMERICAN TANK & FABRICATING
AA PL#:8024766

S.O.# :37811-NY

ISG PLATE INC.

TEST CERTIFICATE

SHIP TO:
AMERICAN ALLOY STEEL INC
C/O B. & R. MARINE SVS
PORT OF GREATER BATON ROUGE
TRACK #791
PORT ALLEN LA 70767

PAGE NO: 01 OF 02
FILE NO: 0284-01-20
MILL ORDER NO: 85476-001
MELT NO: U0624
SLAB NO: 4
DATE: 04/09/04

SOLD TO:
AMERICAN ALLOY STEEL, INC
P. O. BOX 40469
HOUSTON TX 77240-0469

SEND TO:
AMERICAN ALLOY STEEL, INC
P. O. BOX 40469
ATTN: HOMER GARZA
HOUSTON, TX 77240-0469

02-C

PLATE DIMENSIONS / DESCRIPTION

TOTAL QTY	GUAGE	WIDTH	LENGTH	DESCRIPTION	PIECE WEIGHT
1	3"	96"	480"	RECTANGLE	39205#

CUSTOMER INFORMATION

CUSTOMER PO: 57082-LA

SPECIFICATION(S)

THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATION(S).

API 2H-8TH-EDITION YR 99 GR 50 S1 S3 S4
SUPPL. PARA. S5 & SUPPL. PARA. S12
SPEC MOD FOR PHYSICALS
SPEC MOD FOR CARBON
ASME SA537 99 CLASS 1 MODIFIED TO .04 MAX CB,
ABS PART 2-SECT-1 00 GRS EH36/DH36, ASTM A633
95 GR C AND MIL-S-22698C GR DH36
MATERIAL PRODUCED UNDER A CERTIFIED QUALITY MGMT SYSTEM COMPLYING WITH
ISO 9001 ABS-QE CERT. NO. 30130

Certified a true copy of the
original, retained in our file.
AMERICAN ALLOY STEEL, INC.

065/3104

CHEMICAL COMPOSITION

MELT:U0624	C	MN	P	S	CU	SI	NI	CR	MO
	.14	1.53	.008	.002	.14	.37	.09	.10	.03
MELT:U0624	V	TI	B	AL	CB	CA	N	CEF	
	.001	.004	.0004	.041	.031	.002	.0077	.44	

CARBON EQUIVALENT FORMULA (CEF)

CEF = C + (MN * .1667) + ((CR + MO + V) * .2000) + ((CU + NI) * .0667)

MANUFACTURE

FINELINE - VACUUM DEGASSED - FINE GRAIN PRACTICE

HEAT TREAT CONDITION

MATL OR TEST	HEAT TREAT DESCRIPTION	NOM TEMP	HOLD MINS	COOL MTHD
PL/TEST	NORMALIZE	1650F	106	AIR COOL



AMERICAN ALLOY
PLATE # 8024766

PA514374

3689

WE HEREBY CERTIFY THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

MEETS THE REQUIREMENTS

Elinore Zaplitz
SUPERVISOR - TEST REPORTING
ELINORE ZAPLITNY

ASTM A633 Grade E 09/10/02
IDA 9-22-04

PO# 54337-
SC# 40945-00

FROM: AMERICAN ALLOY STEEL
P.O.# :054337-00
Item :1 (1 PC) 3" X 96" X 60"
:ISG HEAT# U0624 ALREADY APPROVED

To: AMERICAN TANK & FABRICATING
S.O.# :37811-NY
AA PL#:8024766

ISG PLATE INC.

TEST CERTIFICATE

PAGE NO: 02 OF 02
FILE NO: 0284-01-20
HILL ORDER NO: 85476-001
HELT NO: U0624
SLAB NO: 4
DATE: 04/09/04

TENSILE PROPERTIES

SLAB NO.	LOC	DIR	YIELD STRENGTH PSI X 100	TENSILE STRENGTH PSI X 100	ELONGATION GAGE LGTH	%	XR.A.
4	BOT.	THRU GA.					71.0
4	TOP.	THRU GA.					69.0
4	BOT.	TRANS.	559	807	2.00"	30.0	

CHARPY V-NOTCH IMPACT RESULTS

SLAB	LOC	DIR	TEMP	SIZE	FT. LBS.
4	BOT.	TRANS.	-40F	FULL	90 133 135

DROP WEIGHT TESTING

LOC	DIR	SIZE	DEPTH	TEMP	RSLT	TEMP	RSLT
BOT.	LONG.	P3	SURF	-30F	NB	-30F	NB

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
A.B.S. Q.A. CERTIFICATE 00-QA1415-X.
MATERIAL HAS BEEN VACUUM DEGASSED AND CALCIUM TREATED
FOR SULFIDE SHAPE CONTROL.
FINELINE MOD FOR SULPHUR
TEST CERTS. ARE PREPARED IN ACCORD. WITH PROCEDURES
OUTLINED IN DIN 50049 3.1.B/EN 10204 3.1.B.

B/L# 36809 UP 262082
PCM - .25

Certified a true copy of the
original, retained in our file.
AMERICAN ALLOY STEEL, INC.

MEETS THE REQUIREMENTS

A57m A 633 Grade E *py 20F2*

JR 9.22.04

PO# 54337
SO# 40945-00

WE HEREBY CERTIFY THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

Elinore Zaplitzky
SUPERVISOR - TEST REPORTING
ELINORE ZAPLITZKY

RECEIVING INSPECTION & MATERIAL VALIDATION--STEEL PLATE

1. Receiving Information:

Purchased by: ATF Supplier: 156 P.O. No. 53634
 Line Item No. 3 AT&F Job NO. 40945 AT&F Heat Code NA
 Receiver No. 7583 Date Rec'd. 6/18/04 Quantity Rec'd. 1

2. Dimensional Inspection:

Thickness: 6 6 6 6
 (4 corners)
 Width: 153 Length: 155

3. Material Marking or Stamping

Record the following information from Plate Stamping: (example)

156 Plate Manufacturer (BLF)
SA516-70 MT Material Spec and Type or Grade (SA516-70-G MT LTV)
 (G, MT, LTV if applicable)
U2395 Plate Heat Number (402T6311)
2 Plate Slab Number (1)

UT Number (if applicable) (UT SA435)

4. Remarks: (e.g. shipping damage, other stamping or noted nonconformance)

Plate conforms to the attached P.O. requirements and the attached Material Test Reports match the Plate Markings.

Inspected by: [Signature] Date 6/24/04 ☒ Accept ☐ Reject

Validated by: [Signature] Date 7-9-04 ☒ Accept ☐ Reject

Code No. QDR S/N

Material Identification & Verification (performed at time of fit-up)

1. Item Information:

Mfg. Serial # AT&F Job No. DWG./Item # Rev. No.

2. Permanent Stamping Information: (Center of Plate edge 6" from weld or as req'd.)

Plate Manufacturer
 Material Spec and Type or Grade
 (G, MT, LTV if applicable)
 Plate Heat No.
 Plate Slab No.
 UT Number (if applicable)

Mfg. Ser. No. Manufacturers Serial Number

Plate verified to be same as receipt inspected, plate edges visually inspected for laminations and permanent stamping inspected per attached AT&F validated Material Test Report (s)

Verified by: Date Q/C Review: Date

Alt-Review: Date

SP110-2F1 Rev. 1 4/11/02

SHIP TO:

AMERICAN TANK & FABR. CO.
12314 ELMWOOD AVE.
DOOR #11
CLEVELAND OH 44111

PAGE NO: 01 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10291-002
MELT NO: U2395 ✓
SLAB NO: 2
DATE: 06/16/04

SOLD TO:

AMERICAN TANK & FAB. CO.
12314 ELMWOOD AVE.
CLEVELAND OH 44111

SEND TO:

TEST REPORT WITH SHIPMENT.
FOR BOL # 44024

PLATE DIMENSIONS / DESCRIPTION

TOTAL QTY	GAUGE	WIDTH	LENGTH	DESCRIPTION	PIECE WEIGHT
	8"	153"	155"	RECTANGLE	40353#

CUSTOMER INFORMATION

CUSTOMER PO: 53634

SPECIFICATION(S)

THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATION(S).

ASTM A516 YR 90 GR 70
ASME SA516 2001 EDITION GRADE 70
MATERIAL PRODUCED UNDER A CERTIFIED QUALITY MGMT SYSTEM COMPLYING WITH
ISO 9001 ABS-QE CERT. NO. 30130

CHEMICAL COMPOSITION

	C	MN	P	S	CU	SI	NI	CR	MO
MELT: U2395 ✓	.24	.93	.008	.009	.25	.19	.12	.07	.05
	V	TI	AL	CB					
MELT: U2395	.002	.002	.022	.001					

MANUFACTURE

MCQUAID-EHN GRAIN SIZE PER E112 - 7-B

MEETS THE REQUIREMENTS ✓

ASME SA 516-70 2001 edition

JRC 7-4-04 pg 1 of 2

HEAT TREAT CONDITION

MATL OR TEST	HEAT TREAT DESCRIPTION	NOM TEMP	HOLD MINS	COOL RTHD
PL/TEST	NORMALIZE	1650F	181	AIR COOL

PO# 53634

TENSILE PROPERTIES

40945-00a

SLAB
NO.

LOC

DIR

STRENGTH
PSI X 100

STRENGTH
PSI X 100

GAGE
LGTH X

2

BOT.

TRANS.

423

766

2.00" 24.0

WE HEREBY CERTIFY THAT THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

SUPERVISOR - TEST REPORTING
ELINORE ZAPLITNY

MEETS THE REQUIREMENTS ✓

ASME SA516-70 2001 edition

JDL 7-4-08 pg 2 of 2

40945-0000

ISG PLATE INC.

TEST CERTIFICATE

PAGE NO: 02 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10291-002
MELT NO: U2375
SLAB NO: 2
DATE: 06/16/04

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
MERCURY OR MERCURY COMPOUNDS ARE NOT USED
IN THE MANUFACTURE OF ISG PRODUCTS.

40945-0000

RECEIVING INSPECTION & MATERIAL VALIDATION—STEEL PLATE

1. Receiving Information:

Purchased by: ATF Supplier: ISG P.O. No. 53634
 Line Item No. 3 AT&F Job NO. 40945 AT&F Heat Code N/A
 Receiver No. 7615 Date Rec'd. 6/23/04 Quantity Rec'd. 1

2. Dimensional Inspection:

Thickness: 6 6 6 6
 (4 corners)
 Width: 153 Length: 155

3. Material Marking or Stamping

Record the following information from Plate Stamping:

(example:)

156 Plate Manufacturer (BLP)
SA516-70 MT Material Spec and Type or Grade (SA516-70 GMT LTV)
 ("G, MT, LTV if applicable")
42395 Plate Heat Number (402T6311)
3 Plate Slab Number (1)

UT Number (if applicable)

(UT-SA435)

4. Remarks: (e.g. shipping damage, other stamping or noted nonconformance)

Plate conforms to the attached P.O. requirements and the attached Material Test Reports match the Plate Markings.

Inspected by: [Signature] Date 6/24/04 ☒ Accept ☐ Reject

Validated by: [Signature] Date 7-9-04 ☒ Accept ☐ Reject

Code No. QDR S/N

Material Identification & Verification (performed at time of fit-up)

1. Item Information:

Mfg. Serial # _____ AT&F Job No. _____ DWG./Item # _____ Rev. No. _____

2. Permanent Stamping Information: (Center of Plate edge 6" from weld or as req'd.)

_____ Plate Manufacturer
 _____ Material Spec and Type or Grade
 ("G, MT, LTV if applicable")
 _____ Plate Heat No.
 _____ Plate Slab No.
 _____ UT Number (if applicable)

Mfg. Ser. No. _____ Manufacturers Serial Number

Plate verified to be same as receipt inspected, plate edges visually inspected for laminations and permanent stamping inspected per attached AT&F validated Material Test Report (s)

Verified by: _____ Date _____ Q/C Review: _____ Date _____

AJ-Review: _____ Date _____

SP110-2F1 Rev. 1 4/11/02

ISS PLATE INC.

TEST CERTIFICATE

SHIP TO:

AMERICAN TANK & FABR. CO.
12314 ELMWOOD AVE.
DOOR #11
CLEVELAND OH 44111

PAGE NO: 01 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10291-002
MELT NO: U2395✓
SLAB NO: 3
DATE: 06/16/04

SOLD TO:

AMERICAN TANK & FAB. CO.
12314 ELMWOOD AVE.
CLEVELAND OH 44111

SEND TO:

TEST REPORT WITH SHIPMENT
FOR BOL # 44027

PLATE DIMENSIONS / DESCRIPTION

TOTAL QTY	GAUGE	WIDTH	LENGTH	DESCRIPTION	PIECE WEIGHT
	6"	153"	155"	RECTANGLE	40353#

CUSTOMER INFORMATION

CUSTOMER PO: 53634

SPECIFICATION(S)

THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATION(S).

ASTM A516 YR 90 GR 70
ASME SA516 2001 EDITION GRADE 70
MATERIAL PRODUCED UNDER A CERTIFIED QUALITY MGMT SYSTEM COMPLYING WITH
ISO 9001 ABS-QE CERT. NO. 30130

CHEMICAL COMPOSITION

	C	MN	P	S	CU	SI	NI	CR	NO
MELT:U2395	.24	.93	.008	.009	.25	.19	.12	.07	.05
	V	TI	AL	CB					
MELT:U2395	.002	.002	.022	.001					

MANUFACTURE

MCQUAID-EHN GRAIN SIZE PER E112 - 7-8

MEETS THE REQUIREMENTS ✓

ASME SA516-70 2001 Edition

JR 7-2-04 pg 1 of 2

HEAT TREAT CONDITION

PO 53634

MATL OR TEST	HEAT TREAT DESCRIPTION	NOM TEMP	HOLD MINS	COOL MTHD
PL/TEST	NORMALIZE	1650F	241	AIR COOL

TENSILE PROPERTIES

40945-0000

SLAB NO.	LOC	DIR	STRENGTH PSI X 100	STRENGTH PSI X 100	GAGE LGTH	%
3	BOT.	TRANS.	423	763	2.00"	25.0

WE HEREBY CERTIFY THAT THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

SUPERVISOR - TEST REPORTING
ELINDRE ZAPLITNY

40945-0000

MEETS THE REQUIREMENTS ✓

~~meets~~ + AIME SA-76-70 2001 Ed. 4.

f R 7-9-04. pg 2 of 2

ISS PLATE INC.

TEST CERTIFICATE

PAGE NO: 02 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10271-002
MELT NO: U2395
SLAB NO: 3
DATE: 06/16/04

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
MERCURY OR MERCURY COMPOUNDS ARE NOT USED
IN THE MANUFACTURE OF ISS PRODUCTS.

40945-0000

RECEIVING INSPECTION & MATERIAL VALIDATION—STEEL PLATE

1. Receiving Information:

Purchased by: ATF Supplier: ISC P.O. No. 53634
 Line Item No. 2 AT&F Job NO. 40945 AT&F Heat Code 1A
 Receiver No. 7582 Date Rec'd. 6/18/04 Quantity Rec'd. 1

2. Dimensional Inspection:

Thickness: 6 6 6 6
 (4 corners)
 Width: 154 Length: 153

3. Material Marking or Stamping

Record the following information from Plate Stamping:

(example)

ISC Plate Manufacturer (ELP)
SA516-70 MT Material Spec and Type or Grade (SA516-70-GMT LTV)
 ("G", "MT", "LTV" if applicable)
U2465 Plate Heat Number (402T6511)
2 Plate Slab Number (1)

UT Number (if applicable)

(UT-SA435)

4. Remarks: (e.g. shipping damage, other stamping or noted nonconformance)

Plate conforms to the attached P.O. requirements and the attached Material Test Reports match the Plate Markings.

Inspected by: [Signature] Date 6/24/04 ☒ Accept ☐ Reject

Validated by: [Signature] Date 7-9-04 ☒ Accept ☐ Reject

Code No. QDR S/N

Material Identification & Verification
 (performed at time of fit-up)

1. Item Information:

Mfg. Serial # _____ AT&F Job No. _____ DWG./Item # _____ Rev. No. _____

2. Permanent Stamping Information: (Center of Plate edge 6" from weld or as req'd.)

Plate Manufacturer

Material Spec and Type or Grade
 ("G", "MT", "LTV" if applicable)

Plate Heat No.

Plate Slab No.

UT Number (if applicable)

Mfg. Ser. No. _____ Manufacturers Serial Number

Plate verified to be same as receipt inspected, plate edges visually inspected for laminations and permanent stamping inspected per attached AT&F validated Material Test Report (s)

Verified by: _____ Date _____ Q/C Review: _____ Date _____

AI-Review: _____ Date _____

SP110-2F1 Rev. 1 4/11/02

ISO PLATE INC.

TEST CERTIFICATE

SHIP TO:

AMERICAN TANK & FABR. CO.
12314 ELMWOOD AVE.
DOOR #11
CLEVELAND OH 44111

PAGE NO: 01 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10291-001
MELT NO: U2465 ✓
SLAB NO: 2
DATE: 06/16/04

SOLD TO:

AMERICAN TANK & FAB. CO.
12314 ELMWOOD AVE.
CLEVELAND OH 44111

SEND TO:

TEST REPORT WITH SHIPMENT
FOR BOL # 44025

PLATE DIMENSIONS / DESCRIPTION

TOTAL QTY	GAUGE	WIDTH	LENGTH	DESCRIPTION	PIECE WEIGHT
	6" ✓	154"	153"	RECTANGLE	40093#

CUSTOMER INFORMATION

CUSTOMER PO: 53634

SPECIFICATION(S)

THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATION(S).

ASTM A516 YR 90 GR 70
ASME SA516 2001 EDITION GRADE 70
MATERIAL PRODUCED UNDER A CERTIFIED QUALITY MGMT SYSTEM COMPLYING WITH
ISO 9001 ABS-QE CERT. NO. 30130

CHEMICAL COMPOSITION

	C	MN	P	S	CU	SI	NI	CR	MO
MELT:U2465	.23	.95	.010	.011	.26	.19	.11	.10	.03
	U	TI	AL	CB					
MELT:U2465	.002	.001	.029	.001					

MANUFACTURE

MCQUAID-EHN GRAIN SIZE PER E112 - 7-8

MEETS THE REQUIREMENTS ✓

ASME SA516-70 2001 edition

JR 7-4-04 pg 1042
40945-000

HEAT TREAT CONDITION

MATL OR TEST	HEAT TREAT DESCRIPTION	NOM TEMP	HOLD MINS	COOL MTHD
PL/TEST	NORMALIZE	1650F	180	AIR COOL

PO# 53634

TENSILE PROPERTIES

SLAB NO.	LOC	DIR	YIELD STRENGTH PSI X 100	TENSILE STRENGTH PSI X 100	ELONGATION GAGE LGTH %
2 V	BOT.	TRANS.	423	781	2.00" 23.0

WE HEREBY CERTIFY THAT THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

SUPERVISOR - TEST REPORTING
ELINORE ZAPLITNY

40945-0000

MEETS THE REQUIREMENTS

ASME SA 516.70 - 2001 Ed. 1.1.2

JDR 7-9-04 py 2052

ISG PLATE 1

TEST CERTIFICATE

PAGE NO: 02 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10291-001
MELT NO: U2465
SLAB NO: 2
DATE: 06/16/04

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
MERCURY OR MERCURY COMPOUNDS ARE NOT USED
IN THE MANUFACTURE OF ISG PRODUCTS.

40995 0000

ISG PLATE 1

TEST CERTIFICATE

PAGE NO: 02 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 16291-001
MELT NO: U2465
SLAB NO: 2
DATE: 06/16/04

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
MERCURY OR MERCURY COMPOUNDS ARE NOT USED
IN THE MANUFACTURE OF ISG PRODUCTS.

40945 0000

SLAB NO.	LDC	DIR	YIELD STRENGTH PSI X 100	TENSILE STRENGTH PSI X 100	ELONGATION GAGE LGTH	%
2 ✓	BOT.	TRANS.	423	781	2.00"	23.0

WE HEREBY CERTIFY THAT THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

SUPERVISOR - TEST REPORTING
ELINORE ZAPLITNY

40945-0000

MEETS THE REQUIREMENTS ✓

ASME SA 516-70 - 2001 Ed. Vol 2

JDL 7-9-04 py 2042

ISG PLATE

TEST CERTIFICATE

PAGE NO: 02 OF 02
FILE NO: Q325-01-05
MILL ORDER NO: 10291-001
MELT NO: U2465
SLAB NO: 2
DATE: 06/16/04

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
MERCURY OR MERCURY COMPOUNDS ARE NOT USED
IN THE MANUFACTURE OF ISG PRODUCTS.

40945 0000

RECEIVING INSPECTION & MATERIAL VALIDATION—STEEL PLATE

1. Receiving Information :

Purchased by : ATF Supplier : 15G P.O.No. 53634
 Line Item No. 2 AT&F Job NO. 40945 AT&F Heat Code NA
 Receiver No. 7616 Date Rec'd. 6/23/04 Quantity Rec'd. 1

2. Dimensional Inspection :

Thickness : 6 6 6 6
 (4 corners)
 Width : 154 Length : 153

3. Material Marking or Stamping

Record the following information from Plate Stamping :

(example)

15G Plate Manufacturer (BLP)
SA516-70 MT Material Spec and Type or Grade (SA516-70 GMT LTV)
 (G, MT, LTV if applicable)
U2465 Plate Heat Number (402T6511)
1 Plate Slab Number (1)
 UT Number (if applicable) (UT-SA435)

4. Remarks : (e.g. shipping damage, other stamping or noted nonconformance)

Plate conforms to the attached P.O. requirements and the attached Material Test Reports match the Plate Markings.

Inspected by : [Signature] Date 6/24/04 ☒ Accept ☐ Reject

Validated by : [Signature] Date 7-9-04 ☒ Accept ☐ Reject

Code No. QDR S/N

Material Identification & Verification
 (performed at time of fit-up)

1. Item Information :

Mfg. Serial # _____ AT&F Job No. _____ DWG./ Item # _____ Rev.No. _____

2. Permanent Stamping Information : (Center of Plate edge 6" from weld or as req'd.)

_____ Plate Manufacturer
 _____ Material Spec and Type or Grade
 (G, MT, LTV if applicable)
 _____ Plate Heat No.
 _____ Plate Slab No.
 _____ UT Number (if applicable)

Mfg. Ser. No. _____ Manufacturers Serial Number

Plate verified to be same as receipt inspected, plate edges visually inspected for laminations and permanent stamping inspected per attached AT&F validated Material Test Report (s)

Verified by : _____ Date _____ Q/C Review : _____ Date _____

AI-Review : _____ Date _____

SP110-2F1 Rev.1 4/11/02

ISS PLATE INC.

TEST CERTIFICATE

SHIP TO:

AMERICAN TANK & FABR. CO.
12314 ELMWOOD AVE.
DOOR #11
CLEVELAND OH 44111

PAGE NO: 01 OF 02

FILE NO: 0325-01-05

MILL ORDER NO: 10291-001

MELT NO: U2465

SLAB NO: 1

DATE: 06/21/04

SOLD TO:

AMERICAN TANK & FAB. CO.
12314 ELMWOOD AVE.
CLEVELAND OH 44111

SEND TO:

TEST REPORT WITH SHIPMENT

FOR BOL # 44482

PLATE DIMENSIONS / DESCRIPTION

TOTAL QTY	GAUGE	WIDTH	LENGTH	DESCRIPTION	PIECE WEIGHT
	6"	154"	153"	RECTANGLE	40093#

CUSTOMER INFORMATION

CUSTOMER PO: 53634

SPECIFICATION(S)

THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATION(S).

ASTM A516 YR 90 GR 70

ASME SA516 2001 EDITION GRADE 70

MATERIAL PRODUCED UNDER A CERTIFIED QUALITY MGMT SYSTEM COMPLYING WITH

ISO 9001 ABS-QE CERT. NO. 30130

CHEMICAL COMPOSITION

	C	MN	P	S	CU	SI	NI	CR	MO
MELT:U2465	.23	.95	.010	.011	.26	.19	.11	.10	.03

	V	TI	AL	CB
MELT:U2465	.002	.001	.029	.001

MANUFACTURE

MCQUAID-EHN GRAIN SIZE PER E112 - 7-8

HEAT TREAT CONDITION

MATL OR TEST	HEAT TREAT DESCRIPTION	NOM TEMP	HOLD MINS	COOL MTHD
PL/TEST	NORMALIZE	1650F	180	AIR COOL

MEETS THE REQUIREMENTS ✓

ASME SA516-70 2001 ed./Am

for 7-2-04 PS 10F2

PO# 53634

TENSILE PROPERTIES

SLAB NO.	LOC	DIR	FIELD STRENGTH PSI X 100	LABORATORY STRENGTH PSI X 100	BASE LGTH	%
1	BOT.	TRANS.	885	758	2.00"	27.0

WE HEREBY CERTIFY THAT THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

SUPERVISOR - TEST REPORTING
ELINORE ZAPLITNY

MEETS THE REQUIREMENTS ✓

ASME 5A516-70 2001 Edition

JRL 7-9-04 pg 2 of 2

40945-0000

ISS PLATE INC.

T E S T C E R T I F I C A T E

PAGE NO: 02 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10291-001
MELT NO: U2465
SLAB NO: 1
DATE: 06/21/04

G E N E R A L I N F O R M A T I O N

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
MERCURY OR MERCURY COMPOUNDS ARE NOT USED
IN THE MANUFACTURE OF ISS PRODUCTS.

40945-0000

ISG PLATE INC.

T E S T C E R T I F I C A T E

SHIP TO:
AMERICAN TANK & FABR. CO.
12314 ELMWOOD AVE.
DOOR #11
CLEVELAND OH 44111

PAGE NO: 01 OF 02
FILE NO: 0325-01-
MILL ORDER NO: 10291-00
MELT NO: U2395
SLAB NO: 1A
DATE: 07/16/03

SOLD TO:
AMERICAN TANK & FABR. CO.
12314 ELMWOOD AVE.
CLEVELAND OH 44111

SEND TO:
AMERICAN TANK & FABR. CO.
12314 ELMWOOD AVENUE
ATTN: WAREHOUSE DEPT.
CLEVELAND, OH 44111

P L A T E D I M E N S I O N S / D E S C R I P T I O N

TOTAL QTY	GAUGE	WIDTH	LENGTH	DESCRIPTION	PIECE WEIGHT
1	4"	151"	162"	RECTANGLE	27750#

C U S T O M E R I N F O R M A T I O N

CUSTOMER PO: 53634

S P E C I F I C A T I O N (S)

THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATION(S).

ASTM A516 YR 90 GR 70
ASME SA516 2001 EDITION GRADE 70
MATERIAL PRODUCED UNDER A CERTIFIED QUALITY MGMT SYSTEM COMPLYING WITH
ISO 9001 ABS-QE CERT. NO. 30130

C H E M I C A L C O M P O S I T I O N

MELT:U2395	C	MN	P	S	CU	SI	NI	CR
	.24	.93	.008	.009	.25	.19	.12	.07
MELT:U2395	V	TI	AL	CB				
	.002	.002	.022	.001				

M A N U F A C T U R E

MCQUAID-EHN GRAIN SIZE PER E112 - 7-8

H E A T T R E A T C O N D I T I O N

MATL OR TEST	HEAT TREAT DESCRIPTION	NOM TEMP	HOLD MINS	COOL MTHD
PL/TEST	NORMALIZE	1650F	134	AIR COOL

T E N S I L E P R O P E R T I E S

SLAB NO.	LOC	DIR	YIELD STRENGTH PSI X 100	TENSILE STRENGTH PSI X 100	ELONGATION GAGE LGTH %
1A	BOT.	TRANS.	443	790	2.00" 26.0

WE HEREBY CERTIFY THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

Elinore Zaplitny
SUPERVISOR - TEST REPORTING
ELINORE ZAPLITNY

ISG PLATE INC.

TEST CERTIFICATE

PAGE NO: 02 OF 02
FILE NO: 0325-01-1
MILL ORDER NO: 10291-00:
MELT NO: U2395
SLAB NO: 1A
DATE: 07/16/04

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
MERCURY OR MERCURY COMPOUNDS ARE NOT USED
IN THE MANUFACTURE OF ISG PRODUCTS.

B/L #46938 CUSTOMER'S TRUCK

WE HEREBY CERTIFY THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

Elinore Zaplitny
SUPERVISOR - TEST REPORTING
ELINORE ZAPLITNY

ISG PLATE INC.

TEST CERTIFICATE

SHIP TO:
AMERICAN TANK & FABR. CO.
12314 ELMWOOD AVE.
DOOR #11
CLEVELAND OH 44111

PAGE NO: 01 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10291-003
MELT NO: U2395
SLAB NO: 1B
DATE: 07/21/04

SOLD TO:
AMERICAN TANK & FAB. CO.
12314 ELMWOOD AVE.
CLEVELAND OH 44111

SEND TO:
AMERICAN TANK & FABR. CO.
12314 ELMWOOD AVENUE
ATTN: WAREHOUSE DEPT.
CLEVELAND, OH 44111

03-C

PLATE DIMENSIONS / DESCRIPTION

TOTAL QTY	GAUGE	WIDTH	LENGTH	DESCRIPTION	PIECE WEIGHT
1	4" ✓	151"	162"	RECTANGLE	27750#

CUSTOMER INFORMATION

CUSTOMER PO: 53634

SPECIFICATION(S)

THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATION(S).

ASTM A516 YR 90 GR 70
ASME SA516 2001 EDITION GRADE 70
MATERIAL PRODUCED UNDER A CERTIFIED QUALITY MGMT SYSTEM COMPLYING WITH
ISO 9001 ABS-QE CERT. NO. 30130

CHEMICAL COMPOSITION

MELT:U2395	C	MN	P	S	CU	SI	NI	CR	MO
	.24	.93	.008	.009	.25	.19	.12	.07	.05
MELT:U2395	V	TI	AL	CB					
	.002	.002	.022	.001					

MANUFACTURE

MCQUAID-EHN GRAIN SIZE PER E112 - 7-8

HEAT TREAT CONDITION

MATL OR TEST	HEAT TREAT DESCRIPTION	NOM TEMP	HOLD MINS	COOL MTHD
PL/TEST	NORMALIZE	1650F	133	AIR COOL

TENSILE PROPERTIES

SLAB NO.	LOC	DIR	YIELD STRENGTH PSI X 100	TENSILE STRENGTH PSI X 100	ELONGATION GAGE LGTH	%
1B	BOT.	TRANS.	426	787	2.00"	27.0

WE HEREBY CERTIFY THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

Elinore Zaplitny
SUPERVISOR - TEST REPORTING
ELINORE ZAPLITNY

ISG PLATE INC.

TEST CERTIFICATE

PAGE NO: 02 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10291-003
MELT NO: U2395
SLAB NO: 1B
DATE: 07/21/04

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
MERCURY OR MERCURY COMPOUNDS ARE NOT USED
IN THE MANUFACTURE OF ISG PRODUCTS.

B/L #47375 CUSTOMER'S TRUCK

WE HEREBY CERTIFY THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

Elinore Zaplitny
SUPERVISOR - TEST REPORTING
ELINORE ZAPLITNY

PAGE 1

CERT. #: 00422400

**steel
warehouse**2722 West Tucker Drive
South Bend, In 46624-1377P.O. Box 1377
(574) 236-5100

CERTIFICATE OF ANALYSIS AND TESTS

FOR: AM. TANK & FAB CO.

DATE: 09/15/04

12314 ELMWOOD AVE.

YOUR P/O NUMBER 54275 ✓

CLEVELAND OH 44111

SHIPPER NUMBER 00652848

DOOR 6

OUR INVOICE NUMBER

OUR SALES ORDER 00646710

DESCRIPTION OF MATERIAL AND SPECIFICATIONS

1. HRTPHS 0001 11 0.1120 55.0000 X 372.0000

TCGXL

HEAT # 60515 NAFTA Y BUNDLE # 004035352B

CHEMICAL ANALYSIS

HEAT #	C ✓	MN ✓	P ✓	S ✓	SI ✓	AL	CB	V ✓
1. 60515 ✓	.050	0.800	.012	.002	.020	.020	.001	.056
	CR ✓	CU ✓	MO ✓	NI ✓	NIT	TI	B	
	0.040	0.070	.010	0.030	.0140	.001	.0000	

MECHANICAL PROPERTIES

BUNDLE # NAF	YIELD ✓	TENSILE ✓	ELONGATION % IN 2 IN. ✓	D	MISC
1. 004035352B Y	67500 psi	76150 psi	30	L	
				T	

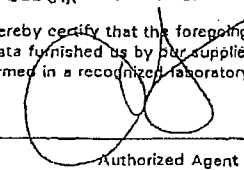
S/N TCGXL
P.O. 54275

Meets The Requirements Of

ASTM A 572-90 TYPE 2 04A

BK 9/20/04

BOUGHT TO STOCK

We hereby certify that the foregoing data is a true copy of
the data furnished us by our supplier or resulting from tests
performed in a recognized laboratory or our laboratory.By 
Authorized Agent

THIS MATERIAL IS IN ACCORDANCE WITH AND CONFORMS TO

A572 -00 GR50 ✓



United States Steel Corporation

Gary Works
Gary, IN 46402

Metallurgical Test Report

ORDER: US51304-01
LOAD: T02438
PO NBR: 051170-00
SOLD TO:

PART:
INVOICE: 154-198163 SHIP DATE: 01/30/02
00 OH
SHIP TO:

THE AMERICAN TANK&FABRICATING CO
12314 ELMWOOD AVE
CLEVELAND OH 44111-5991

THE AMERICAN TANK&FABRICATING CO
12314 ELMWOOD AVE NW
DOOR #5
CLEVELAND OH 44111-5991

SERIAL (HEAT: M27525 I/C: 53W2) STEEL TYPE = CAST REDUCTION RATIO = 11.9 TO 1
84071B00 1.0" X 75.0" X 257.0" 5466LBS 1PC

SPEC: PLATE HIGH STRENGTH LOW ALLOY USS SIXTY-N ASTM A533 REV A 01-JAN-2000 GR E APPROVED
STRUCTURAL QUALITY NORMALIZED PLATE

INSP: 01 MILL INSPECTION PRELIMINARY T/R TO ACCOMPANY SHIPPING PAPERS ALSO T/R TO INDICATE NO
MERCURY CONTENT UPON SHIPMENT FAX T/R TO ATTN: GREG MAZUR AT 216-252-4871 RA/SN ALSO RA/LT
CERTIFY THAT ALL MELTING AND MANUFACTURING TOOK PLACE IN THE USA.

HEAT M27525 MELTED AND MANUFACTURED IN THE USA. FINE GRAIN
C=.20 MN=1.37 P=.016 S=.008 SI=.21 CU=.30 NI=.15 CR=.13 MO=.05 AL=.027 N=.01 V=.09 CB=.001

TRANSVERSE YIELD: 63.0 KSI TENSILE: 84.0 KSI 2" % ELONGATION: 50.0
63000 PSI 84000 PSI 8" % ELONGATION: 25.0

PRODUCT AND TEST SPECIMENS WERE NORMALIZED AT 1660 DEG F. FOR 00 HR 56 MIN. COOLING COMPLETED
IN STILL AIR.

** END OF TEST RESULT DATA **

TEST RESULTS WERE CONDUCTED AND RECORDED IN ACCORDANCE WITH TEST METHODS ACCREDITED BY A2LA.
THIS REPORT SHALL NOT BE REPRODUCED OR ALTERED WITHOUT THE PRIOR WRITTEN APPROVAL OF UNITED
STATES STEEL.
THIS PRODUCT WAS MANUFACTURED IN ACCORDANCE WITH THE QUALITY MANAGEMENT SYSTEM WHICH COMPLIES
WITH ISO 9002:1994.

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MANUFACTURED, TESTED AND/OR INSPECTED
IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECT.
PREP. BY THE OFFICE OF D.M. BORMET, MANAGER, Q.A. BY: *Rubon Anthony* DATE: 2-1-02

*0900

C F

3 0 0 0277450007A BKM

3 1 0

PAGE 1 OF 1



** LOAD TALLY **

PLATES

R O M S O L D T O	PICKUP(S) 32694,	Purchase Order Date 11/19/01	Purchase Order No. 051170-00	
	U. S. STEEL CORP.	Invoice No. 198163	U.S. Steel Order No. UE51304	Page 01
	GARY WORKS GARY, INDIANA 46402	Subject to Section 7 of conditions of Bill of Lading in N.M.F.C. and U.F.C. No recourse clause is exercised. USS Corp. - Consignor		Shipper's No. 154T02438-01
	CHARGE 0277450 SHIP TO 007			
	THE AMERICAN TANK&FABRICATING CO 12314 ELMWOOD AVE CLEVELAND OH 44111-5991	THE AMERICAN TANK&FABRICATING CO 12314 ELMWOOD AVE NW DOOR #5 CLEVELAND OH 44111-5991		

Date Shipped 01/30/02	From GARY, INDIANA	Route / Carrier CAR CAP. 000 CAR TYPE CUSTOMER TRUCK FOR HIRE	9999998
Ship Mode CTH	Minimum Weight 404	00 OH	PPD / COL. COL

IF YOU USE A SHIPPER REFERENCE NBR FOR PYMT, USE 154T02438-01

ORDER ITEM	HEAT	ING	CUT	PC	PLATE#	GAUGE	WIDTH	LENGTH	WEIGHT
ORDERED SIZE	1.0000	75.0000	257.0000						

SPEC: USS SIXTY-N ASTM A633 REV A 01-JAN-2000 GR E APPROVED STRUCTURAL

ST: PT#A633E-1.0000-W--

PT#: A633E-1.0000-W-✓

MARK: STAMP USS HT# SLAB# MT IN 1 PLACE
STEN CUST ORD# & USS EA PLT
STENCIL SIXTY-N STEEL A633 GR E

PACK: OR 1 PC - KEEP SIZES SEP

LOAD: FLATBED TRK - SHEET LIFTER UNLDG - BLOCK - COVER W/TARP
20000 LB ABSOLUTE MAX

B/L COVER WITH TARP

UE51304 01 *BDHBD* METRIC 25.40MM 1905.00MM 6527.80MM 2479KG
M27525 53 W2 1 084071A00 1.000 75.00 257.00 5466#

UE51304 01 *BDHBY* METRIC 25.40MM 1905.00MM 6527.80MM 2479KG
M27525 53 W2 1 084071B00 1.000 75.00 257.00 5466#

Per Controller - Gary Works USS Corp. - Shipper Agent

Permanent Post Office Address of Shipper:
600 Grant Street, Pittsburgh, PA 15219-4776

Per (MONEY)

BETHLEHEM STEEL CORPORATION
QUALITY and PRACTICE DEVELOPMENT
REPORT OF TESTS AND ANALYSES

BETHLEHEM LUKENS PLATE DIVISION

INVENT NO. 803-06934	DATE SHIPPED 3-24-00	CAR OR VEHICLE NO. NS	BN 614279	PAGE 1
-------------------------	-------------------------	--------------------------	--------------	-----------

S	SERIAL NUMBER	PAT. NO.	HEAT NUMBER	NO. PCS.	THICKNESS	WIDTH OR DIA.	LENGTH	WEIGHT	YIELD POINT	TENSILE STRENGTH	ELONG.		RED. %
					INCHES	INCHES	INCHES	POUNDS	PSI	PSI	IN	%	
PRODUCED UNDER A CERTIFIED QMS COMPLYING WITH ISO 9002 ABS-DE CERT. #30477													
QUALITY STEEL MELTED & MANUFACTURED IN THE U. S. A.													
PLATES	ASTM A516-90 GR 70 PVO, ASME SA516												
MFST	GR 70 PVO 1998 EDITION												
	LIFT MAX 15 TON-SIZES & GAUGES SEP UNLOG												
	OH-MAGNET-CHAIN-SLING												
	CO# J.C.R. 2887 GH 365-0653												
	YIELD STRENGTH @ .5% E.U.L.												
S 62195			823L71250	1	1.5	120	240	12252	44200	79500	2	23	
S 62196			823L71250	1	1.5	120	240	12252	46300	79500	2	29	
PLATES	ASTM A 36-96, ASME SA36 1998 EDITION												
MFST	LIFT MAX 15 TON-SIZES & GAUGES SEP UNLOG												
	OH-MAGNET-CHAIN-SLING												
	CO# J.C.R. 2886 GH 365-0654												
			813L70150	1	1	120	480	16335	40400	64200	8	30	
			823L70120	2	1	120	480	32670	40000	66400	8	28	
									41900	67400	8	26	
			823L70130	1	1	120	480	16335	41400	67600	8	27	

Q-QUENCH TEMPERATURE T-TEMPERATURE N-NORMALIZE TEMPERATURE

B DAY Z

SERIAL NUMBER	PAT. NO.	HEAT NUMBER	HARD	BEND	CHARPY IMPACT																		
					THICKNESS INCHES	TYPE	SIZE	DIR.	TEST TEMP. F	ENERGY FT. LBS.			SHEAR (%)			LAT. EXP.			MILES				
											1	2	3	1	2	3	1	2	3				
					The American Tank & Fabricating Co. MEETS THE REQUIREMENTS OF ASTM A516-70 99A																		
					REVIEWED BY: J. Drenth										DATE		8-28-01						

HEAT NUMBER	CHEMICAL ANALYSIS															McQUAD GRAIN SIZE
	C ✓	Mn ✓	P ✓	S ✓	Si ✓	Cu ✓	Ni ✓	Cr ✓	Mo ✓	V ✓	Ti	Al	B ✓	Cb ✓	N	
823L71250	.24	1.10	.012	.007	.253	.019	.01	.03	.005	.002				.002		
813L70150	.14	1.06	.017	.006	.208	.009	.01	.03	.005	.003		.036		.002		
823L70120	.16	1.08	.015	.012	.232	.014	.01	.04	.005	.002				.002		
823L70130	.16	1.09	.015	.012	.224	.010	.01	.04	.005	.004				.002		

I CERTIFY THAT THE ABOVE RESULTS ARE A TRUE AND CORRECT COPY OF ACTUAL RESULTS CONTAINED IN RECORDS MAINTAINED BY BETHLEHEM AND ARE IN FULL COMPLIANCE WITH THE REQUIREMENTS OF THE SPECIFICATION CITED ABOVE. THIS TEST REPORT CANNOT BE ALTERED AND MUST BE TRANSMITTED INTACT WITH ANY SUBSEQUENT THIRD PARTY TEST REPORTS, IF REQUIRED.

SUPV. QUALITY and PRACTICE DEVELOPMENT *[Signature]* PER *[Signature]*



UNITED STATES STEEL CORPORATION

Gary Works
Gary, IN 46402

PRELIMINARY TEST REPORT

CONFIRMING TEST REPORT WILL BE MAILED

ORDER: UE55784-06

PART:

LOAD: T13642

INVOICE: 154 241121

SHIP DATE: 12/05/02

NBR: 52060

VEH ID: 130A

OH 38097

SOLD TO:

SHIP TO:

THE AMERICAN TANK & FABRICATING CO
12314 ELMWOOD AVE
CLEVELAND OH 44111-5991THE AMERICAN TANK & FABRICATING CO
12314 ELMWOOD AVE
DOOR #11
CLEVELAND OH 44111-5991SERIAL HEAT: Y49461 I/C: 54W2 STEEL TYPE = CAST REDUCTION RATIO = 4.0 TO 1
X9108A00 3.0" X 93.0" X 330.0" 1 PC 26111.00 LBSSPEC: PLATE HIGH STRENGTH LOW ALLOY USS SIXTY-N ASTM A633 01-JAN-2001 GR E APPROVED STRUCTURAL
QUALITY NORMALIZED PLATE LCVN IMPACT TEST HEAT LOT FREQ. H LCVN 20 FT-LBS AVG @ +0 F LCVN 15
FT-LBS MIN @ +0 FINSP: 01 MILL INSPECTION TEST REPORT TO INDICATE NO MERCURY CONTENT AND REPORT CB RA/SN ALSO
RA/LT CERTIFY THAT ALL MELTING AND MANUFACTURING TOOK PLACE IN THE USA.HEAT Y49461 MELTED AND MANUFACTURED IN THE USA. FINE GRAIN
C=.18 MN=1.33 P=.015 S=.007 SI=.22 CU=.28 NI=.13 CR=.12 MO=.05 AL=.027 N=.010 V=.11 CB=.001

TRANSVERSE	YIELD:	61.0	KSI	TENSILE:	85.0	KSI	2" % ELONGATION:	23.0
		61000	PSI		85000	PSI		
TRANSVERSE	YIELD:	63.0	KSI	TENSILE:	87.0	KSI	2" % ELONGATION:	32.0
		63000	PSI		87000	PSI		

LONGITUDINAL FL SIZE CHARPY IMPACT V-NOTCH +000 DEG F FT LBS/ 067-074-074
-18 DEG C AVG IMPACT STRENGTH +72 FT LBS
LONGITUDINAL FL SIZE CHARPY IMPACT V-NOTCH +000 DEG F FT LBS/ 098-074-088
-18 DEG C AVG IMPACT STRENGTH +87 FT LBSPRODUCT AND TEST SPECIMENS WERE NORMALIZED AT 1660 DEG F. FOR 02 HR 48 MIN. COOLING COMPLETED
IN STILL AIR.MERCURY OR MERCURY BEARING COMPOUNDS ARE NOT USED IN THE MANUFACTURE OF THIS MATERIAL.
** END OF TEST RESULT DATA **TEST RESULTS WERE CONDUCTED AND RECORDED IN ACCORDANCE WITH TEST METHODS ACCREDITED BY A2LA.
THIS REPORT SHALL NOT BE REPRODUCED OR ALTERED WITHOUT THE PRIOR WRITTEN APPROVAL OF UNITED
STATES STEEL.THIS PRODUCT WAS MANUFACTURED IN ACCORDANCE WITH THE QUALITY MANAGEMENT SYSTEM WHICH COMPLIES
WITH ISO 9002:1994.

BDSUB

The American Tank & Fabricating Co.
MEETS THE REQUIREMENTS OF

ASTM A633 Grade E 00400

REVIEWED BY: JDL DATE 12-12-02

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MANUFACTURED, TESTED AND/OR INSPECTED
IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECT.

PREP. BY THE OFFICE OF D.M. BORMET, MGR, PLATE TECH BY:

DATE:



U.S. Steel Corporation Metallurgical Test Report

Gary Works
Gary, IN 46402

Heat Treat Number M47470

Grade

A516-70

Size

3.0

ORDER: U855761-01

PART:

LOAD: H04202

INVOICE: 154-239192

SHIP DATE: 11/20/02

PO NBR: JCR-3497

VERH ID: EJE 006257

H4202

SOLD TO:

SHIP TO:

SERIAL HEAT: M47470 I/C: 55W1 STEEL TYPE = CAST REDUCTION RATIO = 4.0 TO 1
09170A00 3.0" X 96.0" X 360.0" 1 PC 29404.00 LBS

SPEC: PLATE CARBON ASME SA 516 01-JUL-2001 2001 EDITION 2002 ADDENDA GR 70 APPROVED ASTM A516
01-JAN-2001 GR 70 APPROVED PVQ NORMALIZED PLATE KILLED FINE GRAIN MILL EDGE

INSP: 01 MILL INSPECTION RA/SW ALSO RA/LT CERTIFY THAT ALL MELTING AND MANUFACTURING TOOK PLACE
IN THE USA.

HEAT M47470 MELTED AND MANUFACTURED IN THE USA.

FINE GRAIN

C=.26 MN=.099 P=.017 S=.010 SI=.22 CU=.02 NI=.02 CR=.04 MO=.01 AL=.025 V=.001 TI=.001 CB=.001

TRANSVERSE *YIELD: 44.0 KSI TENSILE: 77.0 KSI 2" % ELONGATION: 29.0
44000 PSI 77000 PSI

TENSILE TEST WAS TAKEN ON INGOT/CUT: 55W 1

PRODUCT AND TEST SPECIMENS WERE NORMALIZED AT 1660 DEG F. FOR 02 HR 48 MIN. COOLING COMPLETED
IN STILL AIR.

- YIELD STRENGTH @ 0.5% E.U.L.

** END OF TEST RESULT DATA **

TEST RESULTS WERE CONDUCTED AND RECORDED IN ACCORDANCE WITH TEST METHODS ACCREDITED BY A2LA.
THIS REPORT SHALL NOT BE REPRODUCED OR ALTERED WITHOUT THE PRIOR WRITTEN APPROVAL OF UNITED
STATES STEEL.

THIS PRODUCT WAS MANUFACTURED IN ACCORDANCE WITH THE QUALITY MANAGEMENT SYSTEM WHICH COMPLIES
WITH ISO 9002:1994.

BDWdx

The American Tank & Fabricating Co.
MEETS THE REQUIREMENTS OF

ASTM A516-70, 03a
REVIEWED BY: *B. Kinn* DATE: 7/17/03

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MANUFACTURED, TESTED AND/OR INSPECTED
IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECT.

PREP. BY THE OFFICE OF D.M. BORMET, MGR, PLATE TECH BY: *John L. Bormet*

DATE: 11/22/02

1611

PCN HNN

1 0 0

0087972002A PXE JAL

1 0 0

PAGE 1 OF 1

Metallurgical Test Report

U.S. DEPARTMENT OF
COMMERCE



GARY WORKS
GARY, INDIANA 46402

A M CASTLE & CO
3400 NORTH WOLF ROAD
FRANKLIN PARK IL 60131-1319

NO. DATE PURCHASE ORDER NO.
11/21/97 01-74317

SAMPLES NO. MILL ORDER NO. INVOICE NO.
704917 04 28 96 UM85692 154-485488
28 YL 37957

THIS IS TO CERTIFY THAT THE
PRODUCT DESCRIBED HEREIN WAS
MFGD., SAMPLED, TESTED AND/OR
INSPECTED IN ACCORDANCE WITH
THE SPECIFICATION AND FUL-
FILLS REQUIREMENTS IN SUCH
RESPECT.

PREPARED BY THE OFFICE OF:
S.C. PAPE GEN. MGR. O.A.

PART NO.: PTX L.A.C. 26135--

** NAFIA CERTIFIED AS NORTH AMERICAN DOMESTIC **

SPEC. A NSP. PLATE CARBON ASTM A516-90 GRADE 70 ASME SA516-1995 EDITION, 96
ADDENDA, DECEMBER 31, 1996 GRADE 70 A M CASTLE AND CO SPEC
R02700-67 REV 5 DATED 8/2/96 PRESSURE VESSEL QUALITY NORMALIZE
BEST FLATNESS TOL 1/2 STD
INSP: 01 MILL RA/SN ALSO RA/LT CERTIFIED T/R WITH LOAD ANALYSIS MERCURY
FREE STATEMENT REQUIRED

ITEM NO.	MATERIAL DESCRIPTION	QUAN- TITY	WEIGHT	HEAT NO.	TEST OR PIECE IDENTITY	YIELD ST.	TENSILE ST.	ELONGATION % IN 2" IN 8"	WELD OF AREA	REMARKS
	MERCURY OR MERCURY BEARING COMPOUNDS ARE NOT USED IN THE MANUFACTURE OF THIS MATERIAL.									
	END OF DATA									

THIS REPORT SHALL NOT BE REPRODUCED WITHOUT THE PRIOR WRITTEN APPROVAL OF THE USA CORPORATION.

HEAT NO.	TYPE	C	MN	P	S	B	CU	N	CR	MO	ZN	AL	N	V	B	TI	CS	CO

END OF DATA

ALL TEST RESULTS WERE CONDUCTED AND RECORDED IN ACCORDANCE WITH TEST METHODS ACCREDITED BY A2LA
MATRIX DECIMAL POSITIONS FOR ELEMENTS ARE INDICATED BY THE LEFT MARGIN, VERTICAL DOTTED LINE OR DECIMAL POINT.

No. 4062 P. 1

80-20-2007-11:48AM

09/15/2004 From: AMERICAN ALLOY STEEL
P.O.# :054337-00
Item :1 (1 PC) 3" X 96" X 60"
:ISG HEAT# U0624 ALREADY APPROVED

To: AMERICAN TANK & FABRICATING
S.O.# :37811-NY
AA PL#:8024766

ISG PLATE INC.

TEST CERTIFICATE

SHIP TO:
AMERICAN ALLOY STEEL INC
C/O B. & R. MARINE SVS
PORT OF GREATER BATON ROUGE
TRACK #791
PORT ALLEN LA 70767

PAGE NO: 01 OF 02
FILE NO: 0284-01-20
MILL ORDER NO: 85476-001
HEAT NO: U0624
SLAB NO: 4
DATE: 04/09/04

SOLD TO:
AMERICAN ALLOY STEEL, INC
P. O. BOX 40469
HOUSTON TX 77240-0469

SEND TO:
AMERICAN ALLOY STEEL, INC
P. O. BOX 40469
ATTN: HOMER GARZA
HOUSTON, TX 77240-0469

02-C

PLATE DIMENSIONS / DESCRIPTION

TOTAL QTY	GAUGE	WIDTH	LENGTH	DESCRIPTION	PIECE WEIGHT
1	3"	96"	480"	RECTANGLE	39205#

CUSTOMER INFORMATION

CUSTOMER PO: 57082-LA

SPECIFICATION(S)

THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATION(S).

API 2H-8TH-EDITION YR 99 GR 50 S1 S3 S4
SUPPL. PARA. S5 & SUPPL. PARA. S12
SPEC MOD FOR PHYSICALS
SPEC MOD FOR CARBON
ASME SA537 99 CLASS 1 MODIFIED TO .04 MAX CB,
ABS PART 2-SECT-1 00 GRS EH36/DH36, ASTM A633
95 GR C AND MIL-S-22698C GR DH36
MATERIAL PRODUCED UNDER A CERTIFIED QUALITY MGMT SYSTEM COMPLYING WITH
ISO 9001 ABS-QE CERT. NO. 30130

Certified a true copy of the
original, retained in our file.
AMERICAN ALLOY STEEL, INC.

065/3104

CHEMICAL COMPOSITION

	C	MN	P	S	CU	SI	NI	CR	MO
MELT:U0624	.14	1.53	.008	.002	.14	.37	.09	.10	.03

	V	TI	B	AL	CB	CA	N	CEF
MELT:U0624	.001	.004	.0004	.041	.031	.002	.0077	.44

CARBON EQUIVALENT FORMULA (CEF)
CEF = C + (MN * .1667) + ((CR + MO + V) * .2000) + ((CU + NI) * .0667)

MANUFACTURE

FINELINE - VACUUM DEGAISED - FINE GRAIN PRACTICE

HEAT TREAT CONDITION

MATL OR TEST	HEAT TREAT DESCRIPTION	NOM TEMP	HOLD MINS	COOL MTHD
PL/TEST	NORMALIZE	1650F	106	AIR COOL



AMERICAN ALLOY
PLATE # 8024766

PA514374

WE HEREBY CERTIFY THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

MEETS THE REQUIREMENTS

Elmore Zaplatny
SUPERVISOR - TEST REPORTING
ELMORE ZAPLATNY

ASTM A633 Grade E 09/10/02
IDA 9-22-04

PO# 54337-
SC# 40445-00

FROM: AMERICAN ALLOY STEEL
P.O.# :054337-00
Item :1 (1 PC) 3" X 96" X 60"
:ISG HEAT# U0624 ALREADY APPROVED

To: AMERICAN TANK & FABRICATING
S.O.# :37811-NY
AA PL#:8024766

ISG PLATE INC.

TEST CERTIFICATE

PAGE NO: 02 OF 02
FILE NO: 0284-01-20
MILL ORDER NO: 85476-001
MELT NO: U0624
SLAB NO: 4
DATE: 04/09/04

TENSILE PROPERTIES

SLAB NO.	LOC	DIR	YIELD STRENGTH PSI X 100	TENSILE STRENGTH PSI X 100	ELONGATION GAGE LGTH	%	%R.A.
4	BOT.	THRU GA.					71.0
4	TOP	THRU GA.					69.0
4	BOT.	TRANS.	559	807	2.00"	30.0	

CHARPY V-NOTCH IMPACT RESULTS

SLAB	LOC	DIR	TEMP	SIZE	FT. LBS.
4	BOT.	TRANS.	-40F	FULL	90 133 135

DROP WEIGHT TESTING

LOC	DIR	SIZE	DEPTH	TEMP	RSLT	TEMP	RSLT
BOT.	LONG.	P3	SURF	-30F	NB	-30F	NB

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
A.B.S. Q.A. CERTIFICATE 00-QA1415-X.
MATERIAL HAS BEEN VACUUM DEGASSED AND CALCIUM TREATED
FOR SULFIDE SHAPE CONTROL.
FINELINE MOD FOR SULPHUR
TEST CERTS. ARE PREPARED IN ACCORD. WITH PROCEDURES
OUTLINED IN DIN 50049 3.1.B/EN 10204 3.1.B.

B/L# 36809 UP 262082
PCM = .25

Certified a true copy of the
original, retained in our file.
AMERICAN ALLOY STEEL, INC.

MEETS THE REQUIREMENTS

AS7m A633 Grade E *py 20F2*
JR 5.22.04

PO# 54337
SO# 40945-00

WE HEREBY CERTIFY THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA. 19320

Elinore Zaplitny
SUPERVISOR - TEST REPORTING
ELINORE ZAPLITNY

WVMP SAR Reference 3-7

West Valley Demonstration Project Waste Characterization
of Vitrification Melter, WVDP-577, Brandjes, C., CH2M Hill-
B&W West Valley, LLC, West Valley, New York,
September 2014.

West Valley Demonstration Project

Doc. ID Number

WVDP-577

Revision Number

0

Revision Date

09/18 /14

WEST VALLEY DEMONSTRATION PROJECT WASTE CHARACTERIZATION OF VITRIFICATION MELTER

Cognizant Author: T. M. Pieczynski

Cognizant Manager: P. M. Sauer

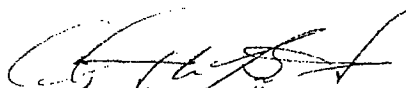


CH2MHILL • B&W West Valley, LLC
10282 Rock Springs Road
West Valley, New York USA 14171-9799

West Valley Demonstration Project Waste Characterization of Vitrification Melter

September 2014

Revision 0

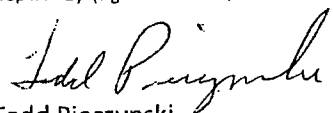


Christopher Brandjes

Prepared By (Signature on File)

09/08/2014

Date



Todd Pieczynski

Prepared By (Signature on File)

09/08/2014

Date

Table of Contents

- 1.0 INTRODUCTION
- 2.0 HISTORY INFORMATION OF WVDP Melter
- 3.0 EXECUTIVE SUMMARY
- 4.0 WASTE CHARACTERIZATION
- 5.0 RESULTS

APPENDICIES

Appendix 1 – Activity Summary

Appendix 2 – Glass Shard Sample Reports (04-0073 and 04-0074)

Appendix 3 – Melter Heel Activity and Decay Correction Calculations (RADCALC)

Appendix 4 – Miscellaneous Pictures of Vitified Glass Contained within Refractory (PNL-3959, Materials and Design Experience in a Slurry-Fed Electric Glass Melter)

Appendix 5 – Melter Refractory Activity and Decay Correction Calculations (RADCALC)

Appendix 6 – Analytical Data for Batch 75

Appendix 7 – RADMAN Waste Stream Report

Appendix 8 – Plugged Discharge Port (Spout) Activity and Decay Correction Calculations (RADCALC)

Appendix 9 – Airborne Sample Analysis from Vitrification Cell

Appendix 10 – Melter Smear Survey Report

Appendix 11 – Radiological Engineering Calculation CALC-2007-048

Appendix 12 – Melter Surface Area Activity and Decay Corrections Calculations (RADCALC)

DRAWINGS

Drawing 1 – Melter Refractory Assembly Drawing

1.0 INTRODUCTION

The purpose of this document is to describe in detail the methodology used and the results of the characterization of the West Valley Demonstration Project (WVDP) molten glass vitrification Melter (Melter).

The information used to characterize the Melter consists of analytical results taken from vitrified glass and slurry samples, Radiation and Contamination Survey Reports, and Melter Refractory Assembly Drawings detailing the construction materials and layout of the Melter.

Section 2 of this report describes the history of the Melter. Section 3 provides an executive summary. Section 4 provides a description of the characterization methods for each of the defined source terms. Section 5 provides the summary of characterization results for all of the combined source terms.

2.0 HISTORICAL INFORMATION

The WVDP molten glass vitrification Melter consists of an electrically heated box structure approximately 10 feet on each side. The outer shell is formed of stainless steel. The interior is lined with a composite of various refractory materials to with-stand high temperatures. The sides and bottom of the outer shell are covered with a cooling water jacket. The Melter is divided into two sections. The main section contains the Melter cavity, which has an overall height of 4.5 feet. The upper part of the cavity is rectangular in shape, with the lower part in the form of an inverted truncated rectangular pyramid. During normal operation, the Melter would accommodate 227 gallons (approximately 30 cubic feet) of slurry. The slurry was heated with three electrodes, one of which served as the floor of the vessel. The discharge section of the Melter contains a primary and a secondary pour chamber, each with spouts and silicon carbide radiant heaters.

During operation, Batches of slurry feed material were transferred from the Melter Feed Hold Tank (MHFT) to the Melter. Inside the Melter, calcined wastes and glass formers were melted and fused into a glass pool where they homogenized. Homogenized molten glass in the Melter was transferred through the discharge section into stainless steel canisters for safe storage. The silicon carbide heaters used in the discharge section of the Melter were expected to have limited service life based on system testing, and two heater assemblies failed during use. Another operating problem was encountered when the primary glass discharge port plugged with glass near the end of vitrification operations. The secondary pour chamber was then utilized to complete vitrification.

In September 2002, after completion of vitrification of primary wastes, the Melter was used to process decontamination solutions, emptied using two evacuated canisters, and shut down. Based on recorded data, approximately 2,200 kg of molten residual glass were removed from the Melter during this process. The residual material which could not be removed by these processes consists of the glass in the plugged discharge port (spout), glass collected in the bottom of the Melter cavity (the heel), and the residual glass material that migrated into the cracks and crevices of the Melter cavity refractory brick and coated the refractory brick during operations.

3.0 EXECUTIVE SUMMARY

The Melter contains four primary source terms consisting of (1) the heel contained within the Melter cavity, (2) residual glass contained within the cracks, crevices and interstitial spacing associated to the refractory brick, (3) the plugged discharge port (spout), and (4) the exterior surface contamination associated to the Melter. Each of these source terms was characterized independently utilizing available historical information, analytical results and swipe sample results. The total activity associated to the Melter is 3,554 Ci (including daughter products). Total fissile (gram) content of the Melter is 81.56 grams. Total number of A2's associated to the Melter is 214.9. Thermal Decay Heat (watts) associated to the Melter is 9.194

WVMP SAR Reference 1-8

West Valley Demonstration Project Waste Characterization
of Vitrification Melter, WVDP-577, Brandjes, C., CH2M Hill-
B&W West Valley, LLC, West Valley, New York, September
2014.

West Valley Demonstration Project

Doc. ID Number	WVDP-577
Revision Number	0
Revision Date	09/18 /14

WEST VALLEY DEMONSTRATION PROJECT WASTE CHARACTERIZATION OF VITRIFICATION MELTER

Cognizant Author: T. M. Pieczynski

Cognizant Manager: P. M. Sauer



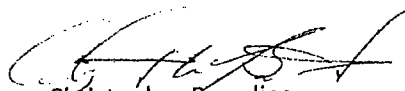
CH2MHILL • B&W West Valley, LLC
10282 Rock Springs Road
West Valley, New York USA 14171-9799

West Valley Demonstration Project

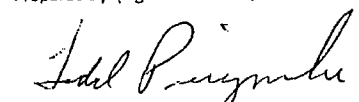
Waste Characterization of Vitrification Melter

September 2014

Revision 0


Christopher Brandjes
Prepared By (Signature on File)

09/08/2014
Date


Todd Pieczynski
Prepared By (Signature on File)

09/08/2014
Date

Table of Contents

- 1.0 INTRODUCTION
- 2.0 HISTORY INFORMATION OF WVDP Melter
- 3.0 EXECUTIVE SUMMARY
- 4.0 WASTE CHARACTERIZATION
- 5.0 RESULTS

APPENDICIES

Appendix 1 – Activity Summary

Appendix 2 – Glass Shard Sample Reports (04-0073 and 04-0074)

Appendix 3 – Melter Heel Activity and Decay Correction Calculations (RADCALC)

Appendix 4 – Miscellaneous Pictures of Vitrified Glass Contained within Refractory (PNL-3959, Materials and Design Experience in a Slurry-Fed Electric Glass Melter)

Appendix 5 – Melter Refractory Activity and Decay Correction Calculations (RADCALC)

Appendix 6 – Analytical Data for Batch 75

Appendix 7 – RADMAN Waste Stream Report

Appendix 8 – Plugged Discharge Port (Spout) Activity and Decay Correction Calculations (RADCALC)

Appendix 9 – Airborne Sample Analysis from Vitrification Cell

Appendix 10 – Melter Smear Survey Report

Appendix 11 – Radiological Engineering Calculation CALC-2007-048

Appendix 12 – Melter Surface Area Activity and Decay Corrections Calculations (RADCALC)

DRAWINGS

Drawing 1 – Melter Refractory Assembly Drawing

1.0 INTRODUCTION

The purpose of this document is to describe in detail the methodology used and the results of the characterization of the West Valley Demonstration Project (WVDP) molten glass vitrification Melter (Melter).

The information used to characterize the Melter consists of analytical results taken from vitrified glass and slurry samples, Radiation and Contamination Survey Reports, and Melter Refractory Assembly Drawings detailing the construction materials and layout of the Melter.

Section 2 of this report describes the history of the Melter. Section 3 provides an executive summary. Section 4 provides a description of the characterization methods for each of the defined source terms. Section 5 provides the summary of characterization results for all of the combined source terms.

2.0 HISTORICAL INFORMATION

The WVDP molten glass vitrification Melter consists of an electrically heated box structure approximately 10 feet on each side. The outer shell is formed of stainless steel. The interior is lined with a composite of various refractory materials to with-stand high temperatures. The sides and bottom of the outer shell are covered with a cooling water jacket. The Melter is divided into two sections. The main section contains the Melter cavity, which has an overall height of 4.5 feet. The upper part of the cavity is rectangular in shape, with the lower part in the form of an inverted truncated rectangular pyramid. During normal operation, the Melter would accommodate 227 gallons (approximately 30 cubic feet) of slurry. The slurry was heated with three electrodes, one of which served as the floor of the vessel. The discharge section of the Melter contains a primary and a secondary pour chamber, each with spouts and silicon carbide radiant heaters.

During operation, Batches of slurry feed material were transferred from the Melter Feed Hold Tank (MHFT) to the Melter. Inside the Melter, calcined wastes and glass formers were melted and fused into a glass pool where they homogenized. Homogenized molten glass in the Melter was transferred through the discharge section into stainless steel canisters for safe storage. The silicon carbide heaters used in the discharge section of the Melter were expected to have limited service life based on system testing, and two heater assemblies failed during use. Another operating problem was encountered when the primary glass discharge port plugged with glass near the end of vitrification operations. The secondary pour chamber was then utilized to complete vitrification.

In September 2002, after completion of vitrification of primary wastes, the Melter was used to process decontamination solutions, emptied using two evacuated canisters, and shut down. Based on recorded data, approximately 2,200 kg of molten residual glass were removed from the Melter during this process. The residual material which could not be removed by these processes consists of the glass in the plugged discharge port (spout), glass collected in the bottom of the Melter cavity (the heel), and the residual glass material that migrated into the cracks and crevices of the Melter cavity refractory brick and coated the refractory brick during operations.

3.0 EXECUTIVE SUMMARY

The Melter contains four primary source terms consisting of (1) the heel contained within the Melter cavity, (2) residual glass contained within the cracks, crevices and interstitial spacing associated to the refractory brick, (3) the plugged discharge port (spout), and (4) the exterior surface contamination associated to the Melter. Each of these source terms was characterized independently utilizing available historical information, analytical results and swipe sample results. The total activity associated to the Melter is 3,554 Ci (including daughter products). Total fissile (gram) content of the Melter is 81.56 grams. Total number of A2's associated to the Melter is 214.9. Thermal Decay Heat (watts) associated to the Melter is 9.194

Primary isotopes of concern consist of Cs-137 (Ba-137m) and Sr-90 (Y-90) contributing greater than 99.8% of the total activity associated to the Melter. Other nuclides of concern include actinides, fission products, activation products and all associated daughter products with a total contribution to total activity to be less than 0.2%. APPENDIX 1 gives a breakdown of the total activity by source term, quantity of fissile material by source term and activity of primary isotopes by source terms. Section 4 contains identifies the characterization methodology, activity calculations and decay correction (RadCalc calculation) sheets for each of the individual source terms.

In characterizing the Melter, a conservative approach was taken to ensure that the isotopic distribution and associated activity was bounded. Decay correction was incorporated in the final activity reports.

4.0 WASTE CHARACTERIZATION

The Melter was characterized utilizing analytical data associated to the waste materials that were processed through it, swipe samples within the vitrification cell and swipe samples of the Melter. Representative samples are used to determine Cs-137 and Sr-90 based scaling factors for calculating the hard to detect nuclides.

The radioactivity associated with the Melter is contained in four separate source terms. The first source term is contained within the Melter cavity, consisting of a heel that was produced during the processing of the decontamination solutions used for flushing the remaining residual waste from the Melter Feed Hold Tank (MFHT) and Concentrator Feed Make-Up Tank (CFMT). Once the flushing of the two tanks was complete, the rinseate was sent to the Melter for vitrification. Based on recorded data, approximately 2,200 kg of molten residual glass was removed from the Melter using two evacuated canister assemblies, leaving 300 kg of residual glass to comprise the heel.

The second source term is comprised of all the residual glass contained within the cracks, crevices and interstitial spacing between all of the refractory brick within the Melter cavity. The activity associated with this source term was derived by evaluating all of the different Batches of material that was processed through the Melter and applying it to a very conservative volume of material based on the actual volume of refractory brick. Total calculated mass of residual glass associated to the refractory brick material is 68.2 kg.

The third source term is comprised of the material that is contained within the plugged discharge port (Spout) and associated structures. During the processing of Batch 75, the discharge port became plugged. The volume of material associated to the plugged discharge port consists of material contained within the spout and pour chamber. The spout and pour chamber consists of 2,325 cubic inches of vitrified glass weighing 99.0 kg.

The fourth source term is comprised of activity associated to the surface contamination of the exterior Melter body and components. Based on measurements associated with the Melter

Refractory Assembly drawings, the exterior Melter body and components consist of a total surface area of 522,261.6 cm². By using the maximum result from swipe samples taken from the exterior of the Melter body and applying a conservative wiping efficiency, a bounding total removable activity associated to the exterior of the Melter was determined to be 14.36 Ci.

4.1 Melter Heel Characterization

The Melter heel consists of 300 kg of residual glass contained within the lower body of the Melter cavity. The heel was produced during the processing of the decontamination solutions used for flushing the remaining residual waste from the Melter Feed Hold Tank (MFHT) and Concentrator Feed Make-Up Tank (CFMT). Once the flushing of the two tanks was complete, the rinseate was sent to the Melter for vitrification. Based on recorded data, approximately 2,200 kg of molten residual glass was removed from the Melter using two evacuated canister assemblies, leaving 300 kg of residual glass to comprise the heel.

For determining the isotopic distribution and associated activities related to the Melter heel, analytical data from glass shard samples taken from the Evacuated Canisters was utilized (containers MV-997 and MV-998). For analysis, each of the glass shard samples were split into three separate samples and analyzed (See APPENDIX 2 for Shard Sample Analysis – Sample 04-0073 (#1, #2, #3) and Sample 04-0074 (#1, #2, #3)). In calculating the total activity for the heel, for each isotope, an average of all six sample results (uCi/g) was used and multiplied by the 300 kg of vitrified glass that comprised the heel (see APPENDIX 3 for Melter Heel Activity Calculations). In order to derive a more accurate activity, the isotopic activity was decayed from 7/18/2002 to 9/02/2014 (original expected shipment date).

The total activity associated to the Melter heel (decayed corrected) is 1.117E+03 Ci (including all daughter products) with 29.23 grams of fissile material. Melter heel contains 63.15 A2's with a Thermal Decay Heat of 2.834 W.

4.2 Residual Glass Contained within Refractory Brick Characterization

During the course of six years of vitrification, molten glass would seep into cracks, crevices and interstitial spacing between and within the pieces of refractory brick. Based on the Melter Refractory Assembly Drawings PNL-011-01 through -018 (DRAWING 1), the volume of refractory brick contained within the Melter cavity is 92.7 ft³, being comprised of two types: Monofrax Refractory (61.88 ft³) and Zirmul Refractory (30.82 ft³). For the purposes of determining the total volume of residual glass contained within the cracks, crevices and interstitial spacing, a conservative estimate of 1% of the total volume of refractory brick was applied. This estimate was based on the cross sectioning samples (APPENDIX 4) that were taken of similar refractory material and video taken of inside of the Melter cavity.

For determining the isotopic distribution and associated activities, the average geometric mean for all of the samples taken from Batches 6 through 77 were used. Analytical results from Batches 6 through 69 were analyzed for Cs-137 and Sr-90 (predominant isotopes in waste

matrix). Analytical results for Batches 70 through 77 included actinides, fission products and activation products. For Batches 6 through 69, the actinides and activation products were scaled in based on the Sr-90 contribution in relation to the geometric mean for Batches 70-77.

As previously stated, the total volume of refractory contained within the Melter is 92.7 ft³. The total volume of residual glass, based on the conservative estimate of 1% of the total volume of refractory, is 0.927 ft³. With the glass matrix having a specific gravity of 2.6 g/cc, the total mass of residual glass contained within the cracks, crevices and interstitial spacing is 68.2 kg. By applying the geometric mean of the batched material that was processed through the Melter, the total activity associated to this source term (decay corrected) is 630 Ci (including all daughter products). The refractory contains 67.13 A2's with a Thermal Decay Heat of 1.768 W. The residual glass contained within the refractory contains 32.68 g of fissile material. APPENDIX 5 identifies the original activity calculations and RADCALC decay corrected calculations, glass volume and mass calculations, and volume and mass calculations for the refractory brick.

4.3 Plugged Discharge Port (Spout) Characterization

During the processing of Batch 75, Canister 266, the west discharge port of the melter became clogged (plugged) and unusable. For the purposes of characterization of this source term, the plugged discharge port and associated area is presumed to be completely full. Based on the Melter Refractory Assembly drawings (Drawing 1) the plugged discharge port and associated area consists of a volume of 2,325 cubic inches containing 99 kg of vitrified glass. The plugged discharge port and associated area consist of the pour spout and pour chamber.

For the purposes of determining the isotopic distribution and associated activity, sample data from Batch 75 Canister 266 was used (APPENDIX 6). The Cs-137 and Sr-90 values came directly from the Canister 266 glass shard analytical results. The actinides, remaining fission and activation products were scaled using Radman Waste Stream from the Heel material (APPENDIX 7). By applying analytical results of Batch 75, Canister 266 material that was processed through the Melter and applying the scaling factors identified in Heel material, the total activity associated to this source term (decay corrected) is 1,793 Ci (including all daughter products) with 18.99 g of fissile material. The plugged discharge port contains 82.44 A2's and generates 4.551 W of thermal Decay Heat. APPENDIX 8 contains the activity and RADCALC calculations identifying the decay corrected activity of this material from 9/02/2014.

4.4 Melter Exterior Surface Contamination Characterization

The final source term associated to the Melter is the exterior shell and associated components (i.e. electrodes, passive feed nozzle, airlift, etc.). The external Melter surface contamination was determined by calculating the total activity bases on swipe samples taken on the exterior surface of the Melter and multiplying it by the total surface area of the Melter. A conservative isotopic distribution consisting of the airborne sample analysis from the contaminated vitrification cell (see APPENDIX 9) and the isotopic distribution associated with the refractory was utilized to bound the isotopic activity.

Based on the Melter Refractory Assembly drawing (DRAWING 1), the surface area of the Melter was calculated to be 80,950.7 in² (522,261.6 cm²) with the body of the Melter having a surface area of 79,537.02 in² (513,141.01 cm²) and the associated components having a surface area of 1,413.7 in² (9,120.6 cm²).

The isotopic distribution for the Melter surface contamination was derived by utilizing the distribution associated with the Vitrification Airborne sample results in combination with the isotopic distribution associated with the refractory brick contained within the Melter. A comparison of both isotopic distributions and percent abundance was completed. All of the isotopes associated with each distribution were included in the final distribution. The most conservative percent abundance was used when both distributions contained the same isotope. When only one of the distributions contained an isotope, that isotope was included to the final distribution with its corresponding percent abundance.

In April of 2004, three smear samples were taken on the Melter body (see APPENDIX 10 – Rad Survey Report 124255). Contact dose rate reading of these smear samples were reported as 2R/hr, 2R/hr and 6R/hr. Each smear sample was taken over a 100 cm² surface area. Due to the small sample population the most conservative results (6R/hr) was applied to the entire surface area of the container. In accordance with Radiological Engineering Calculation CALC-2007-48 (APPENDIX 11), 1 mR/hr is equal to approximately 67,000 dpm B⁻ / Y. To ensure that the total removable activity associated to the exterior of the Melter has been accounted for, a smear wiping efficiency factor of 10% was included. Based on this information, the total removable activity associated to the exterior surface of the Melter is (decay corrected) 14.36 Ci (including all daughter products) with 0.66 g of fissile material (see APPENDIX 12) with a concentration of 27.50 uCi/cm². The Melter exterior surface activity contains 2.136 A2's and produces a thermal Decay Heat of 0.041 W.

5.0 RESULTS

Based on the results of this characterization analysis, the Melter contains a total activity of 3,554 Ci (including all daughter products) with Cs-137 (Ba-137m) contributing 3,143 Ci (88.425%) and Sr-90 (Y-90) contributing 407.1 Ci (11.453%). 99.6% of the total activity associated with the Melter is contained within the Melter cavity in the form of residual glass contained within the refractory brick, heel and plugged discharge consisting of 3,540 Ci. The total surface contamination activity associated to the Melter is 14.36 Ci. The activity from surface contamination represents approximately 0.404% of the total activity at a concentration of 27.50 uCi/cm². The Melter contains 2.149E+02 A2's and generates 9.194 watts (decay heat).

APPENDIX 1

Activity Summary

APPENDIX 1 - Activity Summary

Activity Breakdown by Source Term					
Source Term	Total Act (Ci)	Fissile Mass (g)	A2's	Decay Heat (W)	% of Total Activity
Exterior Contamination (decay corrected)	1.436E+01	6.569E-01	2.136E+00	4.054E-02	0.404%
Melter Spout (decay corrected)	1.793E+03	1.899E+01	8.244E+01	4.551E+00	50.445%
Refractory (decay corrected)	6.300E+02	3.268E+01	6.713E+01	1.768E+00	17.725%
Melter Heel (decay corrected)	1.117E+03	2.923E+01	6.315E+01	2.834E+00	31.426%
Totals	3.554E+03	8.156E+01	2.149E+02	9.194E+00	100.000%

Activity Associated to Primary Isotopes						
	Exterior Surface	Spout	Refractory	Heel	Totals	
	Act (Ci)	Act (Ci)	Act (Ci)	Act (Ci)	Act (Ci)	% of Total Act
Cs-137	5.062E+00	8.566E+02	2.132E+02	5.419E+02	1.617E+03	45.487%
Ba-137m	4.778E+00	8.086E+02	2.012E+02	5.116E+02	1.526E+03	42.938%
Sr-90	2.213E+00	6.332E+01	1.068E+02	3.120E+01	2.035E+02	5.726%
Y-90	2.213E+00	6.333E+01	1.068E+02	3.121E+01	2.036E+02	5.727%
Total Activity of Primary Isotopes						99.878%
Remaining Activity						0.122%

APPENDIX 2

Glass Shard Sample Report (04-0073 & 04-0074)

APPENDIX 2

Sample Report

Report Date : 5/22/2014

Revision Date : 03/10/2004

User Sample ID: 04-0073#1

Description: SHD-VV-997-02,03

Activity Units: uCi/gm

Sample Date: 09/16/2002

Nuclide	Activity	LLD	%Abundance	Scaling Nuclide	Scaling Factor
Cm-243	8.340E-03	False	0.000 %	Cs-137	3.808E-06
Cm-244	2.180E-01	False	0.009 %	Cs-137	9.954E-05
Mn-54	8.120E-02	False	0.003 %	Cs-137	3.708E-05
Co-60	4.040E-02	False	0.002 %	Cs-137	1.845E-05
Ni-63	4.840E-01	False	0.021 %	Cs-137	2.210E-04
Sr-90	1.270E+02	False	5.469 %	Cs-137	5.799E-02
Tc-99	9.670E-03	False	0.000 %	Cs-137	4.416E-06
Cs-137	2.190E+03	False	94.307 %	N/A	N/A
Eu-154	6.560E-01	False	0.028 %	Cs-137	2.995E-04
Th-228	2.940E-02	False	0.001 %	Cs-137	1.342E-05
Th-230	2.100E-04	False	0.000 %	Cs-137	9.589E-08
Th-232	2.450E-04	False	0.000 %	Cs-137	1.119E-07
U-232	2.660E-02	False	0.001 %	Cs-137	1.215E-05
U-233	1.080E-02	False	0.000 %	Cs-137	4.932E-06
U-234	5.170E-03	False	0.000 %	Cs-137	2.361E-06
U-235	2.120E-04	False	0.000 %	Cs-137	9.680E-08
U-236	6.350E-04	False	0.000 %	Cs-137	2.900E-07
U-238	1.150E-03	False	0.000 %	Cs-137	5.251E-07
Np-237	3.850E-03	False	0.000 %	Cs-137	1.758E-06
Pu-238	3.340E-01	False	0.014 %	Cs-137	1.525E-04
Pu-239	7.650E-02	False	0.003 %	Cs-137	3.493E-05
Pu-240	5.850E-02	False	0.003 %	Cs-137	2.671E-05
Pu-241	1.540E+00	False	0.066 %	Cs-137	7.032E-04
Am-241	1.490E+00	False	0.064 %	Cs-137	6.804E-04
Am-243	1.470E-02	False	0.001 %	Cs-137	6.712E-06
Cm-242	1.020E-01	False	0.004 %	Cs-137	4.658E-05

Sample Report

Report Date : 5/22/2014

Revision Date : 03/10/2004

User Sample ID: 04-0073#2

Description: SHD-WV-997-02,03

Activity Units: uCi/gm

Sample Date: 09/16/2002

Nuclide	Activity	LLD	%Abundance	Scaling Nuclide	Scaling Factor
K-40	4.440E-02	False	0.002 %	Cs-137	1.965E-05
Ni-63	5.480E-01	False	0.023 %	Cs-137	2.425E-04
Sr-90	1.300E+02	False	5.396 %	Cs-137	5.752E-02
Zr-95	1.370E+01	False	0.569 %	Cs-137	6.062E-03
Tc-99	9.420E-03	False	0.000 %	Cs-137	4.168E-06
Cs-137	2.260E+03	False	93.816 %	N/A	N/A
Eu-154	5.940E-01	False	0.025 %	Cs-137	2.628E-04
Th-228	2.720E-02	False	0.001 %	Cs-137	1.204E-05
Th-230	1.940E-04	False	0.000 %	Cs-137	8.584E-08
Th-232	1.880E-04	False	0.000 %	Cs-137	8.319E-08
U-232	2.620E-02	False	0.001 %	Cs-137	1.159E-05
U-233	1.060E-02	False	0.000 %	Cs-137	4.690E-06
U-234	5.070E-03	False	0.000 %	Cs-137	2.243E-06
U-235	1.840E-04	False	0.000 %	Cs-137	8.142E-08
U-236	5.510E-04	False	0.000 %	Cs-137	2.438E-07
U-238	1.200E-03	False	0.000 %	Cs-137	5.310E-07
Np-237	2.680E-03	False	0.000 %	Cs-137	1.186E-06
Pu-238	3.520E-01	False	0.015 %	Cs-137	1.558E-04
Pu-239	8.050E-02	False	0.003 %	Cs-137	3.562E-05
Pu-240	6.150E-02	False	0.003 %	Cs-137	2.721E-05
Pu-241	1.650E+00	False	0.068 %	Cs-137	7.301E-04
Am-241	1.510E+00	False	0.063 %	Cs-137	6.681E-04
Am-243	1.490E-02	False	0.001 %	Cs-137	6.593E-06
Cm-242	1.050E-01	False	0.004 %	Cs-137	4.646E-05
Cm-243	8.450E-03	False	0.000 %	Cs-137	3.739E-06
Cm-244	2.210E-01	False	0.009 %	Cs-137	9.779E-05

Sample Report

Report Date : 5/22/2014

Revision Date : 03/10/2004

User Sample ID: 04-0073#3

Description: SHD-WV-997-02,03

Activity Units: uCi/gm

Sample Date: 09/16/2002

Nuclide	Activity	LLD	%Abundance	Scaling Nuclide	Scaling Factor
Ni-63	5.140E-01	False	0.020 %	Cs-137	2.089E-04
Sr-90	1.250E+02	False	4.826 %	Cs-137	5.081E-02
Tc-99	9.860E-03	False	0.000 %	Cs-137	4.008E-06
Cs-137	2.460E+03	False	94.976 %	N/A	N/A
Eu-154	5.510E-01	False	0.021 %	Cs-137	2.240E-04
Th-228	3.120E-02	False	0.001 %	Cs-137	1.268E-05
Th-230	2.230E-04	False	0.000 %	Cs-137	9.065E-08
Th-232	1.610E-04	False	0.000 %	Cs-137	6.545E-08
U-232	2.830E-02	False	0.001 %	Cs-137	1.150E-05
U-233	1.150E-02	False	0.000 %	Cs-137	4.675E-06
U-234	5.490E-03	False	0.000 %	Cs-137	2.232E-06
U-235	1.980E-04	False	0.000 %	Cs-137	8.049E-08
U-236	5.950E-04	False	0.000 %	Cs-137	2.419E-07
U-238	8.780E-04	False	0.000 %	Cs-137	3.569E-07
Pu-238	3.540E-01	False	0.014 %	Cs-137	1.439E-04
Pu-239	8.160E-02	False	0.003 %	Cs-137	3.317E-05
Pu-240	6.240E-02	False	0.002 %	Cs-137	2.537E-05
Pu-241	1.660E+00	False	0.064 %	Cs-137	6.748E-04
Am-241	1.480E+00	False	0.057 %	Cs-137	6.016E-04
Am-243	1.460E-02	False	0.001 %	Cs-137	5.935E-06
Cm-242	1.020E-01	False	0.004 %	Cs-137	4.146E-05
Cm-243	8.270E-03	False	0.000 %	Cs-137	3.362E-06
Cm-244	2.160E-01	False	0.008 %	Cs-137	8.780E-05

Sample Report

Report Date : 5/22/2014

Revision Date : 03/04/2004

User Sample ID: 04-0074#1

Description: SHD-WV-998-01,02

Activity Units: uCi/gm

Sample Date: 09/20/2002

Nuclide	Activity	LLD	%Abundance	Scaling Nuclide	Scaling Factor
Ni-63	6.140E-01	False	0.023 %	Cs-137	2.486E-04
Sr-90	1.790E+02	False	6.738 %	Cs-137	7.247E-02
Tc-99	3.690E-03	False	0.000 %	Cs-137	1.494E-06
Cs-137	2.470E+03	False	92.982 %	N/A	N/A
Eu-154	9.570E-01	False	0.036 %	Cs-137	3.874E-04
Th-228	3.570E-02	False	0.001 %	Cs-137	1.445E-05
Th-230	2.410E-04	False	0.000 %	Cs-137	9.757E-08
Th-232	3.230E-04	False	0.000 %	Cs-137	1.308E-07
U-232	2.980E-02	False	0.001 %	Cs-137	1.206E-05
U-233	1.220E-02	False	0.000 %	Cs-137	4.939E-06
U-234	5.810E-03	False	0.000 %	Cs-137	2.352E-06
U-235	2.260E-04	False	0.000 %	Cs-137	9.150E-08
U-236	6.790E-04	False	0.000 %	Cs-137	2.749E-07
U-238	1.470E-03	False	0.000 %	Cs-137	5.951E-07
Pu-238	4.900E-01	False	0.018 %	Cs-137	1.984E-04
Pu-239	1.120E-01	False	0.004 %	Cs-137	4.534E-05
Pu-240	8.570E-02	False	0.003 %	Cs-137	3.470E-05
Pu-241	2.290E+00	False	0.086 %	Cs-137	9.271E-04
Am-241	2.220E+00	False	0.084 %	Cs-137	8.988E-04
Am-243	3.070E-02	False	0.001 %	Cs-137	1.243E-05
Cm-242	1.780E-01	False	0.007 %	Cs-137	7.206E-05
Cm-243	1.320E-02	False	0.000 %	Cs-137	5.344E-06
Cm-244	3.450E-01	False	0.013 %	Cs-137	1.397E-04

Sample Report

Report Date : 5/22/2014

Revision Date : 03/04/2004

User Sample ID: 04-0074#2

Description: SHD-WV-998-01,02

Activity Units: uCi/gm

Sample Date: 09/20/2002

Nuclide	Activity	LLD	%Abundance	Scaling Nuclide	Scaling Factor
Co-60	6.060E-02	False	0.002 %	Cs-137	2.424E-05
Ni-63	5.750E-01	False	0.022 %	Cs-137	2.300E-04
Sr-90	1.650E+02	False	6.176 %	Cs-137	6.600E-02
Tc-99	3.920E-03	False	0.000 %	Cs-137	1.568E-06
Cs-137	2.500E+03	False	93.570 %	N/A	N/A
Eu-154	9.400E-01	False	0.035 %	Cs-137	3.760E-04
Th-228	3.010E-02	False	0.001 %	Cs-137	1.204E-05
Th-230	2.040E-04	False	0.000 %	Cs-137	8.160E-08
Th-232	2.620E-04	False	0.000 %	Cs-137	1.048E-07
U-232	2.920E-02	False	0.001 %	Cs-137	1.168E-05
U-233	1.190E-02	False	0.000 %	Cs-137	4.760E-06
U-234	5.680E-03	False	0.000 %	Cs-137	2.272E-06
U-235	2.220E-04	False	0.000 %	Cs-137	8.880E-08
U-236	6.650E-04	False	0.000 %	Cs-137	2.660E-07
U-238	1.700E-03	False	0.000 %	Cs-137	6.800E-07
Np-237	4.420E-03	False	0.000 %	Cs-137	1.768E-06
Pu-238	4.390E-01	False	0.016 %	Cs-137	1.756E-04
Pu-239	1.010E-01	False	0.004 %	Cs-137	4.040E-05
Pu-240	7.750E-02	False	0.003 %	Cs-137	3.100E-05
Pu-241	2.080E+00	False	0.078 %	Cs-137	8.320E-04
Am-241	1.970E+00	False	0.074 %	Cs-137	7.880E-04
Am-243	2.720E-02	False	0.001 %	Cs-137	1.088E-05
Cm-242	1.380E-01	False	0.005 %	Cs-137	5.520E-05
Cm-243	1.140E-02	False	0.000 %	Cs-137	4.560E-06
Cm-244	2.980E-01	False	0.011 %	Cs-137	1.192E-04

Sample Report

Report Date : 5/22/2014

Revision Date : 03/10/2004

User Sample ID: 04-0074#3

Description: SHD-VV-998-01,02

Activity Units: uCi/gm

Sample Date: 09/20/2002

Nuclide	Activity	LLD	%Abundance	Scaling Nuclide	Scaling Factor
C-14	1.150E-02	False	0.000 %	Cs-137	4.792E-06
Ni-63	5.740E-01	False	0.023 %	Cs-137	2.392E-04
Sr-90	1.050E+02	False	4.184 %	Cs-137	4.375E-02
Tc-99	3.590E-03	False	0.000 %	Cs-137	1.496E-06
Cs-137	2.400E+03	False	95.631 %	N/A	N/A
Eu-154	5.660E-01	False	0.023 %	Cs-137	2.358E-04
Th-228	1.980E-02	False	0.001 %	Cs-137	8.250E-06
Th-230	1.340E-04	False	0.000 %	Cs-137	5.583E-08
Th-232	1.690E-04	False	0.000 %	Cs-137	7.042E-08
U-232	2.450E-02	False	0.001 %	Cs-137	1.021E-05
U-233	1.000E-02	False	0.000 %	Cs-137	4.167E-06
U-234	4.780E-03	False	0.000 %	Cs-137	1.992E-06
U-235	1.860E-04	False	0.000 %	Cs-137	7.750E-08
U-236	5.580E-04	False	0.000 %	Cs-137	2.325E-07
U-238	1.090E-03	False	0.000 %	Cs-137	4.542E-07
Np-237	2.800E-03	False	0.000 %	Cs-137	1.167E-06
Pu-238	3.010E-01	False	0.012 %	Cs-137	1.254E-04
Pu-239	7.090E-02	False	0.003 %	Cs-137	2.954E-05
Pu-240	5.410E-02	False	0.002 %	Cs-137	2.254E-05
Pu-241	1.430E+00	False	0.057 %	Cs-137	5.958E-04
Am-241	1.270E+00	False	0.051 %	Cs-137	5.292E-04
Am-243	1.750E-03	False	0.000 %	Cs-137	7.292E-07
Cm-242	9.120E-02	False	0.004 %	Cs-137	3.800E-05
Cm-243	7.270E-03	False	0.000 %	Cs-137	3.029E-06
Cm-244	1.900E-01	False	0.008 %	Cs-137	7.917E-05

APPENDIX 3

Melter Heel Activity and Decay Correction Calculations (RADCALC)

APPENDIX 3 - MELTER Heel Activity Calculations

	04-0074#3	04-0073#1	04-0073#2	04-0073#3	04-0074#1	04-0074#2	Average	300000	grams
Nuclide	Activity (uCi/g)	Activity (uCi/g)	Activity (uCi/g)	Activity (uCi/g)	Activity (uCi/g)	Activity (uCi/g)	Activity (uCi/g)	Total Act (uCi)	Total Act (Ci)
Am-241	1.27E+00	1.49E+00	1.51E+00	1.48E+00	2.22E+00	1.97E+00	1.66E+00	4.97E+05	4.97E-01
Am-243	1.75E-02	1.47E-02	1.49E-02	1.46E-02	3.07E-02	2.72E-02	1.99E-02	5.98E+03	5.98E-03
C-14	1.15E-02	1.06E-02	1.10E-02	1.19E-02	1.22E-02	1.22E-02	1.16E-02	3.47E+03	3.47E-03
Cm-242	9.12E-02	1.02E-01	1.05E-01	1.02E-01	1.78E-01	1.38E-01	1.19E-01	3.58E+04	3.58E-02
Cm-243	7.27E-03	8.34E-03	8.45E-03	8.27E-03	1.32E-02	1.14E-02	9.49E-03	2.85E+03	2.85E-03
Cm-244	1.90E-01	2.18E-01	2.21E-01	2.16E-01	3.45E-01	2.98E-01	2.48E-01	7.44E+04	7.44E-02
Co-60	5.02E-02	4.04E-02	4.82E-02	5.18E-02	5.32E-02	6.06E-02	5.07E-02	1.52E+04	1.52E-02
Cs-137	2.40E+03	2.19E+03	2.26E+03	2.46E+03	2.47E+03	2.50E+03	2.38E+03	7.14E+08	7.14E+02
Eu-154	5.66E-01	6.56E-01	5.94E-01	5.51E-01	9.57E-01	9.40E-01	7.11E-01	2.13E+05	2.13E-01
K-40	5.02E-02	4.64E-02	4.44E-02	5.18E-02	5.32E-02	5.34E-02	4.99E-02	1.50E+04	1.50E-02
Mn-54	7.53E-02	8.12E-02	7.23E-02	7.77E-02	7.98E-02	8.01E-02	7.77E-02	2.33E+04	2.33E-02
Ni-63	5.74E-01	4.84E-01	5.48E-01	5.14E-01	6.14E-01	5.75E-01	5.52E-01	1.65E+05	1.65E-01
Np-237	2.80E-03	3.85E-03	2.68E-03	3.60E-03	3.70E-03	4.42E-03	3.51E-03	1.05E+03	1.05E-03
Pu-238	3.01E-01	3.34E-01	3.52E-01	3.54E-01	4.90E-01	4.39E-01	3.78E-01	1.14E+05	1.14E-01
Pu-239	7.09E-02	7.65E-02	8.05E-02	8.16E-02	1.12E-01	1.01E-01	8.71E-02	2.61E+04	2.61E-02
Pu-240	5.41E-02	5.85E-02	6.15E-02	6.24E-02	8.57E-02	7.75E-02	6.66E-02	2.00E+04	2.00E-02
Pu-241	1.43E+00	1.54E+00	1.65E+00	1.66E+00	2.29E+00	2.08E+00	1.78E+00	5.33E+05	5.33E-01
Sr-90	1.05E+02	1.27E+02	1.30E+02	1.25E+02	1.79E+02	1.65E+02	1.39E+02	4.16E+07	4.16E+01
Tc-99	3.59E-03	9.67E-03	9.42E-03	9.86E-03	3.69E-03	3.92E-03	6.69E-03	2.01E+03	2.01E-03
Th-228	1.98E-02	2.94E-02	2.72E-02	3.12E-02	3.57E-02	3.01E-02	2.89E-02	8.67E+03	8.67E-03
Th-230	1.34E-04	2.10E-04	1.94E-04	2.23E-04	2.41E-04	2.04E-04	2.01E-04	6.03E+01	6.03E-05
Th-232	1.69E-04	2.45E-04	1.88E-04	1.61E-04	3.23E-04	2.62E-04	2.25E-04	6.74E+01	6.74E-05
U-232	2.45E-02	2.66E-02	2.62E-02	2.83E-02	2.98E-02	2.92E-02	2.74E-02	8.23E+03	8.23E-03
U-233	1.00E-02	1.08E-02	1.06E-02	1.15E-02	1.22E-02	1.19E-02	1.12E-02	3.35E+03	3.35E-03
U-234	4.78E-03	5.17E-03	5.07E-03	5.49E-03	5.81E-03	5.68E-03	5.33E-03	1.60E+03	1.60E-03
U-235	1.86E-04	2.12E-04	1.84E-04	1.98E-04	2.26E-04	2.22E-04	2.05E-04	6.14E+01	6.14E-05
U-236	5.58E-04	6.35E-04	5.51E-04	5.95E-04	6.79E-04	6.65E-04	6.14E-04	1.84E+02	1.84E-04
U-238	1.09E-03	1.15E-03	1.20E-03	8.78E-04	1.47E-03	1.70E-03	1.25E-03	3.74E+02	3.74E-04
Zr-95	1.43E+01	1.32E+01	1.37E+01	1.47E+01	1.51E+01	1.52E+01	1.44E+01	4.31E+06	4.31E+00

Note - This table does not depict the decay corrected activity. Decay correction and final total activity will be identified on Radcalc decay calculation.

Radcalc 4.1
File Name: Melter Heal with Shard Data_062714.rad

6/27/2014 9:02 AM

This report was generated using an unvalidated installation of Radcalc version 4.1.

Radcalc 4.1: C:\WVDP - Melter\Recharacterization Information\Melter Heal Data\Melter Heal with Shard Data_062714.rad

Performed By: Chris Brandjes
Checked By:

===== Input Information =====

Comments:

Activity calculation for melter heel based on the average of six Shard Sample results of the Evacuated Canister material.

Initial Source Data:

Isotope	Ci	Gm	TBq
C-14	3.470E-03	7.747E-04	1.284E-04
K-40	1.500E-02	2.121E+03	5.550E-04
Mn-54	2.330E-02	3.004E-06	8.621E-04
Co-60	1.520E-02	1.343E-05	5.624E-04
Ni-63	1.650E-01	2.922E-03	6.105E-03
Sr-90	4.160E+01	3.012E-01	1.539E+00
Zr-95	4.310E+00	2.006E-04	1.595E-01
Tc-99	2.010E-03	1.190E-01	7.437E-05
Cs-137	7.140E+02	8.214E+00	2.642E+01
Eu-154	2.130E-01	7.880E-04	7.881E-03
Th-228	8.670E-03	1.058E-05	3.208E-04
Th-230	6.030E-05	2.926E-03	2.231E-06
Th-232	6.740E-05	6.146E+02	2.494E-06
U-232	8.230E-03	3.729E-04	3.045E-04
U-233	3.350E-03	3.478E-01	1.240E-04
U-234	1.600E-03	2.574E-01	5.920E-05
U-235	6.150E-05	2.846E+01	2.276E-06
U-236	1.840E-04	2.879E+00	6.808E-06
U-238	3.740E-04	1.113E+03	1.384E-05
Np-237	1.050E-03	1.490E+00	3.885E-05
Pu-238	1.140E-01	6.657E-03	4.218E-03
Pu-239	2.610E-02	4.208E-01	9.657E-04
Pu-240	2.000E-02	8.814E-02	7.400E-04
Pu-241	5.330E-01	5.150E-03	1.972E-02
Am-241	4.970E-01	1.450E-01	1.839E-02
Am-243	5.980E-03	2.994E-02	2.213E-04
Cm-242	3.580E-02	1.081E-05	1.325E-03
Cm-243	2.850E-03	5.813E-05	1.055E-04
Cm-244	7.440E-02	9.143E-04	2.753E-03

Total Activity: 7.617E+02 2.818E+01

* Radionuclides with an A1/A2 fraction of less than 0.001 will not be shown in the output.

Container Data:

Container Void Volume:	0	m^3
Container Mass:	1	kg
Mass of solid beryllium, lead, graphite, and hydrogenous material enriched with deuterium:	0	kg
Gross Mass:	301	kg

Waste Data:

Waste Form:	Normal	
Waste State:	Solid	
Waste Volume:	43.08	ft^3
Waste Mass:	300	kg

Radcalc 4.1

6/27/2014 9:02 AM

File Name: Melter Heal with Shard Data_062714.rad

Mass of solid lead:	0	kg
Mass of solid beryllium, graphite, and hydrogenous material enriched with deuterium:	0	kg
Waste Void Volume:	0	m ³

Decay Time Data:

Date to begin source decay:	9/20/2002
Date container sealed:	9/2/2014

===== Radioactive Decay Results =====

Decayed Source:

Isotope	Ci	Gm	TBq
C-14	3.465E-03	7.736E-04	1.282E-04
K-40	1.500E-02	2.121E+03	5.550E-04
Mn-54	1.437E-06	1.853E-10	5.318E-08
Co-60	3.157E-03	2.790E-06	1.168E-04
Ni-63	1.520E-01	2.691E-03	5.622E-03
Sr-90	3.120E+01	2.259E-01	1.154E+00
Y-90	3.121E+01	5.739E-05	1.155E+00
Zr-95	1.299E-20	6.045E-25	4.805E-22
Nb-95	2.864E-20	7.283E-25	1.060E-21
Nb-95m	1.487E-22	3.900E-28	5.502E-24
Tc-99	2.010E-03	1.190E-01	7.437E-05
Cs-137	5.419E+02	6.234E+00	2.005E+01
Ba-137m	5.116E+02	9.506E-07	1.893E+01
Eu-154	8.123E-02	3.005E-04	3.005E-03
Hg-206	9.794E-16	8.744E-24	3.624E-17
Tl-206	6.881E-14	3.167E-22	2.546E-15
Tl-207	2.559E-09	1.344E-17	9.468E-11
Tl-208	2.717E-03	9.176E-12	1.005E-04
Tl-209	8.094E-08	1.979E-16	2.995E-09
Tl-210	6.540E-11	9.495E-20	2.420E-12
Pb-209	3.747E-06	8.129E-13	1.386E-07
Pb-210	5.155E-08	6.709E-10	1.907E-09
Pb-211	2.566E-09	1.039E-16	9.494E-11
Pb-212	7.563E-03	5.443E-09	2.798E-04
Pb-214	3.114E-07	9.497E-15	1.152E-08
Bi-209	8.103E-25	9.000E-09	2.998E-26
Bi-210	5.139E-08	4.142E-13	1.901E-09
Bi-211	2.566E-09	6.248E-18	9.494E-11
Bi-212	7.563E-03	5.162E-10	2.798E-04
Bi-213	3.747E-06	1.935E-13	1.386E-07
Bi-214	3.114E-07	7.053E-15	1.152E-08
Bi-215	2.100E-15	1.777E-23	7.768E-17
Po-210	4.712E-08	1.049E-11	1.743E-09
Po-211	7.005E-12	6.760E-23	2.592E-13
Po-212	4.844E-03	2.713E-20	1.792E-04
Po-213	3.667E-06	2.907E-22	1.357E-07
Po-214	3.114E-07	9.668E-22	1.152E-08
Po-215	2.566E-09	8.704E-23	9.494E-11
Po-216	7.563E-03	2.172E-14	2.798E-04
Po-218	3.114E-07	1.119E-15	1.152E-08
At-215	1.026E-14	1.956E-29	3.798E-16
At-217	3.748E-06	2.328E-18	1.387E-07
At-218	5.917E-11	1.715E-21	2.189E-12
At-219	2.165E-15	2.269E-24	8.009E-17
Rn-217	4.497E-10	4.671E-24	1.664E-11
Rn-218	5.917E-14	4.002E-26	2.189E-15
Rn-219	2.566E-09	1.973E-19	9.494E-11
Rn-220	7.563E-03	8.230E-12	2.798E-04
Rn-222	3.114E-07	2.024E-12	1.152E-08

Radcalc 4.1

6/27/2014 9:02 AM

File Name: Melter Heal with Shard Data_062714.rad

Fr-221	3.748E-06	2.158E-14	1.387E-07
Fr-223	3.608E-11	9.328E-19	1.335E-12
Ra-223	2.566E-09	5.009E-14	9.494E-11
Ra-224	7.563E-03	4.723E-08	2.798E-04
Ra-225	3.760E-06	9.590E-11	1.391E-07
Ra-226	3.118E-07	3.154E-07	1.154E-08
Ra-228	5.144E-05	1.887E-07	1.903E-06
Ac-225	3.748E-06	6.458E-11	1.387E-07
Ac-227	2.614E-09	3.615E-11	9.672E-11
Ac-228	5.144E-05	2.302E-11	1.903E-06
Th-227	2.548E-09	8.293E-14	9.429E-11
Th-228	7.562E-03	9.225E-06	2.798E-04
Th-229	3.778E-06	1.777E-05	1.398E-07
Th-230	6.047E-05	2.934E-03	2.237E-06
Th-231	6.150E-05	1.157E-10	2.276E-06
Th-232	6.740E-05	6.146E+02	2.494E-06
Th-234	3.740E-04	1.615E-08	1.384E-05
Pa-231	1.554E-08	3.291E-07	5.751E-10
Pa-233	1.052E-03	5.069E-08	3.892E-05
Pa-234	5.610E-07	2.840E-13	2.076E-08
Pa-234m	3.740E-04	5.446E-13	1.384E-05
U-232	7.309E-03	3.311E-04	2.704E-04
U-233	3.350E-03	3.478E-01	1.239E-04
U-234	1.604E-03	2.579E-01	5.933E-05
U-235	6.150E-05	2.846E+01	2.276E-06
U-235m	2.608E-02	8.476E-10	9.649E-04
U-236	1.840E-04	2.879E+00	6.808E-06
U-237	7.365E-06	9.025E-11	2.725E-07
U-238	3.740E-04	1.113E+03	1.384E-05
Np-237	1.052E-03	1.493E+00	3.892E-05
Np-239	5.973E-03	2.575E-08	2.210E-04
Pu-238	1.039E-01	6.067E-03	3.844E-03
Pu-239	2.609E-02	4.207E-01	9.655E-04
Pu-240	2.005E-02	8.836E-02	7.418E-04
Pu-241	2.990E-01	2.889E-03	1.106E-02
Am-241	4.952E-01	1.445E-01	1.832E-02
Am-243	5.973E-03	2.991E-02	2.210E-04
Cm-242	3.084E-10	9.315E-14	1.141E-11
Cm-243	2.162E-03	4.411E-05	8.001E-05
Cm-244	4.696E-02	5.771E-04	1.737E-03
Total Activity:	1.117E+03		4.134E+01
w/o Daughters:	5.744E+02		2.125E+01

Decay Heat:

Heat Generated on Start Date:	0.889	W
Heat Generated on Seal Date:	2.834	W

===== Regulatory Requirements Warning =====

Radcalc utilizes numerically based criteria to classify packages against the regulations. Many regulations also include subjective criteria that Radcalc does not consider. The user must check to ensure that all requirements in the regulations are met.

===== DOT Classification Results =====

* DOT classification calculations are made at the end of the user-specified decay time.

Radioactive Determination:

Radioactive:	Yes		(ACEMs and ALECs > 1.0)
ACEM Limit Fraction:	6806000	ACEMs	(Number of ACEMs)
ALEC Limit Fraction:	2.125E+09	ALECs	(Number of ALECs)

Radcalc 4.1

6/27/2014 9:02 AM

File Name: Melter Heal with Shard Data_062714.rad

* This package is not exempt from 49 CFR Subchapter C.

Effective A2s for Mixture:	3.365E+11	Bq	
Type Determination:			
Type:	B		(A2s > 1.0)
A2 Limit Fraction:	63.15	A2s	(Number of A2s)
Limited Quantity Determination:			
Limited Quantity:	No		(Solid, activity > 0.001 A2)
Activity:	63.15	A2	
	1117	Ci	
	41.34	TBq	
Fissile:	Yes		
Fissile Excepted:	Yes (c)		
LSA Determination:			
LSA-I:	No		(Fissile excepted, ACEMs > 30 x rad limits)
LSA-II:	No		(A2s/gm > 0.0001)
LSA-III:	Yes		(A2s/gm <= 0.002)
Specific Activity:	0.0002105	A2/gm	
	0.003724	Ci/gm	
HRCQ Determination:			
HRCQ:	No		(A2s <= 3000, Activity <= 1000 TBq)
A2 Limit Fraction:	63.15	A2s	
Activity:	1117	Ci	
	41.34	TBq	
Fissile Determination:			
Fissile:	Yes		(Contains fissile isotopes per 49 CFR 173.403)
Fissile Excepted Determination:			
Fissile Excepted:	Yes (c)		(Fissile <= 180 grams, non-fissile > = 2000 * fissile)
Fissile Mass:	29.23	gm	
Container beryllium, lead, graphite, and hydrogenous material enriched with deuterium:	0	gm	
Container Mass:	1000	gm	
Waste lead:	0	gm	
Waste beryllium, graphite, and hydrogenous material enriched with deuterium:	0	gm	
Waste Mass:	300000	gm	
Solid Non-Fissile Mass:	300000	gm	
Total Uranium Mass:	1145	gm	
U-233 Mass:	0.3478	gm	
U-235 Mass:	28.46	gm	
Uranium Enrichment:	2.486	%	
Total Plutonium Mass:	0.5181	gm	
Pu-239 Mass:	0.4207	gm	
Pu-241 Mass:	0.002889	gm	
Reportable Quantity Determination:			
Reportable Quantity:	Yes		(RQs > = 1.0)
RQ Limit Fraction:	1441	RQs	(Number of RQs)
Shipping Papers and Labels:			
Isotope	Number of A2s	Fraction of A2s	Cumulative A2s
+ Cs-137	33.42	0.5292	33.42
+ Am-241	18.32	0.2901	51.74
+ Sr-90	3.848	0.06093	55.59
			Cumulative Fraction of A2s
			0.5292
			0.8193
			0.8802

Radcalc 4.1

6/27/2014 9:02 AM

File Name: Melter Heal with Shard Data_062714.rad

+	Pu-238	3.844	0.06087	59.43	0.9411
+	Pu-239	0.9655	0.01529	60.4	0.9564
	Cm-244	0.8687	0.01376	61.27	0.9701
	Pu-240	0.7418	0.01175	62.01	0.9819
	Th-228	0.2798	0.00443	62.29	0.9863
	U-232	0.2704	0.004282	62.56	0.9906
	Am-243	0.221	0.0035	62.78	0.9941
	Pu-241	0.1844	0.00292	62.97	0.997
	Cm-243	0.08001	0.001267	63.05	0.9983

+ Contains 95% of the total A2s and must be included per 49 CFR 173.433.

* Radionuclides comprising less than 0.1% of the total A2s are not shown in the list.

===== DOE Classification Results =====

* DOE classification calculations are made at the end of the user-specified decay time.

DOE-STD-1027 Category Determination:

Category:	Cat 3	(Cat3s > 1.0, Cat2s <= 1.0)
Cat 2 Limit Fraction:	0.02215	
Cat 3 Limit Fraction:	12.31	

* The DOE-STD-1027 category determination is based on dose-related limits.
The user must apply any criticality-related limits separately.

Dose-Equivalent Curies:

ICRP-72 DE-Ci:	0.6769
FGR-11 DE-Ci:	0.85

TRU Waste Determination:

TRU Waste:	Yes	(TRU activity > 100 nCi/gm)
TRU Activity:	2182	nCi/g

WIPP Quantities:

FGE Value:	19.07
PE-Ci Value:	0.686

===== NRC Classification Results =====

* NRC classification calculations are made at the end of the user-specified decay time.

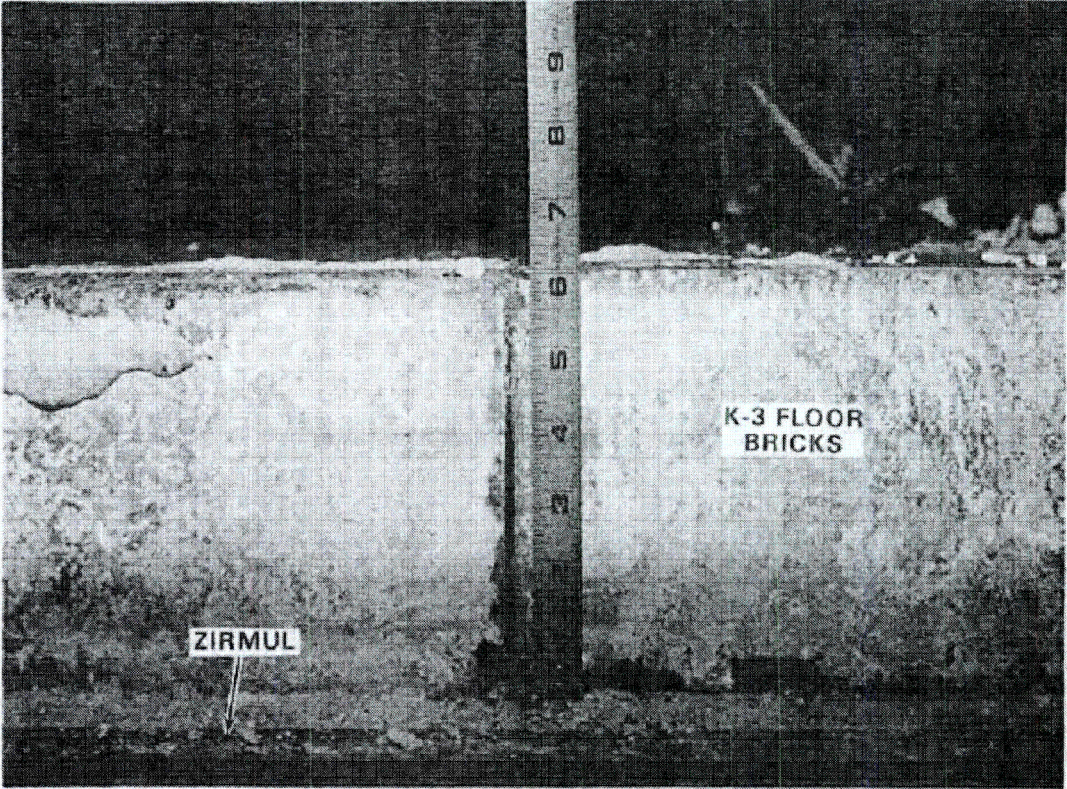
NRC Container Category:

Container Category:	III	
LSA-I:	No	
LSA-II:	No	
LSA-III:	Yes	
Total Activity:	1117	Ci
A2 Limit Fraction:	63.15	A2s

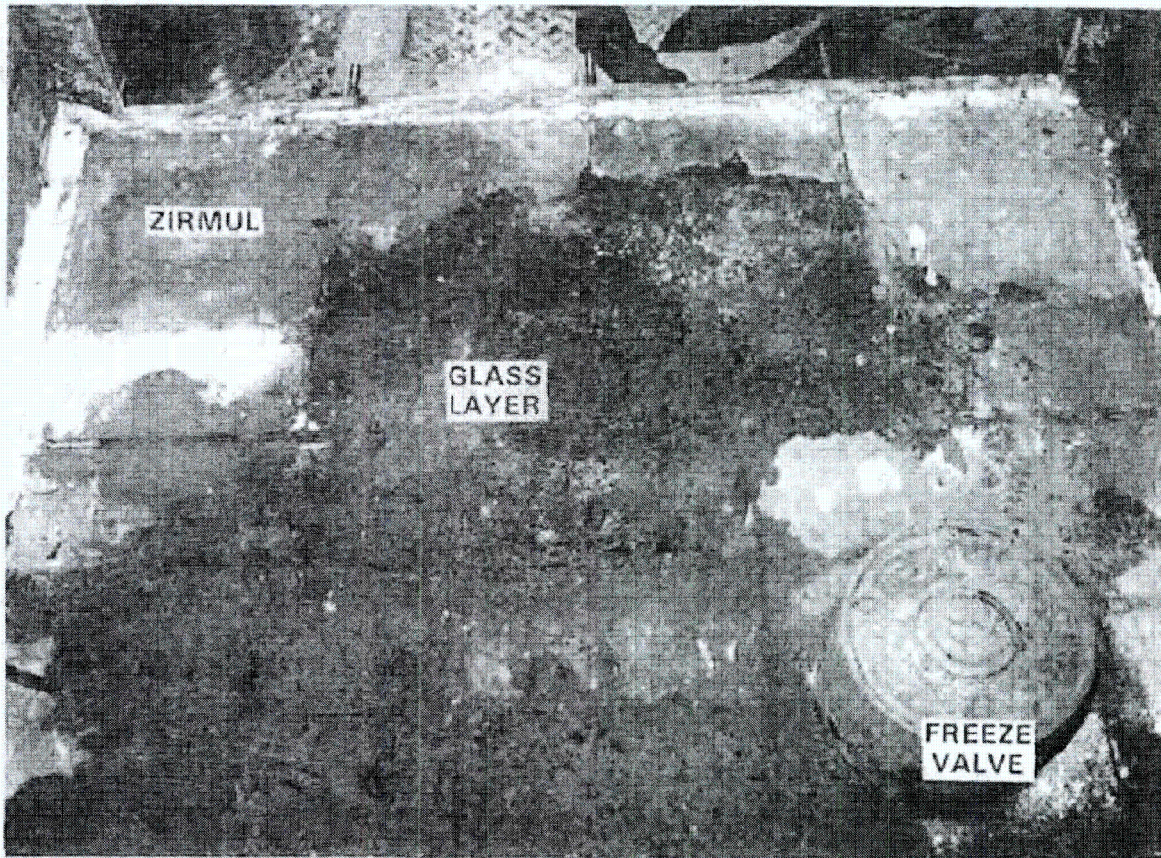
APPENDIX 4

Miscellaneous Pictures of Vitrified Glass Contained within Refractory

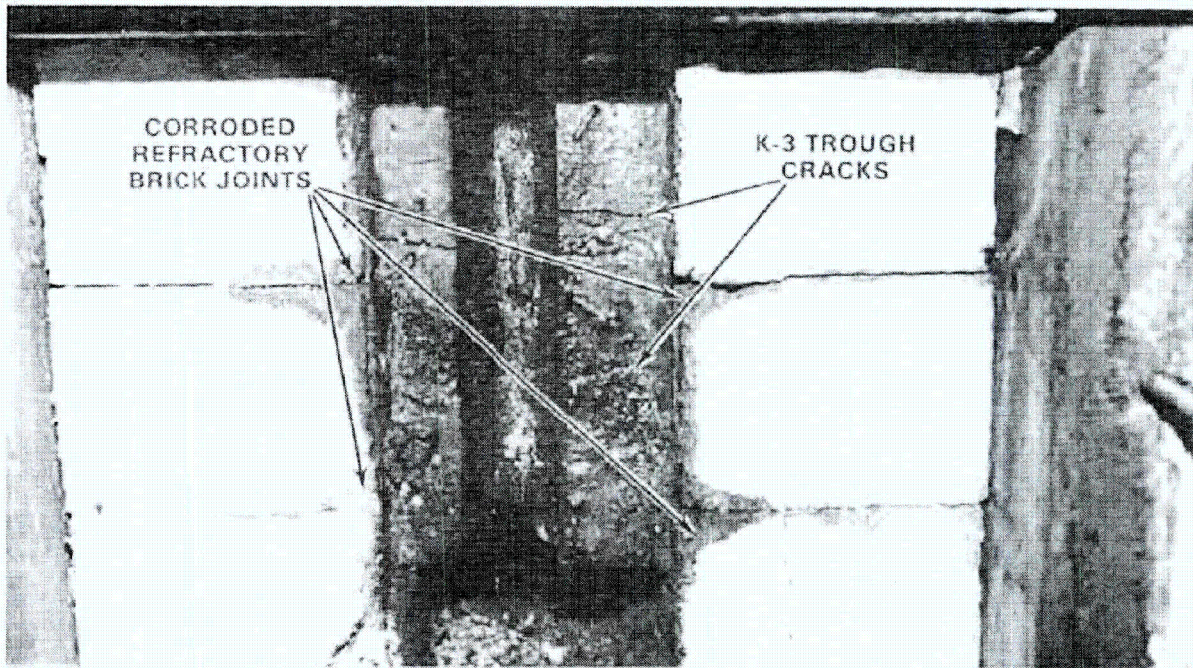
(PNL-3959, Materials and Design Experience
in a Slurry-Fed Electric Glass Melter)

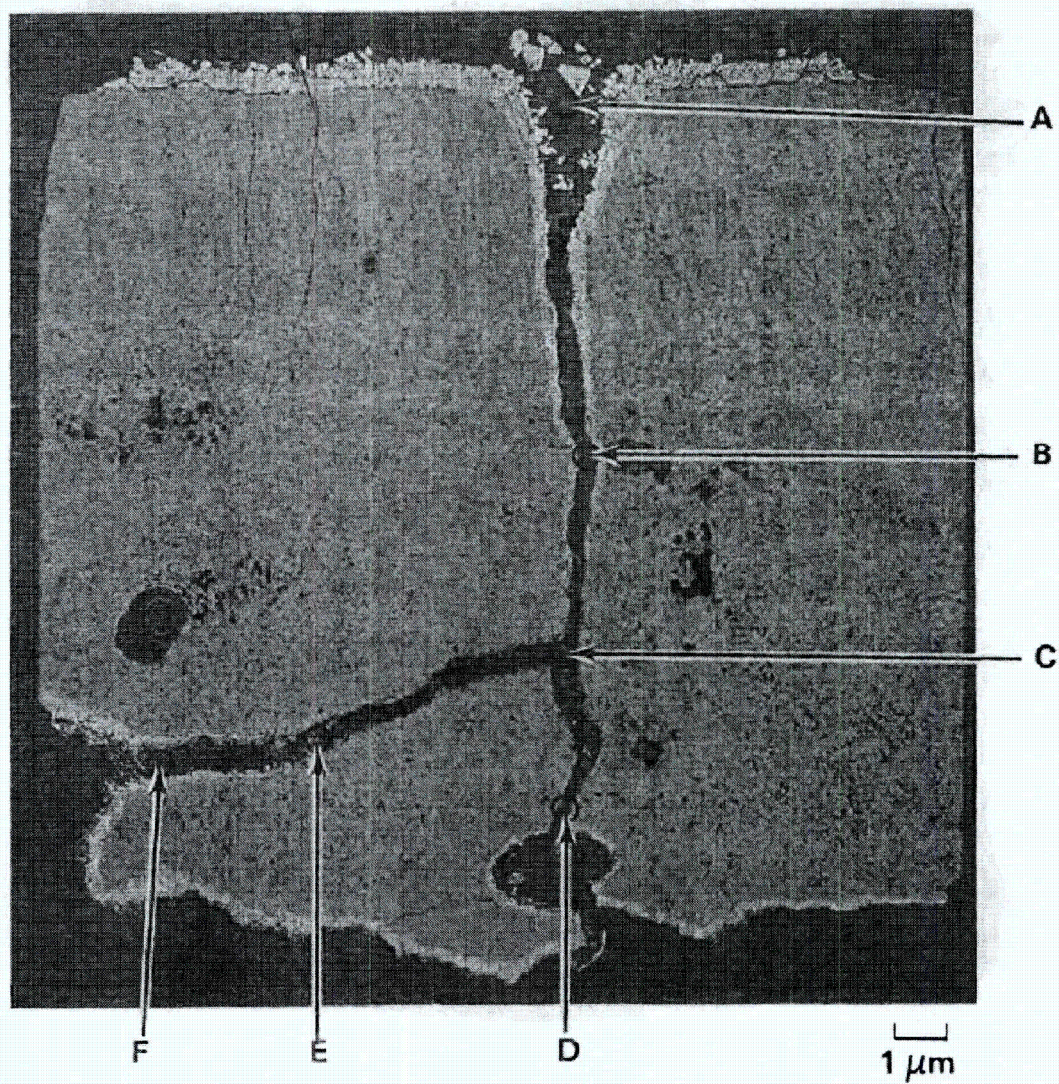


Miscellaneous Melter Photos
Continued

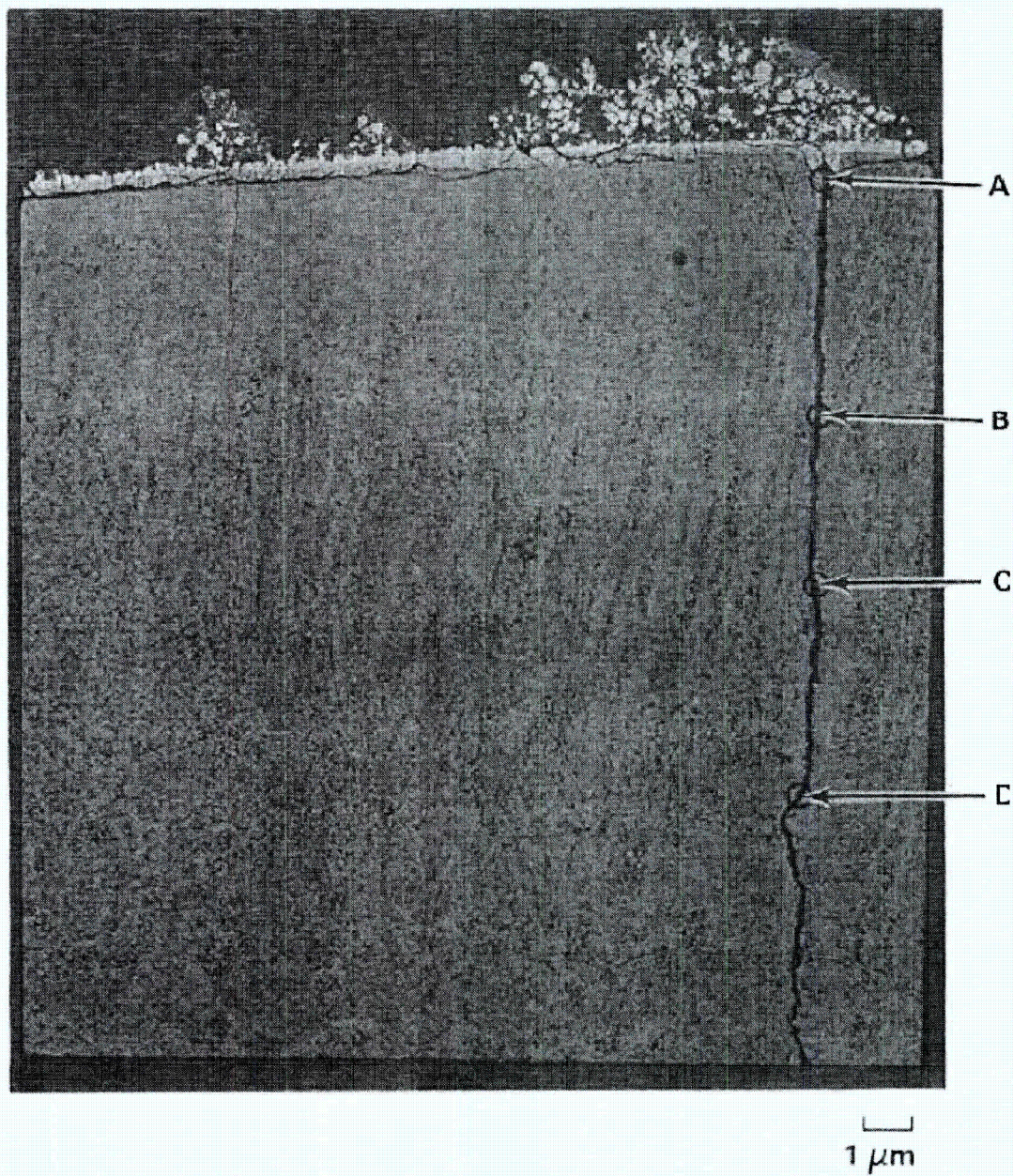


Glass Layer on the Zirmul Floor Blocks

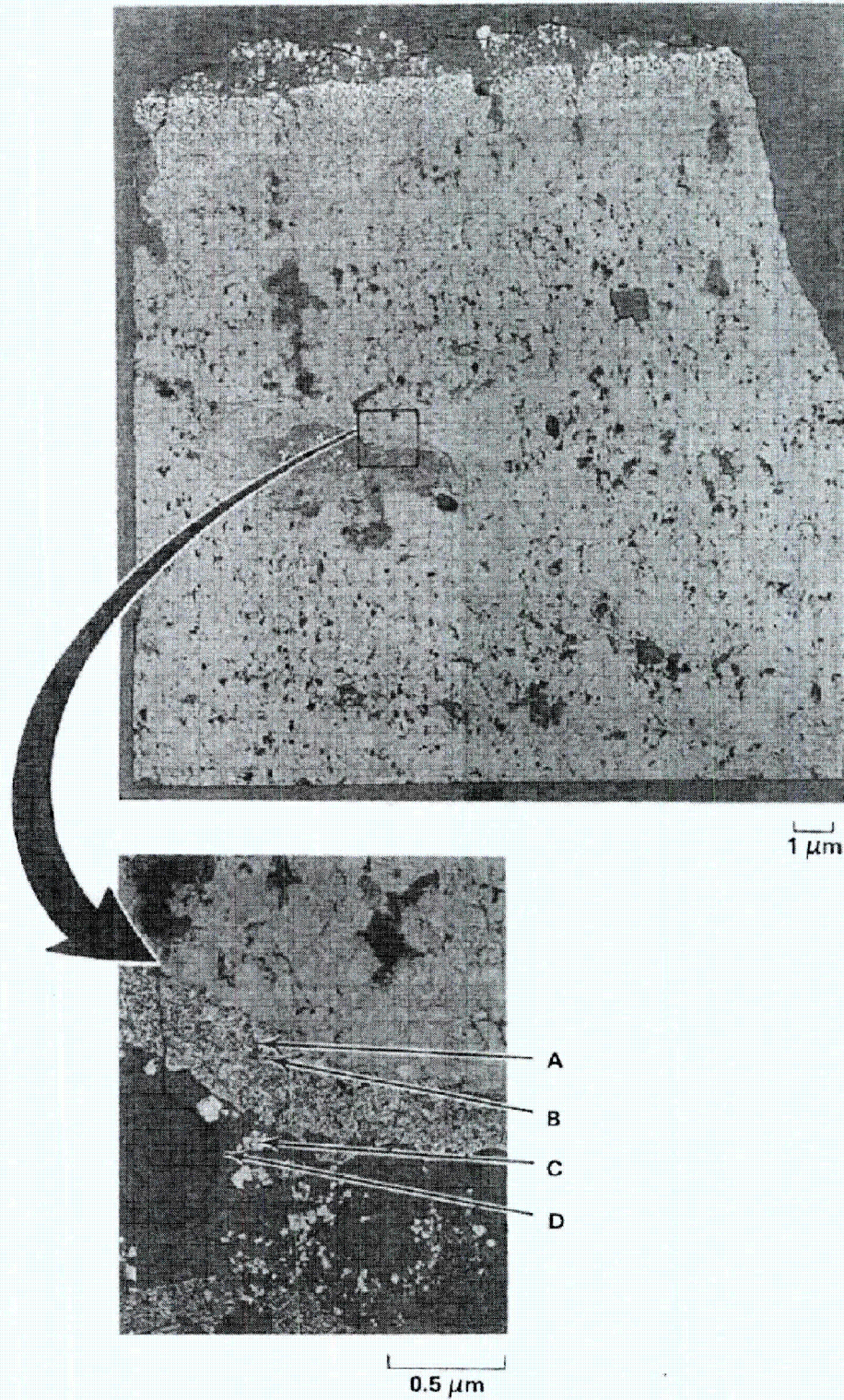




Miscellaneous Melter Photos
Continued



Glass-Filled Crack in Monofrax K-3



APPENDIX 5

Melter Refractory Activity and Decay Correction Calculations (RADCALC)

APPENDIX 5 - Refractory Activity Calculations

Monofrax Refractory

Description

Volume (ft3)	61.88
Density (lbs/ft3)	243.5
Total Weight (lbs)	15067.78

Zirmul Refractory

Description

Volume (ft3)	30.82
Density (lbs/ft3)	196
Total Weight (lbs)	6040.72

1% of the total Volume	Volume (ft3)	Mass (lbs)	Mass (g)
Monofrax Refractory	0.6188	150.6778	68407.72
Zirmul Refractory	0.3082	60.4072	27424.87

Glass Calc (Based on 1% of total volume of refractory)

	Volume (ft3)	Volume (cc)	Mass (g)
Monofrax Refractory	0.6188	17522.47	45558.41
Zirmul Refractory	0.3082	8727.25	22690.86

Totals			68249.27
---------------	--	--	----------

	Geomean (6-69)	Geomean (70-77)	Ave (Conc.) Geomean for 6-77	Ave (Act) Geomean for 6-77
Isotope	Conc. (uCi/g)	Conc. (uCi/g)	Conc. (uCi/g)	Act (Ci)
Cs-137	4.83E+03	3.43E+03	4.13E+03	2.82E+02
Sr-90	4.00E+03	1.89E+02	2.10E+03	1.43E+02
Am-241	2.35E+01	1.57E+00	1.25E+01	8.56E-01
Am-243	1.85E-01	1.23E-02	9.85E-02	6.73E-03
Cm-242	1.88E-01	1.25E-02	1.00E-01	6.84E-03
Cm-243	1.10E-01	7.35E-03	5.89E-02	4.02E-03
Cm-244	2.95E+00	1.97E-01	1.58E+00	1.08E-01
Co-60	1.80E+00	1.20E-01	9.61E-01	6.56E-02
Eu-154	4.03E+01	2.69E+00	2.15E+01	1.47E+00
Np-237	2.32E-02	1.55E-03	1.24E-02	8.46E-04
Pu-238	4.26E+00	2.84E-01	2.27E+00	1.55E-01
Pu-239	1.02E+00	6.80E-02	5.45E-01	3.72E-02
Pu-240	7.80E-01	5.19E-02	4.16E-01	2.84E-02
Pu-241	1.02E+01	6.79E-01	5.44E+00	3.71E-01
Tc-99	1.43E+00	9.54E-02	7.65E-01	5.22E-02
Th-228	6.26E-02	4.17E-03	3.34E-02	2.28E-03
Th-230	4.18E-04	2.78E-05	2.23E-04	1.52E-05
Th-232	1.15E-03	7.64E-05	6.12E-04	4.18E-05
U-232	1.37E-02	9.10E-04	7.29E-03	4.97E-04
U-233	1.61E-02	1.07E-03	8.57E-03	5.85E-04
U-234	7.67E-03	5.10E-04	4.09E-03	2.79E-04
U-235	1.90E-03	1.27E-04	1.01E-03	6.92E-05
U-236	5.70E-03	3.80E-04	3.04E-03	2.08E-04
U-238	3.19E-03	2.13E-04	1.70E-03	1.16E-04
			Total	4.28E+02

Note - This table does not reflect decay corrected activity. Decay corrected activity is addressed in Radcalc decay calculation.

Radcalc 4.1
File Name: Refractory with Ave. Geomean 6-77 Act.rad

6/26/2014 3:57 PM

This report was generated using an unvalidated installation of Radcalc version 4.1.

Radcalc 4.1: C:\WVDP - Melter\Recharacterization Information\Refractory with Ave. Geomean 6-77 Act.rad

Performed By: Chris Brandjes
Checked By:

===== Input Information =====

Comments:

Activity associated to refractory using average Geomean for all samples.

Mass of glass is based on 1% of total volume of Refractory with a glass density of 2.6 g/cc.

Decayed from 7/18/2002 to 09/02/2014. Representing last Sample Date.

Initial Source Data:

Isotope	Ci	Gm	TBq
Co-60	6.560E-02	5.797E-05	2.427E-03
Sr-90	1.430E+02	1.035E+00	5.291E+00
Tc-99	5.220E-02	3.090E+00	1.931E-03
Cs-137	2.820E+02	3.244E+00	1.043E+01
Eu-154	1.470E+00	5.439E-03	5.439E-02
Th-228	2.280E-03	2.782E-06	8.436E-05
Th-230	1.520E-05	7.375E-04	5.624E-07
Th-232	4.180E-05	3.812E+02	1.547E-06
U-232	4.970E-04	2.252E-05	1.839E-05
U-233	5.850E-04	6.073E-02	2.165E-05
U-234	2.790E-04	4.488E-02	1.032E-05
U-235	6.920E-05	3.202E+01	2.560E-06
U-236	2.080E-04	3.255E+00	7.696E-06
U-238	1.160E-04	3.451E+02	4.292E-06
Np-237	8.460E-04	1.200E+00	3.130E-05
Pu-238	1.550E-01	9.051E-03	5.735E-03
Pu-239	3.720E-02	5.998E-01	1.376E-03
Pu-240	2.840E-02	1.252E-01	1.051E-03
Pu-241	3.710E-01	3.585E-03	1.373E-02
Am-241	8.560E-01	2.498E-01	3.167E-02
Am-243	6.730E-03	3.370E-02	2.490E-04
Cm-242	6.840E-03	2.066E-06	2.531E-04
Cm-243	4.020E-03	8.200E-05	1.487E-04
Cm-244	1.080E-01	1.327E-03	3.996E-03

Total Activity: 4.282E+02 1.584E+01

* Radionuclides with an A1/A2 fraction of less than 0.001 will not be shown in the output.

Container Data:

Container Void Volume:	0	m^3
Container Mass:	1	kg
Mass of solid beryllium, lead, graphite, and hydrogenous material enriched with deuterium:	0	kg
Gross Mass:	69.19	kg

Waste Data:

Waste Form:	Normal	
Waste State:	Solid	
Waste Volume:	0.927	ft^3
Waste Mass:	150.3	lb
Mass of solid lead:	0	kg
Mass of solid beryllium, graphite, and hydrogenous material enriched with deuterium:	0	kg

Radcalc 4.1

6/26/2014 3:57 PM

File Name: Refractory with Ave. Geomean 6-77 Act.rad

Waste Void Volume: 0 m³

Decay Time Data:

Date to begin source decay: 7/18/2002
Date container sealed: 9/2/2014

===== Radioactive Decay Results =====

Decayed Source:

Isotope	Ci	Gm	TBq
Co-60	1.332E-02	1.177E-05	4.927E-04
Sr-90	1.068E+02	7.732E-01	3.951E+00
Y-90	1.068E+02	1.964E-04	3.952E+00
Tc-99	5.220E-02	3.090E+00	1.931E-03
Cs-137	2.132E+02	2.452E+00	7.887E+00
Ba-137m	2.012E+02	3.739E-07	7.446E+00
Eu-154	5.527E-01	2.045E-03	2.045E-02
Hg-206	2.537E-16	2.265E-24	9.385E-18
Tl-206	1.782E-14	8.204E-23	6.594E-16
Tl-207	2.960E-09	1.554E-17	1.095E-10
Tl-208	1.806E-04	6.098E-13	6.681E-06
Tl-209	1.434E-08	3.507E-17	5.307E-10
Tl-210	1.672E-11	2.427E-20	6.186E-13
Pb-209	6.641E-07	1.441E-13	2.457E-08
Pb-210	1.335E-08	1.738E-10	4.940E-10
Pb-211	2.968E-09	1.202E-16	1.098E-10
Pb-212	5.026E-04	3.617E-10	1.860E-05
Pb-214	7.960E-08	2.428E-15	2.945E-09
Bi-209	1.457E-25	1.618E-09	5.392E-27
Bi-210	1.331E-08	1.073E-13	4.925E-10
Bi-211	2.968E-09	7.227E-18	1.098E-10
Bi-212	5.026E-04	3.430E-11	1.860E-05
Bi-213	6.640E-07	3.429E-14	2.457E-08
Bi-214	7.962E-08	1.803E-15	2.946E-09
Bi-215	2.428E-15	2.054E-23	8.984E-17
Po-210	1.222E-08	2.720E-12	4.522E-10
Po-211	8.103E-12	7.819E-23	2.998E-13
Po-212	3.219E-04	1.803E-21	1.191E-05
Po-213	6.498E-07	5.152E-23	2.404E-08
Po-214	7.960E-08	2.472E-22	2.945E-09
Po-215	2.968E-09	1.007E-22	1.098E-10
Po-216	5.026E-04	1.443E-15	1.859E-05
Po-218	7.962E-08	2.860E-16	2.946E-09
At-215	1.187E-14	2.263E-29	4.393E-16
At-217	6.641E-07	4.126E-19	2.457E-08
At-218	1.513E-11	4.385E-22	5.597E-13
At-219	2.503E-15	2.624E-24	9.262E-17
Rn-217	7.969E-11	8.278E-25	2.949E-12
Rn-218	1.513E-14	1.023E-26	5.597E-16
Rn-219	2.968E-09	2.282E-19	1.098E-10
Rn-220	5.026E-04	5.469E-13	1.859E-05
Rn-222	7.962E-08	5.176E-13	2.946E-09
Fr-221	6.641E-07	3.825E-15	2.457E-08
Fr-223	4.172E-11	1.079E-18	1.544E-12
Ra-223	2.968E-09	5.794E-14	1.098E-10
Ra-224	5.026E-04	3.138E-09	1.859E-05
Ra-225	6.663E-07	1.699E-11	2.465E-08
Ra-226	7.972E-08	8.064E-08	2.950E-09
Ra-228	3.211E-05	1.178E-07	1.188E-06
Ac-225	6.641E-07	1.144E-11	2.457E-08
Ac-227	3.023E-09	4.180E-11	1.119E-10
Ac-228	3.211E-05	1.437E-11	1.188E-06

Radcalc 4.1

6/26/2014 3:57 PM

File Name: Refractory with Ave. Geomean 6-77 Act.rad

Th-227	2.947E-09	9.592E-14	1.091E-10
Th-228	5.024E-04	6.129E-07	1.859E-05
Th-229	6.695E-07	3.148E-06	2.477E-08
Th-230	1.523E-05	7.389E-04	5.635E-07
Th-231	6.920E-05	1.302E-10	2.560E-06
Th-232	4.180E-05	3.812E+02	1.547E-06
Th-234	1.160E-04	5.008E-09	4.292E-06
Pa-231	1.775E-08	3.757E-07	6.566E-10
Pa-233	8.493E-04	4.093E-08	3.142E-05
Pa-234	1.740E-07	8.810E-14	6.438E-09
Pa-234m	1.160E-04	1.689E-13	4.292E-06
U-232	4.406E-04	1.996E-05	1.630E-05
U-233	5.850E-04	6.073E-02	2.165E-05
U-234	2.841E-04	4.569E-02	1.051E-05
U-235	6.920E-05	3.202E+01	2.560E-06
U-235m	3.717E-02	1.208E-09	1.375E-03
U-236	2.080E-04	3.255E+00	7.696E-06
U-237	5.083E-06	6.229E-11	1.881E-07
U-238	1.160E-04	3.451E+02	4.292E-06
Np-237	8.493E-04	1.205E+00	3.143E-05
Np-239	6.722E-03	2.898E-08	2.487E-04
Pu-238	1.409E-01	8.226E-03	5.212E-03
Pu-239	3.719E-02	5.997E-01	1.376E-03
Pu-240	2.847E-02	1.255E-01	1.054E-03
Pu-241	2.064E-01	1.994E-03	7.636E-03
Am-241	8.449E-01	2.466E-01	3.126E-02
Am-243	6.722E-03	3.366E-02	2.487E-04
Cm-242	4.488E-11	1.356E-14	1.661E-12
Cm-243	3.038E-03	6.196E-05	1.124E-04
Cm-244	6.771E-02	8.320E-04	2.505E-03
Total Activity:	6.300E+02		2.331E+01
w/o Daughters:	3.220E+02		1.191E+01

Decay Heat:

Heat Generated on Start Date:	0.5161	W
Heat Generated on Seal Date:	1.768	W

===== Regulatory Requirements Warning =====

Radcalc utilizes numerically based criteria to classify packages against the regulations. Many regulations also include subjective criteria that Radcalc does not consider. The user must check to ensure that all requirements in the regulations are met.

===== DOT Classification Results =====

* DOT classification calculations are made at the end of the user-specified decay time.

Radioactive Determination:

Radioactive:	Yes		(ACEMs and ALECs > 1.0)
ACEM Limit Fraction:	12760000	ACEMs	(Number of ACEMs)
ALEC Limit Fraction:	1.190E+09	ALECs	(Number of ALECs)

* This package is not exempt from 49 CFR Subchapter C.

Effective A2s for Mixture:	1.775E+11	Bq
----------------------------	-----------	----

Type Determination:

Type:	B		(A2s > 1.0)
A2 Limit Fraction:	67.13	A2s	(Number of A2s)

Limited Quantity Determination:

Limited Quantity:	No		(Solid, activity > 0.001 A2)
-------------------	----	--	------------------------------

Radcalc 4.1

6/26/2014 3:57 PM

File Name: Refractory with Ave. Geomean 6-77 Act.rad

Activity:	67.13	A2		
	630	Ci		
	23.31	TBq		
Fissile:	Yes			
Fissile Excepted:	Yes (c)			
LSA Determination:				
LSA-I:	No		(Fissile excepted, ACEMs > 30 x rad limits)	
LSA-II:	No		(A2s/gm > 0.0001)	
LSA-III:	Yes		(A2s/gm <= 0.002)	
Specific Activity:	0.0009844	A2/gm		
	0.00924	Ci/gm		
HRCQ Determination:				
HRCQ:	No		(A2s <= 3000, Activity <= 1000 TBq)	
A2 Limit Fraction:	67.13	A2s		
Activity:	630	Ci		
	23.31	TBq		
Fissile Determination:				
Fissile:	Yes		(Contains fissile isotopes per 49 CFR 173.403)	
Fissile Excepted Determination:				
Fissile Excepted:	Yes (c)		(Fissile <= 180 grams, non-fissile > = 2000 * fissile)	
Fissile Mass:	32.68	gm		
Container beryllium, lead, graphite, and hydrogenous material enriched with deuterium:	0	gm		
Container Mass:	1000	gm		
Waste lead:	0	gm		
Waste beryllium, graphite, and hydrogenous material enriched with deuterium:	0	gm		
Waste Mass:	68190	gm		
Solid Non-Fissile Mass:	68160	gm		
Total Uranium Mass:	380.5	gm		
U-233 Mass:	0.06073	gm		
U-235 Mass:	32.02	gm		
Uranium Enrichment:	8.415	%		
Total Plutonium Mass:	0.7354	gm		
Pu-239 Mass:	0.5997	gm		
Pu-241 Mass:	0.001994	gm		
Reportable Quantity Determination:				
Reportable Quantity:	Yes		(RQs > = 1.0)	
RQ Limit Fraction:	1606	RQs	(Number of RQs)	
Shipping Papers and Labels:				
Isotope	Number of A2s	Fraction of A2s	Cumulative A2s	Cumulative Fraction of A2s
+ Am-241	31.26	0.4657	31.26	0.4657
+ Sr-90	13.17	0.1962	44.43	0.6619
+ Cs-137	13.15	0.1958	57.58	0.8578
+ Pu-238	5.212	0.07765	62.79	0.9354
+ Pu-239	1.376	0.0205	64.17	0.9559
Cm-244	1.253	0.01866	65.42	0.9746
Pu-240	1.054	0.01569	66.47	0.9903
Am-243	0.2487	0.003705	66.72	0.994
Pu-241	0.1273	0.001896	66.85	0.9959
Cm-243	0.1124	0.001674	66.96	0.9976
U-235m	0.06876	0.001024	67.03	0.9986
+ Contains 95% of the total A2s and must be included per 49 CFR 173.433.				
* Radionuclides comprising less than 0.1% of the total A2s are not shown in the list.				

Radcalc 4.1
File Name: Refractory with Ave. Geomean 6-77 Act.rad

6/26/2014 3:57 PM

===== DOE Classification Results =====

* DOE classification calculations are made at the end of the user-specified decay time.

DOE-STD-1027 Category Determination:

Category:	Cat 3	(Cat3s > 1.0, Cat2s <= 1.0)
Cat 2 Limit Fraction:	0.02833	
Cat 3 Limit Fraction:	12.38	

* The DOE-STD-1027 category determination is based on dose-related limits.
The user must apply any criticality-related limits separately.

Dose-Equivalent Curies:

ICRP-72 DE-Ci:	1.054
FGR-11 DE-Ci:	1.465

TRU Waste Determination:

TRU Waste:	Yes	(TRU activity > 100 nCi/gm)
TRU Activity:	15580	nCi/g

WIPP Quantities:

FGE Value:	21.28
PE-Ci Value:	1.105

===== NRC Classification Results =====

* NRC classification calculations are made at the end of the user-specified decay time.

NRC Container Category:

Container Category:	III	
LSA-I:	No	
LSA-II:	No	
LSA-III:	Yes	
Total Activity:	630	Ci
A2 Limit Fraction:	67.13	A2s

APPENDIX 6

Analytical Data for Batch 75

Appendix 6 - Analytical Data for Batch 75

PRIM_SAM_KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPOIN_T	SAMTYPE	VTBATCH	RES_TYP1	UNCERTAINTY_ALUE	RESULT_VALUE	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) VM	Scaling factors
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Am241	8.28E-02	1.37E+00	2	uCi/g	Rep2 (B75)	Cs-137	1.16E+04	1.00E+00
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Am241	1.01E-01	1.68E+00	4	uCi/g	Rep4 (B75)	Sr-90	8.70E+02	7.47E-02
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Am241	1.05E-01	1.75E+00	3	uCi/g	Rep3 (B75)	Am-241	3.86E+00	3.32E-04
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Am241	9.16E-02	1.52E+00	1	uCi/g	Rep1 (B75)	Am-241	4.60E-02	3.95E-06
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Am241	2.24E-01	3.72E+00	3	uCi/g	Rep3 (03db)	Cm-242	4.37E-02	3.75E-06
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Am241	2.33E-01	3.87E+00	7	uCi/g	Rep7 (07db)	Cm-243	2.51E-02	2.16E-06
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Am241	2.26E-01	3.75E+00	8	uCi/g	Rep8 (08db)	Cm-244	6.72E-01	5.77E-05
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Am241	2.43E-01	4.04E+00	6	uCi/g	Rep6 (06db)	Co-60	2.96E-01	2.54E-05
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Am241	2.33E-01	3.88E+00	1	uCi/g	Rep1 (01db)	Eu-154	2.95E+00	2.53E-04
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Am241	2.21E-01	3.66E+00	5	uCi/g	Rep5 (18 db)	Np-237	7.14E-03	6.13E-07
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Am241	2.51E-01	4.17E+00	4	uCi/g	Rep4 (04db)	Pu-238	1.27E+00	1.09E-04
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Am241	2.34E-01	3.87E+00	2	uCi/g	Rep2 (02db)	Pu-239	3.04E-01	2.61E-05
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Am241	2.29E-01	3.80E+00	9	uCi/g	Rep9 (09db)	Pu-240	2.32E-01	1.99E-05
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Am-241	4.61E-02	1.33E-01	1	uCi/g	Rep1	Tc-99	1.59E-01	1.36E-05
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Am-241	5.58E-02	1.32E-01	2	uCi/g	Rep2			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Am-241	3.48E-02	8.98E-02	7	uCi/g	Rep7			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Am-241	3.43E-02	1.06E-01	9	uCi/g	Rep9			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Am-241	5.52E-02	1.42E-01	5	uCi/g	Rep5			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Am-241	7.47E-02	1.25E-01	4	uCi/g	Rep4			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Am-241	4.09E-02	1.13E-01	6	uCi/g	Rep6			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Am-241	5.79E-02	1.59E-01	3	uCi/g	Rep3			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Am-241	3.53E-02	1.36E-01	8	uCi/g	Rep8			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Am-241	7.97E-02	2.49E-01	3	uCi/g	Rep3 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Am-241	1.08E-01	3.64E-01	2	uCi/g	Rep2 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Am-241	9.89E-02	2.96E-01	1	uCi/g	Rep1 (B75)			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Am-241	8.69E-02	3.42E-01	3	uCi/g	Rep3			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Am-241	1.28E-01	4.78E-01	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Am-241	1.21E-01	4.65E-01	2	uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Am-241	6.88E-02	5.35E-01	1	uCi/g	Rep1			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Am-241	8.38E-02	5.55E-01	2	uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Am-241	8.33E-02	5.25E-01	3	uCi/g	Rep3			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Am-241	2.39E-01	7.67E-01	1	uCi/g	Rep1 (38)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Am-241	2.67E-01	7.18E-01	2	uCi/g	Rep2 (39)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Am-241	4.17E-01	7.09E-01	3	uCi/g	Rep3 (40)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Am-241	5.57E-01	1.07E+00	3	uCi/g	Rep3			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Am-241	4.07E-01	8.47E-01	2	uCi/g	Rep2			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Am-241	3.27E-01	1.00E+00	1	uCi/g	Rep1			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Am-241	2.65E-01	8.74E-01	1	uCi/g	Rep1			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Am-241	2.68E-01	8.92E-01	2	uCi/g	Rep2			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Am-241	2.74E-01	9.02E-01	3	uCi/g	Rep3			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Am-241	6.10E-01	1.50E+00	3	uCi/g	Rep3 (64DB)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Am-241	3.43E-01	7.48E-01	1	uCi/g	Rep1 (62DB)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Am-241	5.18E-01	9.70E-01	2	uCi/g	Rep2 (63DB)			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	Am-241	4.36E-01	1.31E+00	1	uCi/g	Rep1			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	Am-241	5.18E-01	1.24E+00	2	uCi/g	Rep2			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	Am-241	5.63E-01	1.12E+00	3	uCi/g	Rep3			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Am-241	7.91E-01	1.31E+00	3	uCi/g	Rep3 (B75)			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Am-241	1.10E+00	1.58E+00	2	uCi/g	Rep2 (B75)			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Am-241	7.99E-01	1.57E+00	1	uCi/g	Rep1 (B75)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Am-241	1.18E+00	2.25E+00	4	uCi/g	Rep4			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Am-241	6.62E-01	1.79E+00	3	uCi/g	Rep3			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Am-241	8.90E-01	1.69E+00	2	uCi/g	Rep2			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Am-241	5.63E-01	1.79E+00	1	uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Am-241	1.98E+00	4.64E+00	5	uCi/g	Rep5			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Am-241	8.64E-01	3.08E+00	3	uCi/g	Rep3			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Am-241	9.52E-01	3.87E+00	6	uCi/g	Rep6			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Am-241	9.96E-01	4.03E+00	7	uCi/g	Rep7			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Am-241	2.31E+00	2.92E+00	1	uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Am-241	<2.73E+0		8	uCi/g	Rep8			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Am-241	6.94E-01	3.95E+00	4	uCi/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Am-241	1.25E+00	4.27E+00	2	uCi/g	Rep2			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Am-241	1.01E+00	3.37E+00	9	uCi/g	Rep9			
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Am243	1.35E-03	2.10E-02	1	uCi/g	Rep1 (B75)			

PRIM_SAM_KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPOIN_T	SAMTYPE	VITBATCH	RES_TYP1	UNCERTAINTY_ALUE	RESULT_VALUE	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) VM	Scaling factors
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Am243	1.49E-03	2.32E-02	4	uCi/g	Rep4 (B75			
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Am243	1.55E-03	2.41E-02	3	uCi/g	Rep3 (B75			
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Am243	1.22E-03	1.89E-02	2	uCi/g	Rep2 (B75			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Am243	2.92E-03	4.52E-02	9	uCi/g	Rep9 (09db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Am243	2.88E-03	4.47E-02	8	uCi/g	Rep8 (08db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Am243	2.82E-03	4.36E-02	5	uCi/g	Rep5 (18 db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Am243	2.86E-03	4.44E-02	3	uCi/g	Rep3 (03db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Am243	2.97E-03	4.61E-02	7	uCi/g	Rep7 (07db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Am243	2.99E-03	4.61E-02	2	uCi/g	Rep2 (02db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Am243	3.10E-03	4.62E-02	6	uCi/g	Rep6 (06db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Am243	2.98E-03	4.63E-02	1	uCi/g	Rep1 (01db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Am243	3.20E-03	4.97E-02	4	uCi/g	Rep4 (04db			
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Cm242	1.77E-03	2.22E-02	3	uCi/g	Rep3 (B75			
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Cm242	1.34E-03	1.61E-02	1	uCi/g	Rep1 (B75			
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Cm242	1.28E-03	1.52E-02	2	uCi/g	Rep2 (B75			
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Cm242	1.40E-03	1.76E-02	4	uCi/g	Rep4 (B75			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cm242	3.95E-03	4.45E-02	2	uCi/g	Rep2 (02db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cm242	3.54E-03	4.40E-02	6	uCi/g	Rep6 (06db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cm242	3.51E-03	4.52E-02	9	uCi/g	Rep9 (09db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cm242	3.20E-03	4.27E-02	8	uCi/g	Rep8 (08db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cm242	3.46E-03	4.45E-02	1	uCi/g	Rep1 (01db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cm242	3.47E-03	4.46E-02	7	uCi/g	Rep7 (07db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cm242	3.74E-03	4.16E-02	5	uCi/g	Rep5 (18 db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cm242	3.25E-03	4.14E-02	3	uCi/g	Rep3 (03db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cm242	3.65E-03	4.49E-02	4	uCi/g	Rep4 (04db			
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Cm243/244	1.71E-02	2.80E-01	1	uCi/g	Rep1 (B75			
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Cm243/244	1.54E-02	2.50E-01	2	uCi/g	Rep2 (B75			
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Cm243/244	1.87E-02	3.04E-01	3	uCi/g	Rep3 (B75			
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Cm243/244	1.86E-02	3.05E-01	4	uCi/g	Rep4 (B75			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cm243/244	4.35E-02	7.03E-01	2	uCi/g	Rep2 (02db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cm243/244	4.15E-02	6.82E-01	8	uCi/g	Rep8 (08db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cm243/244	4.03E-02	6.51E-01	5	uCi/g	Rep5 (18 db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cm243/244	4.20E-02	6.88E-01	9	uCi/g	Rep9 (09db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cm243/244	4.53E-02	7.41E-01	6	uCi/g	Rep6 (06db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cm243/244	4.28E-02	7.02E-01	7	uCi/g	Rep7 (07db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cm243/244	4.52E-02	7.38E-01	4	uCi/g	Rep4 (04db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cm243/244	4.10E-02	6.71E-01	3	uCi/g	Rep3 (03db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cm243/244	4.28E-02	7.01E-01	1	uCi/g	Rep1 (01db			
01-1392	7/11/2001		75WH-17	7/11/2001	B75WH	CFMT	WH	75	Co-60	3.02E-03	5.59E-03	8	uCi/g	Rep8			
01-1392	7/11/2001		75WH-17	7/11/2001	B75WH	CFMT	WH	75	Co-60		<3.95E-3		6	uCi/g	Rep6		
01-1392	7/11/2001		75WH-17	7/11/2001	B75WH	CFMT	WH	75	Co-60		<6.27E-3		1	uCi/g	Rep1		
01-1392	7/11/2001		75WH-17	7/11/2001	B75WH	CFMT	WH	75	Co-60	1.74E-03	4.23E-03	9	uCi/g	Rep9			
01-1392	7/11/2001		75WH-17	7/11/2001	B75WH	CFMT	WH	75	Co-60	2.32E-03	5.82E-03	7	uCi/g	Rep7			
01-1392	7/11/2001		75WH-17	7/11/2001	B75WH	CFMT	WH	75	Co-60	1.02E-02	1.78E-02	2	uCi/g	Rep2			
01-1392	7/11/2001		75WH-17	7/11/2001	B75WH	CFMT	WH	75	Co-60		<5.79E-3		5	uCi/g	Rep5		
01-1392	7/11/2001		75WH-17	7/11/2001	B75WH	CFMT	WH	75	Co-60	5.97E-03	9.66E-03	4	uCi/g	Rep4			
01-1392	7/11/2001		75WH-17	7/11/2001	B75WH	CFMT	WH	75	Co-60	7.08E-03	9.71E-03	3	uCi/g	Rep3			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Co-60	5.22E-03	1.22E-02	3	uCi/g	Rep3 (B75			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Co-60		<1.10E-2		2	uCi/g	Rep2 (B75		
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Co-60	7.07E-03	2.01E-02	1	uCi/g	Rep1 (B75			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Co-60	2.40E-02	2.99E-02	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Co-60		<1.43E-2		3	uCi/g	Rep3		
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Co-60		<1.19E-2		2	uCi/g	Rep2		
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Co-60		<1.44E-2		1	uCi/g	Rep1		
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Co-60		<1.55E-2		2	uCi/g	Rep2		
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Co-60		<1.33E-2		3	uCi/g	Rep3		
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Co-60		<3.28E-2		3	uCi/g	Rep3 (40		
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Co-60	1.87E-02	4.10E-02	1	uCi/g	Rep1 (38			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Co-60		<1.90E-2		2	uCi/g	Rep2 (39		
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Co-60		<3.51E-2		2	uCi/g	Rep2		
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Co-60		<2.80E-2		1	uCi/g	Rep1		
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Co-60		<2.75E-2		3	uCi/g	Rep3		
01-1722	8/21/2001		46-48,52-5	8/20/2001	175WH46,47,48,52,53	CFMT	WH	75	Co-60		<3.34E-2		2	uCi/g	Rep2		

PRIM_SAM_KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPOIN_T	SAMTYPE	VITBATCH	RES_TYP1	UNCERTAINTY	RESULT	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g)	Scaling factors
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VH46,47,48,52,53	CFMT	WH	75	Co-60		<2.94E-2	1	uCi/g	Rep1			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VH46,47,48,52,53	CFMT	WH	75	Co-60	1.39E-02	3.42E-02	3	uCi/g	Rep3			
01-1778	8/27/2001		62-64	8/25/2001	75VH62-64	CFMT	WH	75	Co-60	8.22E-02	1.03E-01	3	uCi/g	Rep3 (64DB)			
01-1778	8/27/2001		62-64	8/25/2001	75VH62-64	CFMT	WH	75	Co-60	4.10E-02	1.00E-01	2	uCi/g	Rep2 (63DB)			
01-1778	8/27/2001		62-64	8/25/2001	75VH62-64	CFMT	WH	75	Co-60		<3.14E-2	1	uCi/g	Rep1 (62DB)			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Co-60		<6.39E-2	3	uCi/g	Rep3 (B75)			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Co-60	8.81E-02	9.87E-02	2	uCi/g	Rep2 (B75)			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Co-60		<5.01E-2	1	uCi/g	Rep1 (B75)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Co-60	4.37E-02	7.48E-02	1	uCi/g	Rep1			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Co-60	4.42E-02	8.65E-02	3	uCi/g	Rep3			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Co-60	1.25E-01	1.59E-01	4	uCi/g	Rep4			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Co-60		<5.06E-2	2	uCi/g	Rep2			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Co-60	9.23E-02	2.81E-01	9	uCi/g	Rep9			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Co-60	2.05E-01	3.53E-01	7	uCi/g	Rep7			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Co-60		<2.04E-1	1	uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Co-60	9.86E-02	2.89E-01	5	uCi/g	Rep5			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Co-60	1.03E-01	2.07E-01	3	uCi/g	Rep3			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Co-60	1.61E-01	2.52E-01	4	uCi/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Co-60		<1.69E-1	6	uCi/g	Rep6			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Co-60	3.21E-01	3.93E-01	2	uCi/g	Rep2			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Co-60		<2.50E-1	8	uCi/g	Rep8			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75WH	CFMT	WH	75	Cs-137	7.74E+00	3.17E+02	2	uCi/g	Rep2			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75WH	CFMT	WH	75	Cs-137	7.52E+00	2.88E+02	6	uCi/g	Rep6			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75WH	CFMT	WH	75	Cs-137	8.54E+00	3.28E+02	3	uCi/g	Rep3			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75WH	CFMT	WH	75	Cs-137	7.63E+00	3.13E+02	8	uCi/g	Rep8			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75WH	CFMT	WH	75	Cs-137	6.84E+00	2.89E+02	7	uCi/g	Rep7			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75WH	CFMT	WH	75	Cs-137	7.47E+00	3.15E+02	1	uCi/g	Rep1			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75WH	CFMT	WH	75	Cs-137	7.85E+00	3.22E+02	5	uCi/g	Rep5			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75WH	CFMT	WH	75	Cs-137	7.87E+00	3.32E+02	4	uCi/g	Rep4			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75WH	CFMT	WH	75	Cs-137	6.60E+00	2.53E+02	9	uCi/g	Rep9			
01-1440	7/17/2001		21-23	7/17/2001	75VH21-75VH23	CFMT	WH	75	Cs-137	2.15E+01	7.98E+02	2	uCi/g	Rep2 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	75VH21-75VH23	CFMT	WH	75	Cs-137	1.59E+01	5.93E+02	3	uCi/g	Rep3 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	75VH21-75VH23	CFMT	WH	75	Cs-137	1.68E+01	6.36E+02	1	uCi/g	Rep1 (B75)			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Cs-137	3.00E+01	1.14E+03	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Cs-137	2.80E+01	1.05E+03	3	uCi/g	Rep3			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Cs-137	3.03E+01	1.13E+03	2	uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75VH32-75VH34	CFMT	WH	75	Cs-137	3.86E+01	1.43E+03	2	uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75VH32-75VH34	CFMT	WH	75	Cs-137	3.98E+01	1.50E+03	1	uCi/g	Rep1			
01-1557	7/30/2001		32,33,34	7/30/2001	75VH32-75VH34	CFMT	WH	75	Cs-137	3.48E+01	1.30E+03	3	uCi/g	Rep3			
01-1621	8/7/2001		38-40	8/7/2001	75VH38-75VH40	CFMT	WH	075	Cs-137	4.40E+01	1.85E+03	3	uCi/g	Rep3 (40)			
01-1621	8/7/2001		38-40	8/7/2001	75VH38-75VH40	CFMT	WH	075	Cs-137	4.49E+01	1.72E+03	2	uCi/g	Rep2 (39)			
01-1621	8/7/2001		38-40	8/7/2001	75VH38-75VH40	CFMT	WH	075	Cs-137	4.41E+01	1.81E+03	1	uCi/g	Rep1 (38)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Cs-137	5.41E+01	2.22E+03	2	uCi/g	Rep2			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Cs-137	5.24E+01	2.15E+03	3	uCi/g	Rep3			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Cs-137	5.95E+01	2.28E+03	1	uCi/g	Rep1			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VH46,47,48,52,53	CFMT	WH	75	Cs-137	6.29E+01	2.62E+03	6	uCi/g	Rep6			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VH46,47,48,52,53	CFMT	WH	75	Cs-137	6.40E+01	2.66E+03	4	uCi/g	Rep4			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VH46,47,48,52,53	CFMT	WH	75	Cs-137	6.29E+01	2.66E+03	1	uCi/g	Rep1			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VH46,47,48,52,53	CFMT	WH	75	Cs-137	6.87E+01	2.64E+03	3	uCi/g	Rep3			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VH46,47,48,52,53	CFMT	WH	75	Cs-137	6.84E+01	2.61E+03	5	uCi/g	Rep5			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VH46,47,48,52,53	CFMT	WH	75	Cs-137	6.48E+01	2.66E+03	2	uCi/g	Rep2			
01-1778	8/27/2001		62-64	8/25/2001	75VH62-64	CFMT	WH	75	Cs-137	7.48E+01	3.07E+03	3	uCi/g	Rep3 (64DB)			
01-1778	8/27/2001		62-64	8/25/2001	75VH62-64	CFMT	WH	75	Cs-137	8.13E+01	3.12E+03	1	uCi/g	Rep1 (62DB)			
01-1778	8/27/2001		62-64	8/25/2001	75VH62-64	CFMT	WH	75	Cs-137	7.53E+01	3.18E+03	2	uCi/g	Rep2 (63DB)			
01-1892	9/10/2001		80-84	9/4/2001	75VH80-75VH84	CFMT	WH	75	Cs-137	9.21E+01	3.78E+03	2	uCi/g	Rep2			
01-1892	9/10/2001		80-84	9/4/2001	75VH80-75VH84	CFMT	WH	75	Cs-137	1.05E+02	4.02E+03	3	uCi/g	Rep3			
01-1892	9/10/2001		80-84	9/4/2001	75VH80-75VH84	CFMT	WH	75	Cs-137	8.88E+01	3.75E+03	1	uCi/g	Rep1			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Cs-137	1.13E+02	4.52E+03	1	uCi/g	Rep1 (B75)			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Cs-137	1.03E+02	4.30E+03	2	uCi/g	Rep2 (B75)			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Cs-137	1.01E+02	4.11E+03	3	uCi/g	Rep3 (B75)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Cs-137	1.25E+02	5.08E+03	3	uCi/g	Rep3			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Cs-137	1.16E+02	4.89E+03	1	uCi/g	Rep1			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Cs-137	1.17E+02	4.91E+03	2	uCi/g	Rep2			

PRIM_SAM_KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPOIN_T	SAMTYPE	VITBATCH	RES_TYP1	UNCERTAINTYV ALUE	RESULT VALUE	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) W	Scaling factors
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Cs-137	1.13E+02	4.72E+03		4 uCi/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cs-137	2.88E+02	1.11E+04		5 uCi/g	Rep5			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cs-137	3.14E+02	1.17E+04		6 uCi/g	Rep6			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cs-137	3.08E+02	1.14E+04		3 uCi/g	Rep3			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cs-137	3.36E+02	1.22E+04		9 uCi/g	Rep9			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cs-137	3.18E+02	1.18E+04		4 uCi/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cs-137	3.20E+02	1.19E+04		7 uCi/g	Rep7			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cs-137	2.87E+02	1.10E+04		1 uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cs-137	3.03E+02	1.20E+04		8 uCi/g	Rep8			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cs-137	3.16E+02	1.17E+04		2 uCi/g	Rep2			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Density		1.02 (29.9)		1 g/mL	Rep1 (B74)			
01-2499	11/26/2001		10 - 13	11/24/2001	B75WM10 - 13	CFMT	WM (ACT #11)	075	Density		1.32 (25.8)		1 g/mL	Rep1			
01-2574	12/6/2001		10 thru 13	12/6/2001	B75 WGF 10-13	CFMT	WGF (ACT #18)	075	Density		1.40 (30.9)		1 g/mL	Rep1			
01-2624	12/11/2001		10 THRU 1	12/11/2001	B75SF10 - B75SF13	CFMT	SF (ACT #25C)	75	Density		1.44 (31.2)		1 g/mL	Rep1			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-154	3.05E-02	1.01E-01		4 uCi/g	Rep4			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-154	1.35E-02	6.50E-02		9 uCi/g	Rep9			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-154	1.81E-02	6.82E-02		7 uCi/g	Rep7			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-154	2.79E-02	8.81E-02		5 uCi/g	Rep5			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-154	2.60E-02	8.84E-02		6 uCi/g	Rep6			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-154	2.72E-02	8.54E-02		1 uCi/g	Rep1			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-154	2.50E-02	9.10E-02		2 uCi/g	Rep2			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-154	1.59E-02	7.44E-02		8 uCi/g	Rep8			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-154	2.50E-02	1.06E-01		3 uCi/g	Rep3			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Eu-154	4.12E-02	1.74E-01		3 uCi/g	Rep3 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Eu-154	5.32E-02	2.18E-01		2 uCi/g	Rep2 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Eu-154	5.19E-02	2.05E-01		1 uCi/g	Rep1 (B75)			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Eu-154	5.94E-02	2.39E-01		3 uCi/g	Rep3			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Eu-154	8.41E-02	2.68E-01		1 uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Eu-154	1.43E-01	2.46E-01		2 uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Eu-154	5.11E-02	2.69E-01		1 uCi/g	Rep1			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Eu-154	7.66E-02	2.55E-01		2 uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Eu-154	4.91E-02	2.80E-01		3 uCi/g	Rep3			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Eu-154	1.46E-01	5.44E-01		3 uCi/g	Rep3 (40)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Eu-154	1.40E-01	4.48E-01		1 uCi/g	Rep1 (38)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Eu-154	1.14E-01	4.70E-01		2 uCi/g	Rep2 (39)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Eu-154	1.86E-01	7.23E-01		3 uCi/g	Rep3			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Eu-154	1.52E-01	6.62E-01		2 uCi/g	Rep2			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Eu-154	1.50E-01	6.83E-01		1 uCi/g	Rep1			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Eu-154	1.45E-01	6.77E-01		1 uCi/g	Rep1			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Eu-154	1.04E-01	5.83E-01		3 uCi/g	Rep3			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Eu-154	1.27E-01	5.93E-01		2 uCi/g	Rep2			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Eu-154		<5.39E-1		2 uCi/g	Rep2 (63DB)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Eu-154	3.05E-01	1.15E+00		3 uCi/g	Rep3 (64DB)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Eu-154	2.06E-01	6.39E-01		1 uCi/g	Rep1 (62DB)			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Eu-154	3.33E-01	1.11E+00		3 uCi/g	Rep3 (B75)			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Eu-154		<9.13E-1		1 uCi/g	Rep1 (B75)			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Eu-154		<8.13E-1		2 uCi/g	Rep2 (B75)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Eu-154	3.33E-01	1.08E+00		2 uCi/g	Rep2			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Eu-154	3.44E-01	1.43E+00		3 uCi/g	Rep3			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Eu-154	4.09E-01	1.53E+00		4 uCi/g	Rep4			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Eu-154	3.17E-01	1.06E+00		1 uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Eu-154	8.40E-01	2.80E+00		3 uCi/g	Rep3			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Eu-154	1.19E+00	4.15E+00		8 uCi/g	Rep8			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Eu-154	1.07E+00	3.62E+00		2 uCi/g	Rep2			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Eu-154	5.63E-01	1.74E+00		4 uCi/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Eu-154	8.07E-01	2.69E+00		7 uCi/g	Rep7			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Eu-154		<2.57E+0		1 uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Eu-154		<8.76E-1		9 uCi/g	Rep9			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Eu-154	7.04E-01	2.88E+00		5 uCi/g	Rep5			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Eu-154	9.45E-01	2.78E+00		6 uCi/g	Rep6			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-155		<3.25E-2		9 uCi/g	Rep9			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-155		<7.29E-2		5 uCi/g	Rep5			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-155		<4.77E-2		7 uCi/g	Rep7			

PRIM_SAM_	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPOIN	SAMTYPE	MTBATCH	RES_TYP1	UNCERTAINTY	RESULT_	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE	Scaling
KEY						T				ALUE	VALUE					ACTIVITY	factors
																(uCi/g) W	
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-155		<4.34E-2	8	uCi/g	Rep6			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-155		<6.59E-2	6	uCi/g	Rep6			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-155		<7.27E-2	3	uCi/g	Rep3			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-155		<5.42E-2	2	uCi/g	Rep2			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-155		<6.37E-2	1	uCi/g	Rep1			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-155		<8.75E-2	4	uCi/g	Rep4			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Eu-155		<1.29E-1	2	uCi/g	Rep2 (B75			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Eu-155		<1.29E-1	1	uCi/g	Rep1 (B75			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Eu-155		<1.09E-1	3	uCi/g	Rep3 (B75			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Eu-155		<8.89E-2	3	uCi/g	Rep3			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Eu-155		<1.70E-1	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Eu-155		<1.08E-1	2	uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Eu-155		<1.06E-1	3	uCi/g	Rep3			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Eu-155		<1.12E-1	2	uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Eu-155		<6.33E-2	1	uCi/g	Rep1			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Eu-155		<4.18E-1	3	uCi/g	Rep3 (40			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Eu-155		<2.49E-1	2	uCi/g	Rep2 (39			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Eu-155		<2.14E-1	1	uCi/g	Rep1 (38			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Eu-155		<6.73E-1	3	uCi/g	Rep3			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Eu-155		<3.23E-1	1	uCi/g	Rep1			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Eu-155		<4.23E-1	2	uCi/g	Rep2			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Eu-155		<2.94E-1	3	uCi/g	Rep3			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Eu-155		<4.17E-1	1	uCi/g	Rep1			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Eu-155		<3.13E-1	2	uCi/g	Rep2			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Eu-155		<5.94E-1	1	uCi/g	Rep1 (62DB			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Eu-155		<6.42E-1	3	uCi/g	Rep3 (64DB			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Eu-155		<9.28E-1	2	uCi/g	Rep2 (63DB			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Eu-155		<7.74E-1	3	uCi/g	Rep3 (B75			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Eu-155		<1.30E+0	2	uCi/g	Rep2 (B75			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Eu-155		<1.10E+0	1	uCi/g	Rep1 (B75			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Eu-155		<1.35E+0	4	uCi/g	Rep4			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Eu-155		<7.14E-1	1	uCi/g	Rep1			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Eu-155		<8.66E-1	3	uCi/g	Rep3			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Eu-155		<6.08E-1	2	uCi/g	Rep2			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossAlpha	1.96E-01	2.31E-01	3	uCi/g	Rep3			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossAlpha	1.77E-01	2.25E-01	2	uCi/g	Rep2			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossAlpha	2.25E-01	3.25E-01	6	uCi/g	Rep6			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossAlpha	1.36E-01	1.86E-01	1	uCi/g	Rep1			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossAlpha	7.31E-02	1.83E-01	10	uCi/g	Rep10			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossAlpha	5.82E-02	1.31E-01	12	uCi/g	Rep12			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossAlpha	6.45E-02	1.49E-01	13	uCi/g	Rep13			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossAlpha	7.14E-02	2.03E-01	11	uCi/g	Rep11			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossAlpha	1.90E-01	2.24E-01	5	uCi/g	Rep5			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	GrossAlpha	1.14E-01	4.63E-01	2	uCi/g	Rep2			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	GrossAlpha	1.07E-01	4.35E-01	3	uCi/g	Rep3			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	GrossAlpha	1.07E-01	4.42E-01	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	GrossAlpha	1.35E-01	6.39E-01	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	GrossAlpha	1.43E-01	7.20E-01	2	uCi/g	Rep2			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	GrossAlpha	1.18E-01	4.74E-01	3	uCi/g	Rep3			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	GrossAlpha	3.69E-01	8.81E-01	2	uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	GrossAlpha	3.66E-01	8.73E-01	3	uCi/g	Rep3			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	GrossAlpha	3.14E-01	6.80E-01	1	uCi/g	Rep1			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	GrossAlpha	Not Measu		4	uCi/g	Rep4: U2			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	GrossAlpha	2.86E-01	6.49E-01	2	uCi/g	Rep2 (39			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	GrossAlpha	3.54E-01	9.98E-01	3	uCi/g	Rep3			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	GrossAlpha	3.95E-01	1.26E+00	1	uCi/g	Rep1 (38			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	GrossAlpha	4.56E-01	1.49E+00	1	uCi/g	Rep1			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	GrossAlpha	4.51E-01	1.23E+00	3	uCi/g	Rep3			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	GrossAlpha	4.55E-01	1.40E+00	2	uCi/g	Rep2			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	GrossAlpha	7.63E-01	2.01E+00	3	uCi/g	Rep3 (B 75			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	GrossAlpha	6.04E-01	1.16E+00	2	uCi/g	Rep2 (B 75			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	GrossAlpha	5.43E-01	7.98E-01	1	uCi/g	Rep1 (B 75			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	GrossAlpha	<2.65E+0		4	uCi/g	Rep4 (B75			

PRIM_SAM_KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPOIN T	SAMTYPE	VITBATCH	RES_TYP1	UNCERTAINTY	RESULT	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) VM	Scaling factors
01-1778	8/27/2001		62-64	8/25/2001	75VMH62-64	CFMT	WH	75	GrossAlpha		<2.63E+0	5	uCi/g	Rep5 (B75			
01-1778	8/27/2001		62-64	8/25/2001	75VMH62-64	CFMT	WH	75	GrossAlpha		<3.06E+0	6	uCi/g	Rep6 (B75			
01-1892	9/10/2001		80-84	9/4/2001	75VMH80- 75VMH84	CFMT	WH	75	GrossAlpha	1.94E+00	2.96E+00	3	uCi/g	Rep3 (#82			
01-1892	9/10/2001		80-84	9/4/2001	75VMH80- 75VMH84	CFMT	WH	75	GrossAlpha	1.78E+00	3.39E+00	1	uCi/g	Rep1 (#80			
01-1892	9/10/2001		80-84	9/4/2001	75VMH80- 75VMH84	CFMT	WH	75	GrossAlpha	1.57E+00	2.52E+00	2	uCi/g	Rep2 (#81			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	GrossBeta	7.13E+00	3.83E+02	1	uCi/g	Rep1			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	GrossBeta	8.25E+00	4.20E+02	5	uCi/g	Rep5			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	GrossBeta	6.69E+00	4.06E+02	10	uCi/g	Rep10			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	GrossBeta	6.62E+00	4.05E+02	12	uCi/g	Rep12			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	GrossBeta	5.77E+00	3.49E+02	11	uCi/g	Rep11			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	GrossBeta	9.47E+00	4.93E+02	3	uCi/g	Rep3			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	GrossBeta	8.15E+00	4.08E+02	6	uCi/g	Rep6			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	GrossBeta	8.02E+00	4.15E+02	2	uCi/g	Rep2			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	GrossBeta	5.68E+00	3.42E+02	13	uCi/g	Rep13			
01-1440	7/17/2001		21-23	7/17/2001	75VMH21-75VMH23	CFMT	WH	75	GrossBeta	1.24E+01	7.78E+02	3	uCi/g	Rep3			
01-1440	7/17/2001		21-23	7/17/2001	75VMH21-75VMH23	CFMT	WH	75	GrossBeta	1.54E+01	9.71E+02	2	uCi/g	Rep2			
01-1440	7/17/2001		21-23	7/17/2001	75VMH21-75VMH23	CFMT	WH	75	GrossBeta	1.23E+01	7.74E+02	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75VMH24-B75VMH26	CFMT	WH	75	GrossBeta	2.13E+01	1.36E+03	3	uCi/g	Rep3			
01-1501	7/24/2001		24-29	7/23/2001	B75VMH24-B75VMH26	CFMT	WH	75	GrossBeta	2.30E+01	1.47E+03	2	uCi/g	Rep2			
01-1501	7/24/2001		24-29	7/23/2001	B75VMH24-B75VMH26	CFMT	WH	75	GrossBeta	2.16E+01	1.37E+03	1	uCi/g	Rep1			
01-1557	7/30/2001		32,33,34	7/30/2001	75VMH32-75VMH34	CFMT	WH	75	GrossBeta	3.05E+01	1.84E+03	2	uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75VMH32-75VMH34	CFMT	WH	75	GrossBeta	3.01E+01	1.82E+03	1	uCi/g	Rep1			
01-1557	7/30/2001		32,33,34	7/30/2001	75VMH32-75VMH34	CFMT	WH	75	GrossBeta	2.78E+01	1.66E+03	3	uCi/g	Rep3			
01-1557	7/30/2001		32,33,34	7/30/2001	75VMH32-75VMH34	CFMT	WH	75	GrossBeta		Not Measu	4	uCi/g	Rep4: U2			
01-1621	8/7/2001		38-40	8/7/2001	75VMH38-75VMH40	CFMT	WH	075	GrossBeta	3.57E+01	2.18E+03	2	uCi/g	Rep2 (39			
01-1621	8/7/2001		38-40	8/7/2001	75VMH38-75VMH40	CFMT	WH	075	GrossBeta	3.66E+01	2.24E+03	1	uCi/g	Rep1 (38			
01-1621	8/7/2001		38-40	8/7/2001	75VMH38-75VMH40	CFMT	WH	075	GrossBeta	3.90E+01	2.39E+03	3	uCi/g	Rep3			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75VMH # 43 - 45	CFMT	WH	75	GrossBeta	4.75E+01	2.93E+03	2	uCi/g	Rep2			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75VMH # 43 - 45	CFMT	WH	75	GrossBeta	4.71E+01	2.91E+03	1	uCi/g	Rep1			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75VMH # 43 - 45	CFMT	WH	75	GrossBeta	4.65E+01	2.84E+03	3	uCi/g	Rep3			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VMH46,47,48,52,53	CFMT	WH	75	GrossBeta	5.67E+01	3.36E+03	2	uCi/g	Rep2 (B 75			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VMH46,47,48,52,53	CFMT	WH	75	GrossBeta	5.89E+01	3.48E+03	1	uCi/g	Rep1 (B 75			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VMH46,47,48,52,53	CFMT	WH	75	GrossBeta	5.72E+01	3.41E+03	3	uCi/g	Rep3 (B 75			
01-1778	8/27/2001		62-64	8/25/2001	75VMH62-64	CFMT	WH	75	GrossBeta	8.59E+01	4.19E+03	6	uCi/g	Rep6 (B75			
01-1778	8/27/2001		62-64	8/25/2001	75VMH62-64	CFMT	WH	75	GrossBeta	7.72E+01	3.81E+03	4	uCi/g	Rep4 (B75			
01-1778	8/27/2001		62-64	8/25/2001	75VMH62-64	CFMT	WH	75	GrossBeta	8.45E+01	4.28E+03	5	uCi/g	Rep5 (B75			
01-1892	9/10/2001		80-84	9/4/2001	75VMH80- 75VMH84	CFMT	WH	75	GrossBeta	1.03E+02	5.29E+03	3	uCi/g	Rep3 (#82			
01-1892	9/10/2001		80-84	9/4/2001	75VMH80- 75VMH84	CFMT	WH	75	GrossBeta	9.16E+01	4.92E+03	1	uCi/g	Rep1 (#80			
01-1892	9/10/2001		80-84	9/4/2001	75VMH80- 75VMH84	CFMT	WH	75	GrossBeta	8.97E+01	4.76E+03	2	uCi/g	Rep2 (#81			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	Na		Not Measu	8	ug/g	Rep8			
01-2326	11/2/2001		108-112	9/25/2001	B75VMH108,109,111 & 112	CFMT	WH	75VMH	Np237	3.49E-04	4.20E-03	4	uCi/g	Rep4 (B75			
01-2326	11/2/2001		108-112	9/25/2001	B75VMH108,109,111 & 112	CFMT	WH	75VMH	Np237	2.33E-04	2.47E-03	2	uCi/g	Rep2 (B75			
01-2326	11/2/2001		108-112	9/25/2001	B75VMH108,109,111 & 112	CFMT	WH	75VMH	Np237	2.60E-04	3.11E-03	3	uCi/g	Rep3 (B75			
01-2326	11/2/2001		108-112	9/25/2001	B75VMH108,109,111 & 112	CFMT	WH	75VMH	Np237	2.57E-04	2.69E-03	1	uCi/g	Rep1 (B75			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	WM (ACT #11)	075	Np237	5.86E-04	7.38E-03	1	uCi/g	Rep1 (01db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	WM (ACT #11)	075	Np237	5.11E-04	6.54E-03	4	uCi/g	Rep4 (04db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	WM (ACT #11)	075	Np237	6.22E-04	6.87E-03	2	uCi/g	Rep2 (02db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	WM (ACT #11)	075	Np237	7.07E-04	8.78E-03	7	uCi/g	Rep7 (07db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	WM (ACT #11)	075	Np237	6.77E-04	7.95E-03	6	uCi/g	Rep6 (06db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	WM (ACT #11)	075	Np237	5.62E-04	6.95E-03	9	uCi/g	Rep9 (09db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	WM (ACT #11)	075	Np237	6.08E-04	6.21E-03	5	uCi/g	Rep5 (18 db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	WM (ACT #11)	075	Np237	5.15E-04	6.44E-03	8	uCi/g	Rep8 (08db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	WM (ACT #11)	075	Np237	5.79E-04	7.17E-03	3	uCi/g	Rep3 (03db			
01-2500	11/26/2001		14	11/24/2001	B75VM14	CFMT	WM (ACT #11)	075	pH		0.15.6 (24 °C	1	su	Rep1			
01-2515	11/28/2001		B75PH01.0	11/28/2001	75PH01,75PH02	CFMT	B75 AFTER AC	75	pH		0.12.1 (27 °C	1	su	Rep1			
01-2575	12/6/2001		14 thru 16	12/6/2001	B75 WGF 14-16	CFMT	WGF (ACT #18)	075	pH		0.14.4 (27 °C	1	su	Rep1			
01-2575	12/6/2001		14 thru 16	12/6/2001	B75 WGF 14-16	CFMT	WGF (ACT #18)	075	pH		0.14.5 (27 °C	3	su	Rep3			
01-2575	12/6/2001		14 thru 16	12/6/2001	B75 WGF 14-16	CFMT	WGF (ACT #18)	075	pH		0.14.5 (27 °C	2	su	Rep2			
01-2622	12/11/2001		04 THRU 0	12/11/2001	B75SF04 - B75SF06	CFMT	SF (ACT #25C)	75	pH		0.14.1 (27 °C	3	su	Rep3			
01-2622	12/11/2001		04 THRU 0	12/11/2001	B75SF04 - B75SF06	CFMT	SF (ACT #25C)	75	pH		0.14.2 (27 °C	2	su	Rep2			
01-2622	12/11/2001		04 THRU 0	12/11/2001	B75SF04 - B75SF06	CFMT	SF (ACT #25C)	75	pH		0.14.1 (27 °C	1	su	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	WM (ACT #11)	075	Pu236		<8.77E-5	9	uCi/g	Rep9 (09db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	WM (ACT #11)	075	Pu236		<8.77E-5	1	uCi/g	Rep1 (01db			

PRIM_SAM_KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPOIN_T	SAMTYPE	VITBATCH	RES_TYP1	UNCERTAINTYV	RESULT_VALUE	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) Wt	Scaling factors
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Pu236		<1.04E-4	4	uCi/g	Rep4 (04db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Pu236		<8.77E-5	2	uCi/g	Rep2 (02db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Pu236		<8.77E-5	7	uCi/g	Rep7 (07db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Pu236		<7.74E-5	3	uCi/g	Rep3 (03db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Pu236		<9.46E-5	6	uCi/g	Rep6 (06db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Pu236		<8.08E-5	8	uCi/g	Rep8 (08db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Pu236		<8.08E-5	5	uCi/g	Rep5 (18 db)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-238	1.81E-03	3.08E-02	1	uCi/g	Rep1 (1)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-238	1.67E-03	3.72E-02	8	uCi/g	Rep8 (8DB):			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-238	3.46E-03	6.32E-02	3	uCi/g	Rep3 (3)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-238	1.45E-03	2.94E-02	7	uCi/g	Rep7 (7)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-238	2.51E-03	3.83E-02	6	uCi/g	Rep6 (11)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-238	2.94E-03	3.61E-02	4	uCi/g	Rep4 (4)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-238	1.35E-03	2.60E-02	9	uCi/g	Rep9 (9DB):			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-238	2.32E-03	3.54E-02	5	uCi/g	Rep5 (5)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-238	2.18E-03	3.45E-02	2	uCi/g	Rep2 (2)			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Pu-238	4.69E-03	7.93E-02	3	uCi/g	Rep3			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Pu-238	4.89E-03	7.93E-02	1	uCi/g	Rep1			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Pu-238	5.20E-03	9.13E-02	2	uCi/g	Rep2			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH28	CFMT	WH	75	Pu-238	7.22E-03	1.31E-01	2	uCi/g	Rep2			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH28	CFMT	WH	75	Pu-238	5.73E-03	1.30E-01	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH28	CFMT	WH	75	Pu-238	5.63E-03	1.27E-01	3	uCi/g	Rep3			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Pu-238	5.68E-03	1.43E-01	2	uCi/g	Rep2 (WH-)			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Pu-238	5.87E-03	1.50E-01	1	uCi/g	Rep1 (WH-)			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Pu-238	5.32E-03	1.27E-01	3	uCi/g	Rep3 (WH-)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Pu-238	8.59E-03	2.11E-01	1	uCi/g	Rep1 (38)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Pu-238	7.98E-03	1.95E-01	2	uCi/g	Rep2 (39)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Pu-238	7.79E-03	2.00E-01	3	uCi/g	Rep3 (40)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Pu-238	9.27E-03	2.62E-01	2	uCi/g	Rep2 (44)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Pu-238	9.75E-03	2.64E-01	1	uCi/g	Rep1 (43)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Pu-238	1.11E-02	2.77E-01	3	uCi/g	Rep3			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Pu-238	1.06E-02	3.10E-01	3	uCi/g	Rep3 (01-)			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Pu-238	1.16E-02	3.16E-01	1	uCi/g	Rep1 (01-)			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Pu-238	9.22E-03	2.99E-01	2	uCi/g	Rep2 (01-)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Pu-238	9.59E-03	3.71E-01	2	uCi/g	Rep2 (63)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Pu-238	1.11E-02	3.03E-01	1	uCi/g	Rep1 (62)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Pu-238	1.05E-02	3.93E-01	3	uCi/g	Rep3 (64)			
01-1892	9/10/2001		80-84	9/4/2001	75WH80- 75WH84	CFMT	WH	75	Pu-238	1.28E-02	4.21E-01	1	uCi/g	Rep1			
01-1892	9/10/2001		80-84	9/4/2001	75WH80- 75WH84	CFMT	WH	75	Pu-238	1.29E-02	4.06E-01	2	uCi/g	Rep2			
01-1892	9/10/2001		80-84	9/4/2001	75WH80- 75WH84	CFMT	WH	75	Pu-238	1.61E-02	4.40E-01	3	uCi/g	Rep3			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Pu-238	1.60E-02	4.49E-01	2	uCi/g	Rep2			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Pu-238	1.55E-02	4.57E-01	1	uCi/g	Rep1			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Pu-238	1.53E-02	4.62E-01	3	uCi/g	Rep3			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Pu-238	1.98E-02	4.64E-01	6	uCi/g	Rep6 (#109)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Pu-238	2.30E-02	5.33E-01	7	uCi/g	Rep7 (#111)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Pu-238	2.04E-02	4.70E-01	5	uCi/g	Rep5 (#108)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Pu-238	1.47E-02	4.88E-01	8	uCi/g	Rep8 (#112)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Pu-238	5.10E-02	1.17E+00	5	uCi/g	Rep5			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Pu-238	6.00E-02	1.27E+00	7	uCi/g	Rep7			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Pu-238	6.18E-02	1.28E+00	2	uCi/g	Rep2			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Pu-238	4.99E-02	1.17E+00	8	uCi/g	Rep8			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Pu-238	6.11E-02	1.27E+00	9	uCi/g	Rep9			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Pu-238	6.75E-02	1.51E+00	4	uCi/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Pu-238	5.81E-02	1.27E+00	1	uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Pu-238	6.13E-02	1.37E+00	6	uCi/g	Rep6			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Pu-238	5.04E-02	1.12E+00	3	uCi/g	Rep3			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-239+240	1.16E-03	1.50E-02	2	uCi/g	Rep2 (2)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-239+240	7.26E-04	1.14E-02	9	uCi/g	Rep9 (9DB):			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-239+240	1.76E-03	2.62E-02	3	uCi/g	Rep3 (3)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-239+240	9.81E-04	1.38E-02	1	uCi/g	Rep1 (1)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-239+240	7.81E-04	1.29E-02	7	uCi/g	Rep7 (7)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-239+240	8.99E-04	1.63E-02	8	uCi/g	Rep8 (8DB):			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-239+240	1.20E-03	1.46E-02	5	uCi/g	Rep5 (5)			

PRIM_SAM_KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPPOINT	SAMTYPE	MTBATCH	RES_TYP1	UNCERTAINTY	RESULT_VALUE	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) VM	Scaling factors
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-239+240	1.57E-03	1.57E-02	4	uCi/g	Rep4 (4)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-239+240	1.35E-03	1.68E-02	6	uCi/g	Rep6 (11)			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Pu-239+240	2.61E-03	3.78E-02	2	uCi/g	Rep2			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Pu-239+240	2.33E-03	3.21E-02	3	uCi/g	Rep3			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Pu-239+240	2.48E-03	3.33E-02	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/24/2001	B75WH24-B75WH26	CFMT	WH	75	Pu-239+240	2.80E-03	5.68E-02	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/24/2001	B75WH24-B75WH26	CFMT	WH	75	Pu-239+240	2.81E-03	5.44E-02	3	uCi/g	Rep3			
01-1501	7/24/2001		24-29	7/24/2001	B75WH24-B75WH26	CFMT	WH	75	Pu-239+240	3.78E-03	5.97E-02	2	uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Pu-239+240	3.12E-03	7.14E-02	1	uCi/g	Rep1 (WH)			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Pu-239+240	2.85E-03	6.10E-02	3	uCi/g	Rep3 (WH)			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Pu-239+240	3.05E-03	6.82E-02	2	uCi/g	Rep2 (WH)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Pu-239+240	4.09E-03	8.98E-02	1	uCi/g	Rep1 (38)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Pu-239+240	4.05E-03	8.90E-02	2	uCi/g	Rep2 (39)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Pu-239+240	3.89E-03	8.99E-02	3	uCi/g	Rep3 (40)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Pu-239+240	5.16E-03	1.15E-01	3	uCi/g	Rep3			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Pu-239+240	4.65E-03	1.14E-01	1	uCi/g	Rep1 (43)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Pu-239+240	4.40E-03	1.12E-01	2	uCi/g	Rep2 (44)			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Pu-239+240	4.15E-03	1.23E-01	2	uCi/g	Rep2 (01-)			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Pu-239+240	5.43E-03	1.36E-01	1	uCi/g	Rep1 (01-)			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Pu-239+240	4.87E-03	1.32E-01	3	uCi/g	Rep3 (01-)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Pu-239+240	5.87E-03	1.29E-01	1	uCi/g	Rep1 (62)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Pu-239+240	5.46E-03	1.63E-01	3	uCi/g	Rep3 (64)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Pu-239+240	4.99E-03	1.54E-01	2	uCi/g	Rep2 (63)			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	Pu-239+240	5.81E-03	1.71E-01	2	uCi/g	Rep2			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	Pu-239+240	7.21E-03	1.84E-01	3	uCi/g	Rep3			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	Pu-239+240	5.58E-03	1.73E-01	1	uCi/g	Rep1			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Pu-239+240	6.63E-03	1.89E-01	3	uCi/g	Rep3			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Pu-239+240	6.83E-03	1.82E-01	2	uCi/g	Rep2			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Pu-239+240	6.87E-03	1.91E-01	1	uCi/g	Rep1			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Pu-239+240	9.04E-03	1.94E-01	5	uCi/g	Rep5 (#108)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Pu-239+240	9.08E-03	1.99E-01	6	uCi/g	Rep6 (#109)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Pu-239+240	6.53E-03	2.04E-01	8	uCi/g	Rep8 (#112)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Pu-239+240	1.03E-02	2.27E-01	7	uCi/g	Rep7 (#111)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu-239+240	3.05E-02	5.36E-01	2	uCi/g	Rep2			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu-239+240	2.94E-02	5.10E-01	7	uCi/g	Rep7			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu-239+240	3.29E-02	6.42E-01	4	uCi/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu-239+240	3.08E-02	5.41E-01	9	uCi/g	Rep9			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu-239+240	2.50E-02	5.04E-01	8	uCi/g	Rep8			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu-239+240	2.47E-02	4.86E-01	5	uCi/g	Rep5			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu-239+240	2.49E-02	4.71E-01	3	uCi/g	Rep3			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu-239+240	2.87E-02	5.41E-01	1	uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu-239+240	3.04E-02	5.89E-01	6	uCi/g	Rep6			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu242		<5.72E-3	8	uCi/g	Rep8 (08db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu242		<5.47E-3	3	uCi/g	Rep3 (03db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu242		<6.25E-3	2	uCi/g	Rep2 (02db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu242		<7.38E-3	4	uCi/g	Rep4 (04db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu242		<6.21E-3	9	uCi/g	Rep9 (09db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu242		<5.72E-3	5	uCi/g	Rep5 (18 db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu242		<6.21E-3	7	uCi/g	Rep7 (07db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu242		<6.21E-3	1	uCi/g	Rep1 (01db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu242		<6.69E-3	6	uCi/g	Rep6 (06db)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Sr90	7.19E-01	2.50E+01	3	uCi/g	Rep3 (3DB)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Sr90	5.73E-01	1.87E+01	5	uCi/g	Rep5 (5DB)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Sr90	6.35E-01	2.11E+01	6	uCi/g	Rep6			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Sr90	6.11E-01	2.08E+01	2	uCi/g	Rep2 (2DB)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Sr90	5.11E-01	1.80E+01	1	uCi/g	Rep1 (1DB)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Sr90	6.23E-01	1.93E+01	4	uCi/g	Rep4 (4DB)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Sr90	6.14E-01	2.03E+01	8	uCi/g	Rep8 (8DB)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Sr90	5.31E-01	1.65E+01	7	uCi/g	Rep7 (7DB)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Sr90	5.45E-01	1.63E+01	9	uCi/g	Rep9 (9DB)			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Sr90	1.23E+00	4.91E+01	1	uCi/g	Rep1 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Sr90	1.49E+00	6.12E+01	2	uCi/g	Rep2 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Sr90	1.20E+00	4.75E+01	3	uCi/g	Rep3 (B75)			

PRIM_SAM_KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_ID	SAMPOIN T	SAMTYPE	VITBATCH	RES_TYP1	UNCERTAINTYV	RESULT VALUE	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) VM	Scaling factors
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Sr90	2.04E+00	8.77E+01	4	uCi/g	Rep4 (B75)			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Sr90	2.12E+00	9.16E+01	5	uCi/g	Rep5 (B75)			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Sr90	1.96E+00	8.42E+01	6	uCi/g	Rep6 (B75)			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Sr90	2.35E+00	1.02E+02	3	uCi/g	Rep3 (B75)			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Sr90	2.47E+00	1.07E+02	2	uCi/g	Rep2 (B75)			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Sr90	2.50E+00	1.09E+02	1	uCi/g	Rep1 (B75)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Sr90	2.99E+00	1.31E+02	1	uCi/g	Rep1 (38)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Sr90	2.86E+00	1.25E+02	2	uCi/g	Rep2 (39)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Sr90	3.22E+00	1.42E+02	3	uCi/g	Rep3 (40)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Sr90	4.07E+00	1.80E+02	1	uCi/g	Rep1 (B75)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Sr90	3.86E+00	1.69E+02	3	uCi/g	Rep3 (B75)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Sr90	3.96E+00	1.75E+02	2	uCi/g	Rep2 (B75)			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Sr90	4.30E+00	1.95E+02	2	uCi/g	Rep2 (47)			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Sr90	4.28E+00	1.95E+02	3	uCi/g	Rep3 (48)			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Sr90	4.29E+00	1.93E+02	1	uCi/g	Rep1 (46)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Sr90	5.31E+00	2.49E+02	5	uCi/g	Rep5 (63)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Sr90	4.00E+00	1.84E+02	4	uCi/g	Rep4 (62)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Sr90	5.56E+00	2.60E+02	6	uCi/g	Rep6 (64)			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	Sr90	5.30E+00	2.57E+02	2	uCi/g	Rep2 (#81)			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	Sr90	5.82E+00	2.72E+02	1	uCi/g	Rep1 (#80)			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	Sr90	6.15E+00	2.87E+02	3	uCi/g	Rep3 (#82)			
01-1918	9/16/2001		.03	9/15/2001	B75WH	CFMT	WH	75	Sr90	7.23E+00	3.31E+02	1	uCi/g	Rep1 (85)			
01-1918	9/16/2001		.03	9/15/2001	B75WH	CFMT	WH	75	Sr90	6.75E+00	3.09E+02	2	uCi/g	Rep2 (86)			
01-1918	9/16/2001		.03	9/15/2001	B75WH	CFMT	WH	75	Sr90	6.74E+00	3.10E+02	3	uCi/g	Rep3 (87)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Sr90	7.26E+00	3.37E+02	4	uCi/g	Rep4 (112)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Sr90	6.75E+00	3.11E+02	2	uCi/g	Rep2 (109)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Sr90	8.17E+00	3.80E+02	3	uCi/g	Rep3 (111)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Sr90	7.09E+00	3.24E+02	1	uCi/g	Rep1 (108)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Sr90	1.84E+01	9.04E+02	6	uCi/g	Rep6 (6DB)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Sr90	1.69E+01	8.22E+02	3	uCi/g	Rep3 (3DB)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Sr90	1.85E+01	8.98E+02	1	uCi/g	Rep1 (1)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Sr90	1.74E+01	8.55E+02	7	uCi/g	Rep7 (7DB)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Sr90	1.77E+01	8.70E+02	9	uCi/g	Rep9 (9DB)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Sr90	1.98E+01	9.65E+02	4	uCi/g	Rep4 (4DB)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Sr90	1.80E+01	8.69E+02	2	uCi/g	Rep2 (2DB)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Sr90	1.70E+01	8.33E+02	8	uCi/g	Rep8 (8DB)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Sr90	1.66E+01	8.11E+02	5	uCi/g	Rep5			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Tc99	1.33E-03	1.03E-02	11	uCi/g	Rep11 (B75)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Tc99	1.29E-03	8.61E-03	6	uCi/g	Rep6 (B75)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Tc99	1.35E-03	7.89E-03	4	uCi/g	Rep4 (B75)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Tc99	1.17E-03	7.32E-03	5	uCi/g	Rep5 (B75)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Tc99	1.29E-03	9.71E-03	10	uCi/g	Rep10 (B75)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Tc99	1.24E-03	8.07E-03	7	uCi/g	Rep7 (B75)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Tc99	1.29E-03	8.53E-03	3	uCi/g	Rep3 (B75)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Tc99	9.48E-04	8.11E-03	1	uCi/g	Rep1 (B75)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Tc99	1.13E-03	7.77E-03	2	uCi/g	Rep2 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Tc99	1.74E-03	1.58E-02	3	uCi/g	Rep3			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Tc99	1.92E-03	1.84E-02	2	uCi/g	Rep2			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Tc99	1.70E-03	1.54E-02	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Tc99	2.08E-03	2.13E-02	2	uCi/g	Rep2			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Tc99	2.07E-03	2.15E-02	3	uCi/g	Rep3			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Tc99	2.13E-03	2.31E-02	1	uCi/g	Rep1			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Tc99	2.17E-03	2.65E-02	3	uCi/g	Rep3			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Tc99	2.04E-03	2.55E-02	1	uCi/g	Rep1			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Tc99	2.17E-03	2.61E-02	2	uCi/g	Rep2			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Tc99	2.54E-03	3.54E-02	2	uCi/g	Rep2 (39)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Tc99	2.46E-03	3.39E-02	1	uCi/g	Rep1 (38)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Tc99	2.54E-03	3.56E-02	3	uCi/g	Rep3 (40)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Tc99	2.65E-03	3.65E-02	1	uCi/g	Rep1			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Tc99	3.07E-03	4.19E-02	3	uCi/g	Rep3			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Tc99	2.95E-03	4.23E-02	2	uCi/g	Rep2			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Tc99	2.84E-03	4.33E-02	1	uCi/g	Rep1			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Tc99	2.69E-03	4.22E-02	2	uCi/g	Rep2			

PRIM_SAM_KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPOIN T	SAMTYPE	VITBATCH	RES_TYP1	UNCERTAINTYV ALUE	RESULT_ VALUE	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) Wt	Scaling factors
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VH46,47,48,52,53	CFMT	WH	75	Tc99	2.71E-03	4.42E-02	3	uCi/g	Rep3			
01-1778	8/27/2001		62-64	8/25/2001	75VH62-64	CFMT	WH	75	Tc99	2.82E-03	4.76E-02	6	uCi/g	Rep6 (64DB)			
01-1778	8/27/2001		62-64	8/25/2001	75VH62-64	CFMT	WH	75	Tc99	2.74E-03	5.11E-02	5	uCi/g	Rep5 (63DB)			
01-1778	8/27/2001		62-64	8/25/2001	75VH62-64	CFMT	WH	75	Tc99	2.73E-03	5.06E-02	4	uCi/g	Rep4 (62DB)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Tc99	6.86E-03	1.67E-01	4	uCi/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Tc99	5.29E-03	1.34E-01	9	uCi/g	Rep9			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Tc99	6.80E-03	1.65E-01	6	uCi/g	Rep6			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Tc99	6.90E-03	1.70E-01	1	uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Tc99	6.67E-03	1.63E-01	3	uCi/g	Rep3			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Tc99	6.55E-03	1.63E-01	5	uCi/g	Rep5			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Tc99	6.58E-03	1.62E-01	7	uCi/g	Rep7			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	Tc99	7.04E-03	1.66E-01	2	uCi/g	Rep2			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	ICFMT	WM (ACT #11)	075	Tc99	5.42E-03	1.39E-01	8	uCi/g	Rep8			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75VH	ICFMT	WH	75	TotAlphaPu	2.23E-03	4.23E-02	7	uCi/g	Rep7 (7)			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75VH	CFMT	WH	75	TotAlphaPu	3.34E-03	4.95E-02	2	uCi/g	Rep2 (2)			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75VH	CFMT	WH	75	TotAlphaPu	2.79E-03	4.46E-02	1	uCi/g	Rep1 (1)			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75VH	CFMT	WH	75	TotAlphaPu	2.57E-03	5.35E-02	8	uCi/g	Rep8 (8DB)			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75VH	CFMT	WH	75	TotAlphaPu	2.08E-03	3.74E-02	9	uCi/g	Rep9 (9DB)			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75VH	CFMT	WH	75	TotAlphaPu	3.85E-03	5.51E-02	6	uCi/g	Rep6 (11)			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75VH	CFMT	WH	75	TotAlphaPu	4.51E-03	5.18E-02	4	uCi/g	Rep4 (4)			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75VH	CFMT	WH	75	TotAlphaPu	3.52E-03	5.00E-02	5	uCi/g	Rep5 (5)			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75VH	CFMT	WH	75	TotAlphaPu	5.22E-03	8.94E-02	3	uCi/g	Rep3 (3)			
01-1440	7/17/2001		21-23	7/17/2001	75VH21-75VH23	CFMT	WH	75	TotAlphaPu	7.80E-03	1.29E-01	2	uCi/g	Rep2			
01-1440	7/17/2001		21-23	7/17/2001	75VH21-75VH23	CFMT	WH	75	TotAlphaPu	7.02E-03	1.11E-01	3	uCi/g	Rep3			
01-1440	7/17/2001		21-23	7/17/2001	75VH21-75VH23	CFMT	WH	75	TotAlphaPu	7.37E-03	1.13E-01	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75VH24-B75VH26	ICFMT	WH	75	TotAlphaPu	1.10E-02	1.90E-01	2	uCi/g	Rep2			
01-1501	7/24/2001		24-29	7/23/2001	B75VH24-B75VH26	CFMT	WH	75	TotAlphaPu	8.64E-03	1.87E-01	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75VH24-B75VH26	CFMT	WH	75	TotAlphaPu	8.44E-03	1.81E-01	3	uCi/g	Rep3			
01-1557	7/30/2001		32,33,34	7/30/2001	75VH32-75VH34	CFMT	WH	75	TotAlphaPu	8.16E-03	1.88E-01	3	uCi/g	Rep3 (WH)			
01-1557	7/30/2001		32,33,34	7/30/2001	75VH32-75VH34	CFMT	WH	75	TotAlphaPu	8.73E-03	2.11E-01	2	uCi/g	Rep2 (WH)			
01-1557	7/30/2001		32,33,34	7/30/2001	75VH32-75VH34	CFMT	WH	75	TotAlphaPu	8.99E-03	2.21E-01	1	uCi/g	Rep1 (WH)			
01-1621	8/7/2001		38-40	8/7/2001	75VH38-75VH40	ICFMT	WH	075	TotAlphaPu	1.17E-02	2.90E-01	3	uCi/g	Rep3 (40)			
01-1621	8/7/2001		38-40	8/7/2001	75VH38-75VH40	ICFMT	WH	075	TotAlphaPu	1.27E-02	3.01E-01	1	uCi/g	Rep1 (38)			
01-1621	8/7/2001		38-40	8/7/2001	75VH38-75VH40	CFMT	WH	075	TotAlphaPu	1.20E-02	2.84E-01	2	uCi/g	Rep2 (39)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75VH # 43 - 45	CFMT	WH	75	TotAlphaPu	1.37E-02	3.73E-01	2	uCi/g	Rep2 (44)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75VH # 43 - 45	CFMT	WH	75	TotAlphaPu	1.44E-02	3.77E-01	1	uCi/g	Rep1 (43)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75VH # 43 - 45	ICFMT	WH	75	TotAlphaPu	1.63E-02	3.92E-01	3	uCi/g	Rep3			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VH46,47,48,52,53	ICFMT	WH	75	TotAlphaPu	1.34E-02	4.21E-01	2	uCi/g	Rep2 (01-)			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VH46,47,48,52,53	CFMT	WH	75	TotAlphaPu	1.54E-02	4.42E-01	3	uCi/g	Rep3 (01-)			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VH46,47,48,52,53	CFMT	WH	75	TotAlphaPu	1.70E-02	4.52E-01	1	uCi/g	Rep1 (01-)			
01-1778	8/27/2001		62-64	8/25/2001	75VH62-64	CFMT	WH	75	TotAlphaPu	1.46E-02	5.25E-01	2	uCi/g	Rep2 (63)			
01-1778	8/27/2001		62-64	8/25/2001	75VH62-64	CFMT	WH	75	TotAlphaPu	1.70E-02	4.32E-01	1	uCi/g	Rep1 (62)			
01-1778	8/27/2001		62-64	8/25/2001	75VH62-64	CFMT	WH	75	TotAlphaPu	1.59E-02	5.56E-01	3	uCi/g	Rep3 (64)			
01-1892	9/10/2001		80-84	9/4/2001	75VH80- 75VH84	CFMT	WH	75	TotAlphaPu	1.87E-02	5.77E-01	2	uCi/g	Rep2			
01-1892	9/10/2001		80-84	9/4/2001	75VH80- 75VH84	CFMT	WH	75	TotAlphaPu	1.84E-02	5.94E-01	1	uCi/g	Rep1			
01-1892	9/10/2001		80-84	9/4/2001	75VH80- 75VH84	CFMT	WH	75	TotAlphaPu	2.33E-02	6.24E-01	3	uCi/g	Rep3			
01-1918	9/16/2001		03	9/15/2001	B75VH	CFMT	WH	75	TotAlphaPu	2.30E-02	6.30E-01	2	uCi/g	Rep2			
01-1918	9/16/2001		03	9/15/2001	B75VH	ICFMT	WH	75	TotAlphaPu	2.24E-02	6.48E-01	1	uCi/g	Rep1			
01-1918	9/16/2001		03	9/15/2001	B75VH	CFMT	WH	75	TotAlphaPu	2.19E-02	6.51E-01	3	uCi/g	Rep3			
01-2026	9/26/2001		108-112	9/25/2001	B75VH108-112	CFMT	WH	75	TotAlphaPu	2.95E-02	6.64E-01	5	uCi/g	Rep5 (#108)			
01-2026	9/26/2001		108-112	9/25/2001	B75VH108-112	ICFMT	WH	75	TotAlphaPu	3.33E-02	7.60E-01	7	uCi/g	Rep7 (#111)			
01-2026	9/26/2001		108-112	9/25/2001	B75VH108-112	ICFMT	WH	75	TotAlphaPu	2.89E-02	6.64E-01	6	uCi/g	Rep6 (#109)			
01-2026	9/26/2001		108-112	9/25/2001	B75VH108-112	CFMT	WH	75	TotAlphaPu	2.12E-02	6.91E-01	8	uCi/g	Rep8 (#112)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	TotAlphaPu	9.18E-02	1.96E+00	6	uCi/g	Rep6			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	TotAlphaPu	9.23E-02	1.82E+00	2	uCi/g	Rep2			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	TotAlphaPu	7.57E-02	1.66E+00	5	uCi/g	Rep5			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	TotAlphaPu	1.00E-01	2.16E+00	4	uCi/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	TotAlphaPu	9.19E-02	1.81E+00	9	uCi/g	Rep9			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	TotAlphaPu	7.49E-02	1.68E+00	8	uCi/g	Rep8			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	TotAlphaPu	8.93E-02	1.78E+00	7	uCi/g	Rep7			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	TotAlphaPu	8.68E-02	1.81E+00	1	uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WM (ACT #11)	075	TotAlphaPu	7.53E-02	1.59E+00	3	uCi/g	Rep3			
01-1392	7/11/2001		75VH1-17	7/11/2001	B75VH	CFMT	WH	75	U	<2.28E+2		1	ug/g	Rep1			

PRIM_SAM_KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPOIN T	SAMTYPE	VITBATCH	RES_TYP1	UNCERTAINTY ALUE	RESULT VALUE	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) VM	Scaling factors
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	U		<3.16E+2		3 ug/g	Rep3			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	U		<3.13E+2		7 ug/g	Rep7			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	U		<2.66E+2		5 ug/g	Rep5			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	U		<3.30E+2		4 ug/g	Rep4			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	U		<3.34E+2		8 ug/g	Rep8			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	U		<3.16E+2		9 ug/g	Rep9			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	U		<3.13E+2		2 ug/g	Rep2			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	U		<2.78E+2		6 ug/g	Rep6			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	U		8.32E+02		2 ug/g	Rep2			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	U		8.87E+02		6 ug/g	Rep6			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	U		8.54E+02		4 ug/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	U		8.21E+02		3 ug/g	Rep3			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	U		8.19E+02		9 ug/g	Rep9			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	U		8.66E+02		7 ug/g	Rep7			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	U		8.40E+02		8 ug/g	Rep8			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	U		8.05E+02		1 ug/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	U		8.32E+02		5 ug/g	Rep5			
01-2573	12/6/2001	8/26/2002	1 thru 9	12/6/2001	B75 WGF 1-9	CFMT	WGF (ACT #18)	75	U		5.30E+02		2 ug/g	Rep2			
01-2573	12/6/2001	8/26/2002	1 thru 9	12/6/2001	B75 WGF 1-9	CFMT	WGF (ACT #18)	75	U		<5.24E+2		4 ug/g	Rep4			
01-2573	12/6/2001	8/26/2002	1 thru 9	12/6/2001	B75 WGF 1-9	CFMT	WGF (ACT #18)	75	U		<4.55E+2		6 ug/g	Rep6			
01-2573	12/6/2001	8/26/2002	1 thru 9	12/6/2001	B75 WGF 1-9	CFMT	WGF (ACT #18)	75	U		<4.79E+2		8 ug/g	Rep8			
01-2573	12/6/2001	8/26/2002	1 thru 9	12/6/2001	B75 WGF 1-9	CFMT	WGF (ACT #18)	75	U		<4.03E+2		1 ug/g	Rep1			
01-2573	12/6/2001	8/26/2002	1 thru 9	12/6/2001	B75 WGF 1-9	CFMT	WGF (ACT #18)	75	U		<4.03E+2		9 ug/g	Rep9			
01-2573	12/6/2001	8/26/2002	1 thru 9	12/6/2001	B75 WGF 1-9	CFMT	WGF (ACT #18)	75	U		<5.76E+2		5 ug/g	Rep5			
01-2573	12/6/2001	8/26/2002	1 thru 9	12/6/2001	B75 WGF 1-9	CFMT	WGF (ACT #18)	75	U		<4.78E+2		3 ug/g	Rep3			
01-2573	12/6/2001	8/26/2002	1 thru 9	12/6/2001	B75 WGF 1-9	CFMT	WGF (ACT #18)	75	U		<4.42E+2		7 ug/g	Rep7			

APPENDIX 7

RADMAN Waste Stream Report

APPENDIX 7 - RADMAN Waste Stream Report

RADMAN Waste Stream New Waste Stream Data

Report Date: 3/22/2004 during New Waste Stream Revision Date: 03/22/2004

Waste Description : West Valley Glass Chemical Form : Glass
Generating Process : Vitrification Operations Activated Metal : No
State Code : N/A Physical Form : Solid
Solidification Agent : <none> Activity Units : uCi/gm

Nuclide Name	Activity	Nuclide Type	Scaling Factor	Base Nuclide
H-3	1.89E-02	FP	<LLD>	Cs-137
C-14	1.15E-02	AP	4.84E-06	Cs-137
K-40	4.44E-02	NO	1.87E-05	Cs-137
Mn-54	8.12E-02	AP	3.42E-05	Cs-137
Co-60	4.95E-02	AP	2.08E-05	Cs-137
Ni-63	5.50E-01	AP	2.31E-04	Cs-137
Sr-90	1.36E+02	FP	5.73E-02	Cs-137
Zr-95	1.37E+01	FP	5.76E-03	Cs-137
Tc-99	6.00E-03	FP	2.52E-06	Cs-137
I-129	3.06E-03	FP	<LLD>	Cs-137
Cs-137	2.38E+03	FP	1.00E+00	Cs-137
Ce-144	1.40E+00	FP	<LLD>	Cs-137
Eu-154	6.93E-01	AP	2.92E-04	Cs-137
Th-228	2.85E-02	AP	1.20E-05	Cs-137
Th-230	1.98E-04	AP	8.32E-08	Cs-137
Th-232	2.18E-04	NO	9.15E-08	Cs-137
U-232	2.74E-02	AP	1.15E-05	Cs-137
U-233	1.12E-02	AP	4.71E-06	Cs-137
U-234	5.32E-03	NO	2.24E-06	Cs-137
U-235	2.04E-04	NO	8.58E-08	Cs-137
U-236	6.12E-04	AP	2.57E-07	Cs-137
U-238	1.22E-03	NO	5.13E-07	Cs-137
Np-237	3.36E-03	TR	1.41E-06	Cs-137
Pu-238	3.73E-01	TR	1.57E-04	Cs-137
Pu-239	8.58E-02	TR	3.61E-05	Cs-137
Pu-240	6.55E-02	TR	2.76E-05	Cs-137
Pu-241	1.75E+00	TR	7.36E-04	Cs-137

Nuclide Name	Activity	Nuclide Type	Scaling Factor	Base Nuclide
Am-241	1.63E+00	TR	6.84E-04	Cs-137
Am-243	1.90E-02	TR	7.98E-05	Cs-137
Cm-242	1.16E-01	TR	4.88E-05	Cs-137
Cm-243	0.28E-03	TR	3.90E-06	Cs-137
Cm-244	2.42E-01	TR	1.02E-04	Cs-137

APPENDIX 8

Plugged Discharge Port (Spout) Activity and Decay Correction Calculations (RADCALC)

APPENDIX 8 - Clogged Spout Activity Calculations

Total Mass (g)		99000				
	uCi/g	uCi	Ci			
Sr-90	870	86130000	86.13			
Cs-137	11644	1152756000	1152.756			
Scaling						
Isotope	Act (Ci)	Scaling Factor		Scaling Factors from Heel	Scaling Factors from Analytical	Diff. in Scaling Factors
C-14	2.22E-03	1.93E-06		4.83E-06		
K-40	8.60E-03	7.46E-06		1.87E-05		
Mn-54	1.57E-02	1.36E-05		3.41E-05		
Co-60	2.93E-02	2.54E-05		2.12E-05	2.54E-05	8.35E-01
Ni-63	1.07E-01	9.25E-05		2.32E-04		
Sr-90	8.61E+01	Analytical		Analytical		
Zr-95	2.65E+00	2.30E-03		5.76E-03		
Tc-99	1.57E-02	1.36E-05		2.81E-06	1.36E-05	2.07E-01
Cs-137	1.15E+03	1.00E+00		1.00E+00	1.00E+00	
Eu-154	2.92E-01	2.53E-04		2.99E-04	2.53E-04	1.18E+00
Th-228	5.56E-03	4.82E-06		1.21E-05		
TH-230	3.88E-05	3.37E-08		8.45E-08		
Th-232	4.34E-05	3.76E-08		9.44E-08		
U-232	5.29E-03	4.59E-06		1.15E-05		
U-233	2.16E-03	1.87E-06		4.69E-06		
U-234	1.03E-03	8.93E-07		2.24E-06		
U-235	3.95E-05	3.43E-08		8.60E-08		
U-236	1.19E-04	1.03E-07		2.58E-07		
U-238	2.41E-04	2.09E-07		5.24E-07		
Np-237	7.07E-04	6.13E-07		1.44E-06	6.13E-07	2.35E+00
Pu-238	1.26E-01	1.09E-04		1.59E-04	1.09E-04	1.46E+00
Pu-239	3.01E-02	2.61E-05		3.66E-05	2.61E-05	1.40E+00
Pu-240	2.29E-02	1.99E-05		2.80E-05	1.99E-05	1.41E+00
Pu-241	3.43E-01	2.97E-04		7.46E-04		
Am-241	3.83E-01	3.32E-04		6.96E-04	3.32E-04	2.10E+00
Am-243	4.55E-03	3.95E-06		8.38E-06	3.95E-06	2.12E+00
Cm-242	4.32E-03	3.75E-06		5.02E-05	3.75E-06	1.34E+01
Cm-243	2.49E-03	2.16E-06		3.99E-06	2.16E-06	1.85E+00
Cm-244	6.65E-02	5.77E-05		1.04E-04	5.77E-05	1.80E+00
				Ave Difference in Scaling Factor		2.51E+00

Appendix 8 - Decay Calc for Clogged Discharge Port

Radcalc 4.1
File Name: Melter Spout_062614.rad

6/26/2014 3:46 PM

This report was generated using an unvalidated installation of Radcalc version 4.1.

Radcalc 4.1: C:\WVDP - Melter\Radcalcs from ANL Computer\Melter Spout_062614.rad

Performed By: Chris Brandjes
Checked By:

===== Input Information =====

Comments:

Melter Spout - Act. based on 99 kg of glass at 2.6 g/cc density (1.35 ft3).

Decayed from 11/26/2001 to 09/02/2014. 11/26/2001 was the last Sample Date.

Initial Source Data:

Isotope	Ci	Gm	TBq
C-14	2.220E-03	4.957E-04	8.214E-05
K-40	8.600E-03	1.216E+03	3.182E-04
Mn-54	1.570E-02	2.024E-06	5.809E-04
Co-60	2.930E-02	2.589E-05	1.084E-03
Ni-63	1.070E-01	1.895E-03	3.959E-03
Sr-90	8.610E+01	6.234E-01	3.186E+00
Zr-95	2.650E+00	1.233E-04	9.805E-02
Tc-99	1.570E-02	9.295E-01	5.809E-04
Cs-137	1.150E+03	1.323E+01	4.255E+01
Eu-154	2.920E-01	1.080E-03	1.080E-02
Th-228	5.560E-03	6.783E-06	2.057E-04
Th-230	3.880E-05	1.882E-03	1.436E-06
Th-232	4.340E-05	3.958E+02	1.606E-06
U-232	5.290E-03	2.397E-04	1.957E-04
U-233	2.160E-03	2.242E-01	7.992E-05
U-234	1.030E-03	1.657E-01	3.811E-05
U-235	3.950E-05	1.828E+01	1.462E-06
U-236	1.190E-04	1.862E+00	4.403E-06
U-238	2.410E-04	7.170E+02	8.917E-06
Np-237	7.070E-04	1.003E+00	2.616E-05
Pu-238	1.260E-01	7.358E-03	4.662E-03
Pu-239	3.010E-02	4.853E-01	1.114E-03
Pu-240	2.290E-02	1.009E-01	8.473E-04
Pu-241	3.430E-01	3.314E-03	1.269E-02
Am-241	3.830E-01	1.118E-01	1.417E-02
Am-243	4.550E-03	2.278E-02	1.684E-04
Cm-242	4.320E-03	1.305E-06	1.598E-04
Cm-243	2.490E-03	5.079E-05	9.213E-05
Cm-244	6.650E-02	8.172E-04	2.461E-03

Total Activity: 1.240E+03 4.589E+01

* Radionuclides with an A1/A2 fraction of less than 0.001 will not be shown in the output.

Container Data:

Container Void Volume:	0	m^3
Container Mass:	1	kg
Mass of solid beryllium, lead, graphite, and hydrogenous material enriched with deuterium:	0	kg
Gross Mass:	100	kg

Waste Data:

Waste Form:	Normal	
Waste State:	Solid	
Waste Volume:	1.35	ft^3
Waste Mass:	99	kg

Radcalc 4.1
File Name: Melter Spout_062614.rad

6/26/2014 3:46 PM

Mass of solid lead:	0	kg
Mass of solid beryllium, graphite, and hydrogenous material enriched with deuterium:	0	kg
Waste Void Volume:	0	m ³

Decay Time Data:
Date to begin source decay: 11/26/2001
Date container sealed: 9/2/2014

===== Radioactive Decay Results =====

Decayed Source:

Isotope	Ci	Gm	TBq
C-14	2.217E-03	4.949E-04	8.201E-05
K-40	8.600E-03	1.216E+03	3.182E-04
Mn-54	4.997E-07	6.443E-11	1.849E-08
Co-60	5.467E-03	4.831E-06	2.023E-04
Ni-63	9.799E-02	1.735E-03	3.626E-03
Sr-90	6.332E+01	4.584E-01	2.343E+00
Y-90	6.333E+01	1.165E-04	2.343E+00
Zr-95	3.172E-22	1.476E-26	1.174E-23
Nb-95	6.994E-22	1.779E-26	2.588E-23
Nb-95m	3.631E-24	9.524E-30	1.344E-25
Tc-99	1.570E-02	9.295E-01	5.809E-04
Cs-137	8.566E+02	9.854E+00	3.169E+01
Ba-137m	8.086E+02	1.503E-06	2.992E+01
Eu-154	1.043E-01	3.857E-04	3.858E-03
Hg-206	7.135E-16	6.370E-24	2.640E-17
Tl-206	5.014E-14	2.308E-22	1.855E-15
Tl-207	1.863E-09	9.781E-18	6.893E-11
Tl-208	1.733E-03	5.852E-12	6.412E-05
Tl-209	5.578E-08	1.364E-16	2.064E-09
Tl-210	4.495E-11	6.527E-20	1.663E-12
Pb-209	2.582E-06	5.602E-13	9.555E-08
Pb-210	3.755E-08	4.888E-10	1.390E-09
Pb-211	1.868E-09	7.567E-17	6.911E-11
Pb-212	4.823E-03	3.471E-09	1.785E-04
Pb-214	2.140E-07	6.528E-15	7.919E-09
Bi-209	5.969E-25	6.629E-09	2.208E-26
Bi-210	3.745E-08	3.018E-13	1.385E-09
Bi-211	1.868E-09	4.548E-18	6.911E-11
Bi-212	4.823E-03	3.292E-10	1.785E-04
Bi-213	2.582E-06	1.334E-13	9.554E-08
Bi-214	2.141E-07	4.848E-15	7.921E-09
Bi-215	1.527E-15	1.292E-23	5.648E-17
Po-210	3.454E-08	7.686E-12	1.278E-09
Po-211	5.099E-12	4.921E-23	1.887E-13
Po-212	3.089E-03	1.730E-20	1.143E-04
Po-213	2.527E-06	2.004E-22	9.349E-08
Po-214	2.140E-07	6.646E-22	7.919E-09
Po-215	1.868E-09	6.337E-23	6.911E-11
Po-216	4.823E-03	1.385E-14	1.784E-04
Po-218	2.141E-07	7.689E-16	7.921E-09
At-215	7.472E-15	1.424E-29	2.765E-16
At-217	2.583E-06	1.605E-18	9.555E-08
At-218	4.067E-11	1.179E-21	1.505E-12
At-219	1.574E-15	1.650E-24	5.823E-17
Rn-217	3.099E-10	3.219E-24	1.147E-11
Rn-218	4.067E-14	2.751E-26	1.505E-15
Rn-219	1.868E-09	1.436E-19	6.911E-11
Rn-220	4.823E-03	5.248E-12	1.784E-04
Rn-222	2.141E-07	1.392E-12	7.921E-09

Radcalc 4.1
File Name: Melter Spout_062614.rad

6/26/2014 3:46 PM

Fr-221	2.583E-06	1.487E-14	9.555E-08
Fr-223	2.623E-11	6.782E-19	9.705E-13
Ra-223	1.868E-09	3.647E-14	6.911E-11
Ra-224	4.823E-03	3.012E-08	1.784E-04
Ra-225	2.591E-06	6.607E-11	9.585E-08
Ra-226	2.143E-07	2.168E-07	7.930E-09
Ra-228	3.409E-05	1.250E-07	1.261E-06
Ac-225	2.583E-06	4.451E-11	9.555E-08
Ac-227	1.901E-09	2.628E-11	7.033E-11
Ac-228	3.409E-05	1.525E-11	1.261E-06
Th-227	1.854E-09	6.035E-14	6.861E-11
Th-228	4.822E-03	5.883E-06	1.784E-04
Th-229	2.602E-06	1.224E-05	9.629E-08
Th-230	3.892E-05	1.888E-03	1.440E-06
Th-231	3.950E-05	7.432E-11	1.462E-06
Th-232	4.340E-05	3.958E+02	1.606E-06
Th-234	2.410E-04	1.041E-08	8.917E-06
Pa-231	1.066E-08	2.258E-07	3.946E-10
Pa-233	7.086E-04	3.414E-08	2.622E-05
Pa-234	3.615E-07	1.830E-13	1.337E-08
Pa-234m	2.410E-04	3.510E-13	8.917E-06
U-232	4.660E-03	2.111E-04	1.724E-04
U-233	2.160E-03	2.242E-01	7.992E-05
U-234	1.034E-03	1.664E-01	3.827E-05
U-235	3.950E-05	1.828E+01	1.462E-06
U-235m	3.007E-02	9.774E-10	1.113E-03
U-236	1.190E-04	1.862E+00	4.403E-06
U-237	4.556E-06	5.583E-11	1.686E-07
U-238	2.410E-04	7.170E+02	8.917E-06
Np-237	7.086E-04	1.005E+00	2.622E-05
Np-239	4.545E-03	1.959E-08	1.681E-04
Pu-238	1.139E-01	6.653E-03	4.215E-03
Pu-239	3.009E-02	4.852E-01	1.113E-03
Pu-240	2.294E-02	1.011E-01	8.488E-04
Pu-241	1.850E-01	1.787E-03	6.844E-03
Am-241	3.804E-01	1.110E-01	1.408E-02
Am-243	4.545E-03	2.276E-02	1.681E-04
Cm-242	1.047E-11	3.164E-15	3.876E-13
Cm-243	1.854E-03	3.781E-05	6.860E-05
Cm-244	4.067E-02	4.998E-04	1.505E-03
Total Activity:	1.793E+03		6.634E+01
w/o Daughters:	9.209E+02		3.408E+01

Decay Heat:
Heat Generated on Start Date: 1.408 W
Heat Generated on Seal Date: 4.551 W

===== Regulatory Requirements Warning =====

Radcalc utilizes numerically based criteria to classify packages against the regulations. Many regulations also include subjective criteria that Radcalc does not consider. The user must check to ensure that all requirements in the regulations are met.

===== DOT Classification Results =====

* DOT classification calculations are made at the end of the user-specified decay time.

Radioactive Determination:			
Radioactive:	Yes		(ACEMs and ALECs > 1.0)
ACEM Limit Fraction:	32470000	ACEMs	(Number of ACEMs)
ALEC Limit Fraction:	3.407E+09	ALECs	(Number of ALECs)

Radcalc 4.1
File Name: Melter Spout_062614.rad

6/26/2014 3:46 PM

* This package is not exempt from 49 CFR Subchapter C.

Effective A2s for Mixture:	4.133E+11	Bq	
Type Determination:			
Type:	B		(A2s > 1.0)
A2 Limit Fraction:	82.44	A2s	(Number of A2s)
Limited Quantity Determination:			
Limited Quantity:	No		(Solid, activity > 0.001 A2)
Activity:	82.44	A2	
	1793	Ci	
	66.34	TBq	
Fissile:	Yes		
Fissile Excepted:	Yes (c)		
LSA Determination:			
LSA-I:	No		(Fissile excepted, ACEMs > 30 x rad limits)
LSA-II:	No		(A2s/gm > 0.0001)
LSA-III:	Yes		(A2s/gm <= 0.002)
Specific Activity:	0.0008327	A2/gm	
	0.01811	Ci/gm	
HRCQ Determination:			
HRCQ:	No		(A2s <= 3000, Activity <= 1000 TBq)
A2 Limit Fraction:	82.44	A2s	
Activity:	1793	Ci	
	66.34	TBq	
Fissile Determination:			
Fissile:	Yes		(Contains fissile isotopes per 49 CFR 173.403)
Fissile Excepted Determination:			
Fissile Excepted:	Yes (c)		(Fissile <= 180 grams, non-fissile >= 2000 * fissile)
Fissile Mass:	18.99	gm	
Container beryllium, lead, graphite, and hydrogenous material enriched with deuterium:	0	gm	
Container Mass:	1000	gm	
Waste lead:	0	gm	
Waste beryllium, graphite, and hydrogenous material enriched with deuterium:	0	gm	
Waste Mass:	99000	gm	
Solid Non-Fissile Mass:	98980	gm	
Total Uranium Mass:	737.5	gm	
U-233 Mass:	0.2242	gm	
U-235 Mass:	18.28	gm	
Uranium Enrichment:	2.478	%	
Total Plutonium Mass:	0.5947	gm	
Pu-239 Mass:	0.4852	gm	
Pu-241 Mass:	0.001787	gm	
Reportable Quantity Determination:			
Reportable Quantity:	Yes		(RQs >= 1.0)
RQ Limit Fraction:	2366	RQs	(Number of RQs)
Shipping Papers and Labels:			
Isotope	Number of A2s	Fraction of A2s	Cumulative A2s
+ Cs-137	52.82	0.6408	52.82
+ Am-241	14.08	0.1707	66.9
+ Sr-90	7.809	0.09473	74.71
			Cumulative Fraction of A2s
			0.6408
			0.8115
			0.9062

Radcalc 4.1
File Name: Melter Spout_062614.rad

6/26/2014 3:46 PM

+	Pu-238	4.215	0.05113	78.92	0.9574
	Pu-239	1.113	0.01351	80.04	0.9709
	Pu-240	0.8488	0.0103	80.88	0.9812
	Cm-244	0.7525	0.009128	81.64	0.9903
	Th-228	0.1784	0.002164	81.81	0.9925
	U-232	0.1724	0.002092	81.99	0.9945
	Am-243	0.1681	0.00204	82.16	0.9966
	Pu-241	0.1141	0.001384	82.27	0.998

- + Contains 95% of the total A2s and must be included per 49 CFR 173.433.
- * Radionuclides comprising less than 0.1% of the total A2s are not shown in the list.

===== DOE Classification Results =====

- * DOE classification calculations are made at the end of the user-specified decay time.

DOE-STD-1027 Category Determination:

Category:	Cat 3	(Cat3s > 1.0, Cat2s <= 1.0)
Cat 2 Limit Fraction:	0.02564	
Cat 3 Limit Fraction:	19.37	

- * The DOE-STD-1027 category determination is based on dose-related limits.
The user must apply any criticality-related limits separately.

Dose-Equivalent Curies:

ICRP-72 DE-Ci:	0.6396
FGR-11 DE-Ci:	0.8536

TRU Waste Determination:

TRU Waste:	Yes	(TRU activity > 100 nCi/gm)
TRU Activity:	5601	nCi/g

WIPP Quantities:

FGE Value:	12.46
PE-Ci Value:	0.577

===== NRC Classification Results =====

- * NRC classification calculations are made at the end of the user-specified decay time.

NRC Container Category:

Container Category:	III	
LSA-I:	No	
LSA-II:	No	
LSA-III:	Yes	
Total Activity:	1793	Ci
A2 Limit Fraction:	82.44	A2s

APPENDIX 9

Airborne Sample Analysis from Vitrification Cell

APPENDIX 9 - Airborne Sample Analysis

Analysis of Multiple Sample Data Sets (SCAL)

Sample Data Set Scaling Factor Comparison

Session Date : 7/1/2014

(Last Column is Scaling Factor for All Data Set Values)

Page : 1

Waste :	Airborne c ontaminati on	Airborne C ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Average Data Set Scaling Factor
Date :	11/02/1999	11/02/1999	11/02/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	01/21/2000	01/21/2000	
Sample Id :	99-1961	99-1959	99-1960	99-2062	99-2085	99-2060	99-2061	99-2059	99-2085# 10	99-2061# 6	
Units :	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Sample	uCi/Sample	
Nuclide	Sample Scaling Factors										
Co-60	8.92E-05	2.22E-04	**	1.29E-04	8.41E-05	1.01E-04	9.19E-05	4.91E-05	3.66E-04	1.11E-03	1.81E-04
Sr-90	3.09E-01	5.65E-01	5.00E-01	4.63E-01	3.83E-01	4.19E-01	2.52E-01	1.92E-01	4.93E-01	1.66E-01	3.48E-01
Tc-99	3.63E-05	3.04E-06	4.80E-05	5.52E-07	1.95E-05	4.08E-07	3.58E-07	2.24E-07	9.88E-06	1.18E-05	3.42E-06
Cs-137	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Eu-154	2.48E-03	5.10E-03	4.30E-03	3.05E-03	3.10E-03	3.32E-03	1.79E-03	1.46E-03	4.37E-03	1.17E-03	2.73E-03
Pu-238	5.62E-04	1.04E-03	5.70E-04	1.02E-03	7.36E-04	7.34E-04	4.52E-04	3.09E-04	8.99E-04	2.18E-04	5.89E-04
Pu-239	1.46E-04	2.70E-04	1.52E-04	2.71E-04	1.90E-04	1.94E-04	1.11E-04	8.18E-05	2.32E-04	5.60E-05	1.53E-04
Pu-240	1.02E-04	1.88E-04	1.05E-04	1.88E-04	1.32E-04	1.35E-04	7.72E-05	5.66E-05	1.62E-04	3.89E-05	1.06E-04
Am-241	4.97E-03	9.62E-03	6.80E-03	7.49E-03	4.55E-03	6.37E-03	3.82E-03	2.74E-03	5.42E-03	4.62E-03	5.33E-03
H-3	**	**	**	**	**	**	**	**	1.34E-06	1.71E-06	2.99E-06
C-14	**	**	**	**	**	**	**	**	9.77E-05	9.05E-04	5.88E-04
Fe-55	**	**	**	**	**	**	**	**	3.72E-04	1.45E-03	1.45E-03
Ni-59	**	**	**	**	**	**	**	**	2.11E-05	**	7.88E-05
Ni-63	**	**	**	**	**	**	**	**	1.51E-03	9.93E-04	2.41E-03
I-129	**	**	**	**	**	**	**	**	1.59E-05	5.78E-05	5.99E-05
Pm-147	**	**	**	**	**	**	**	**	1.06E-02	2.79E-03	1.07E-02
U-232	**	**	**	**	**	**	**	**	4.11E-05	1.56E-04	1.58E-04
U-233	**	**	**	**	**	**	**	**	1.13E-06	3.05E-06	3.66E-06
U-234	**	**	**	**	**	**	**	**	3.96E-07	1.07E-06	1.29E-06
U-235	**	**	**	**	**	**	**	**	3.08E-08	1.36E-07	1.28E-07
U-236	**	**	**	**	**	**	**	**	7.17E-08	3.18E-07	2.98E-07
U-238	**	**	**	**	**	**	**	**	2.55E-07	**	9.48E-07

** - Indicates NO Value for Nuclide

Waste :	Airborne c ontaminati on	Airborne C ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	
Date :	11/02/1999	11/02/1999	11/02/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	01/21/2000	01/21/2000	Average
Sample Id :	99-1961	99-1959	99-1960	99-2062	99-2085	99-2060	99-2061	99-2059	99-2085#	99-2061#		Data Set
Units :	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Sample	uCi/Sample	Scaling
Nuclide	Sample Scaling Factors											Factor
Np-237	**	**	**	**	**	**	**	**	**	2.40E-06	7.59E-07	2.67E-06
Pu-241	**	**	**	**	**	**	**	**	**	5.48E-03	1.36E-03	5.39E-03
Pu-242	**	**	**	**	**	**	**	**	**	5.17E-06	3.66E-06	8.60E-06
Am-243	**	**	**	**	**	**	**	**	**	2.96E-04	1.69E-04	4.41E-04
Cm-242	**	**	**	**	**	**	**	**	**	5.32E-05	5.71E-05	1.09E-04
Cm-244	**	**	**	**	**	**	**	**	**	1.06E-03	8.91E-04	1.92E-03
Cm-245	**	**	**	**	**	**	**	**	**	2.38E-03	1.83E-03	4.13E-03
Cm-246	**	**	**	**	**	**	**	**	**	3.88E-04	2.99E-04	6.72E-04

** - Indicates NO Value for Nuclide

Analysis of Multiple Sample Data Sets (SCAL)

Sample Data Set Fractional Abundance Comparison
(Last Column is Average Abundance for All Data Set Values)

Session Date : 7/1/2014

Page : 1

Waste :	Airborne c ontaminati on	Airborne C ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on
Units :	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Sample	uCi/Sample
Sample Id :	99-1961	99-1959	99-1960	99-2062	99-2085	99-2060	99-2061	99-2059	99-2085# 10	99-2061# 6
Date :	11/02/1999	11/02/1999	11/02/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	01/21/2000	01/21/2000

The Topical Criteria for Co-60 (+/- 2) are Exceeded as Follows :

Sample	0.01	0.00	0.09
Average	0.01	0.01	0.01
Variance	2.17	3.19	7.15

The Topical Criteria for Cs-137 (+/- 2) are Exceeded as Follows :

Sample
Average
Variance

The Topical Criteria for Ce-144 (+/- 5) are Exceeded as Follows :

Sample
Average
Variance

Analysis of Multiple Sample Data Sets (SCAL)

Sample Data Set Fractional Abundance Comparison
(Last Column is Average Abundance for All Data Set Values)

Session Date : 7/1/2014

Page : 1

Waste :	Airborne c ontaminati on	Airborne C ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Average Data Set Abundance
Date :	11/02/1999	11/02/1999	11/02/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	01/21/2000	01/21/2000	
Sample Id :	99-1961	99-1959	99-1960	99-2062	99-2085	99-2060	99-2061	99-2059	99-2085# 10	99-2061# 6	
Units :	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Sample	uCi/Sample	
Nuclide	Sample Abundances in %										
Co-60	0.00677	0.01402	**	0.00874	0.00604	0.00707	0.00730	0.00410	0.02394	0.09366	0.01310
Sr-90	23.44375	35.72570	33.06920	31.37935	27.49610	29.32729	20.04233	16.03183	32.28174	14.04884	25.09735
Tc-99	0.00275	0.00019	0.00317	0.00004	0.00140	0.00003	0.00003	0.00002	0.00065	0.00100	0.00025
Cs-137	75.91960	63.23449	66.13839	67.79719	71.87101	69.91417	79.45353	83.57577	65.50503	84.41625	72.21240
Eu-154	0.18810	0.32242	0.28461	0.20673	0.22269	0.23200	0.14244	0.12195	0.28650	0.09859	0.19695
Pu-238	0.04266	0.06600	0.03768	0.06928	0.05292	0.05132	0.03593	0.02586	0.05891	0.01836	0.04256
Pu-239	0.01109	0.01706	0.01003	0.01838	0.01367	0.01354	0.00880	0.00683	0.01520	0.00473	0.01105
Pu-240	0.00771	0.01188	0.00697	0.01274	0.00947	0.00943	0.00613	0.00473	0.01059	0.00328	0.00768
Am-241	0.37755	0.60823	0.44996	0.50755	0.32669	0.44515	0.30350	0.22891	0.35510	0.39004	0.38484
H-3	**	**	**	**	**	**	**	**	**	0.00009	0.00014
C-14	**	**	**	**	**	**	**	**	**	0.00640	0.07641
Fe-55	**	**	**	**	**	**	**	**	**	0.02435	0.12200
Ni-59	**	**	**	**	**	**	**	**	**	0.00139	**
Ni-63	**	**	**	**	**	**	**	**	**	0.09859	0.08380
I-129	**	**	**	**	**	**	**	**	**	0.00104	0.00488
Pm-147	**	**	**	**	**	**	**	**	**	0.69406	0.23538
U-232	**	**	**	**	**	**	**	**	**	0.00269	0.01319
U-233	**	**	**	**	**	**	**	**	**	0.00007	0.00026
U-234	**	**	**	**	**	**	**	**	**	0.00003	0.00009
U-235	**	**	**	**	**	**	**	**	**	0.00000	0.00001
U-236	**	**	**	**	**	**	**	**	**	0.00000	0.00003
U-238	**	**	**	**	**	**	**	**	**	0.00002	**

** - Indicates NO Value for Nuclide

Waste :	Airborne c ontaminati on	Airborne C ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	
Date :	11/02/1999	11/02/1999	11/02/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	01/21/2000	01/21/2000	
Sample Id :	99-1961	99-1959	99-1960	99-2062	99-2085	99-2060	99-2061	99-2059	99-2085# 10	99-2061# 6		Average Data Set Abundance
Units :	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Sample	uCi/Sample	
Nuclide	Sample Abundances in %											
Np-237	**	**	**	**	**	**	**	**	**	0.00016	0.00006	0.00019
Pu-241	**	**	**	**	**	**	**	**	**	0.35913	0.11461	0.38917
Pu-242	**	**	**	**	**	**	**	**	**	0.00034	0.00031	0.00062
Am-243	**	**	**	**	**	**	**	**	**	0.01937	0.01423	0.03185
Cm-242	**	**	**	**	**	**	**	**	**	0.00348	0.00482	0.00786
Cm-244	**	**	**	**	**	**	**	**	**	0.06967	0.07517	0.13883
Cm-245	**	**	**	**	**	**	**	**	**	0.15603	0.15466	0.29799
Cm-246	**	**	**	**	**	**	**	**	**	0.02542	0.02520	0.04855

** - Indicates NO Value for Nuclide

Analysis of Multiple Sample Data Sets (SCAL)

Sample Data Set Value Comparison

Session Date : 7/1/2014

(Last Column is Average Value for All Data Sets)

Page : 1

Waste :	Airborne c ontaminati on	Airborne C ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Average Value ALL Data Sets
Date :	11/02/1999	11/02/1999	11/02/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	01/21/2000	01/21/2000	
Sample Id :	99-1961	99-1959	99-1960	99-2062	99-2085	99-2060	99-2061	99-2059	99-2085# 10	99-2061# 6	
Units :	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Sample	uCi/Sample	
Nuclide											
Co-60	4.97E-05	1.57E-04	**	2.36E-04	1.11E-04	2.70E-04	1.02E-04	1.56E-04	1.78E-03	1.52E-03	2.37E-04
Sr-90	1.72E-01	4.00E-01	1.22E-01	8.47E-01	5.05E-01	1.12E+00	2.80E-01	6.10E-01	2.40E+00	2.28E-01	4.54E-01
Tc-99	2.02E-05	2.15E-06	1.17E-05	1.01E-06	2.58E-05	1.09E-06	3.97E-07	7.11E-07	4.81E-05	1.62E-05	4.47E-06
Cs-137	5.57E-01	7.08E-01	2.44E-01	1.83E+00	1.32E+00	2.67E+00	1.11E+00	3.18E+00	4.87E+00	1.37E+00	1.31E+00
Eu-154	1.38E-03	3.61E-03	1.05E-03	5.58E-03	4.09E-03	8.86E-03	1.99E-03	4.64E-03	2.13E-02	1.60E-03	3.57E-03
Pu-238	3.13E-04	7.39E-04	1.39E-04	1.87E-03	9.72E-04	1.96E-03	5.02E-04	9.84E-04	4.38E-03	2.98E-04	7.71E-04
Pu-239	8.14E-05	1.91E-04	3.70E-05	4.96E-04	2.51E-04	5.17E-04	1.23E-04	2.60E-04	1.13E-03	7.67E-05	2.00E-04
Pu-240	5.66E-05	1.33E-04	2.57E-05	3.44E-04	1.74E-04	3.60E-04	8.57E-05	1.80E-04	7.87E-04	5.33E-05	1.39E-04
Am-241	2.77E-03	6.81E-03	1.66E-03	1.37E-02	6.00E-03	1.70E-02	4.24E-03	8.71E-03	2.64E-02	6.33E-03	6.97E-03
H-3	**	**	**	**	**	**	**	**	**	6.52E-06	2.34E-06
C-14	**	**	**	**	**	**	**	**	**	4.76E-04	1.24E-03
Fe-55	**	**	**	**	**	**	**	**	**	1.81E-03	1.98E-03
Ni-59	**	**	**	**	**	**	**	**	**	1.03E-04	**
Ni-63	**	**	**	**	**	**	**	**	**	7.33E-03	1.36E-03
I-129	**	**	**	**	**	**	**	**	**	7.74E-05	7.92E-05
Pm-147	**	**	**	**	**	**	**	**	**	5.16E-02	3.82E-03
U-232	**	**	**	**	**	**	**	**	**	2.00E-04	2.14E-04
Cm-245	**	**	**	**	**	**	**	**	**	1.16E-02	2.51E-03
Cm-246	**	**	**	**	**	**	**	**	**	1.89E-03	4.09E-04
U-233	**	**	**	**	**	**	**	**	**	5.49E-06	4.18E-06
U-234	**	**	**	**	**	**	**	**	**	1.93E-06	1.47E-06
U-235	**	**	**	**	**	**	**	**	**	1.50E-07	1.87E-07
U-236	**	**	**	**	**	**	**	**	**	3.49E-07	4.35E-07

** - Indicates NO Value for Nuclide

Waste :	Airborne c ontaminati on	Airborne C ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Average Value ALL Data Sets
Date :	11/02/1999	11/02/1999	11/02/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	01/21/2000	01/21/2000	
Sample Id :	99-1961	99-1959	99-1960	99-2062	99-2085	99-2060	99-2061	99-2059	99-2085# 10	99-2061# 6		
Units :	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Sample	uCi/Sample	
Nuclide	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
U-238	**	**	**	**	**	**	**	**	**	1.24E-06	**	1.24E-06
Np-237	**	**	**	**	**	**	**	**	**	1.17E-05	1.04E-06	3.49E-06
Pu-241	**	**	**	**	**	**	**	**	**	2.67E-02	1.86E-03	7.05E-03
Pu-242	**	**	**	**	**	**	**	**	**	2.52E-05	5.02E-06	1.12E-05
Am-243	**	**	**	**	**	**	**	**	**	1.44E-03	2.31E-04	5.77E-04
Cm-242	**	**	**	**	**	**	**	**	**	2.59E-04	7.82E-05	1.42E-04
Cm-244	**	**	**	**	**	**	**	**	**	5.18E-03	1.22E-03	2.51E-03
Totals :	7.34E-01	1.12E+00	3.69E-01	2.70E+00	1.84E+00	3.82E+00	1.40E+00	3.80E+00	7.43E+00	1.62E+00	1.81E+00	
Co-60/ Cs-137 Ratios:	8.92E-05	2.22E-04	**	1.29E-04	8.41E-05	1.01E-04	9.19E-05	4.91E-05	3.66E-04	1.11E-03		

** - Indicates NO Value for Nuclide

Analysis of Multiple Sample Data Sets (SCAL)

NRC Criteria for Scaling Factors (+/- 10) are Exceeded as Follows :

Session Date : 7/1/2014

Page : 1

Nuclide	Sample Id	Date	Sample Scaling Factor	Average Scaling Factor	Variance
Tc-99	99-1961	11/02/1999	3.63E-05	3.42E-06	10.61
Tc-99	99-1960	11/02/1999	4.80E-05	3.42E-06	14.03
Tc-99	99-2059	11/12/1999	2.24E-07	3.42E-06	15.28

APPENDIX 10

Melter Smear Survey Report

APPENDIX 10 - Melter Smear Survey Report

124255		Radiation and Contamination Survey Report				
Survey Number		West Valley Nuclear Services Co.				
Location EDR Work Area EDR		Instruments Used TYPE SERIAL # EFF. <input checked="" type="checkbox"/> SCINTILLATION 177 102730 <input checked="" type="checkbox"/> GM 177 75562 <input checked="" type="checkbox"/> IONIZATION R20 3841 <input checked="" type="checkbox"/> PROPORTIONAL TERN 14437				
Purpose Of SUPPORT ENTRY Survey		Additional Information Attached <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> ON BACK				
AREA/MATERIALS SURVEYED	SMEARABLE NET (DPM/100 cm ²) COUNT TIME 1 MIN		DIRECT CHECK NET CPM		RADIATION LEVEL	
	ALPHA	BETA	ALPHA	BETA	WO READING	Cor. Factor
(3) MASKS	<20	<200	—	<100	—	—
(3) PAIR'S	<20	<200	<5	<100	—	—
RADIO	<20	<200	<5	<100	—	—
R20	<20	<200	<5	<100	—	—
SMears From Vit Cell (all smears - 100 cm ²)						
MELTER 1	—	—	—	—	20/hr	Control
2	—	—	—	—	20/hr	Control
3	—	—	—	—	60/hr	Control
CFMT 1	—	—	—	—	500/hr	Control
2	—	—	—	—	50/hr	Control
3	—	—	—	—	50/hr	Control
MFHT 1	—	—	—	—	150/hr	Control
2	—	—	—	—	150/hr	Control
3	—	—	—	—	150/hr	Control
CONCLUSIONS - AREA/MATERIALS <input type="checkbox"/> RELEASABLE <input type="checkbox"/> NON-RELEASABLE <input checked="" type="checkbox"/> INFORMATION ONLY COMMENTS (IF ANY): PER RP ENGINEER, 1mb/hr = 6,000 dpm B						
RECOMMENDATIONS: <input checked="" type="checkbox"/> NO FURTHER ACTION REQUIRED <input type="checkbox"/> FURTHER ACTION REQUIRED IF FURTHER ACTION REQUIRED, DESCRIBE:						
Technician Name: SMITH, DANIEL B Date: 20 Apr 2004 Signature: [Signature] Time: 0830 Reviewer Name (Print): [Signature] Date: 4/20/04 Signature: [Signature] Time: 1345						

SMEARABLE NET (DPM/100 cm ²)			COMMENTS:
Count Time	Min.		
#	ALPHA	BETA	
1	<20	<200	
2			
3			
4			
5			
6			
7	<20	<200	
8	33	792	
9	<20	253	
10	<20	<200	
11			
12			
13	<20	<200	
14	<20	239	
15	<20	<200	
16	37	2609	
17	22	772	
18	56	1977	
19	<20	<200	
20	<20	652	
21	<20	280	
22	26	1483	
23	<20	<200	
24			
25			
26	<20	<200	

EDR

N

NON-MERCURY
LINER # HG-8

Box #

	CONTRACT	m ² /hr	meter
Top	3.0	0.5	
Bottom	2.0	0.3	
SIDE 1	13.0	1.0	
SIDE 2	0.5	0.2	
SIDE 3	0.3	0.1	
SIDE 4	2.0	0.4	

Survey #: 124255

WV-1156, Rev. 10

APPENDIX 11

Radiological Engineering Calculation (CALC-2007-048)

Radiological Engineering Calculation

Rule of thumb calculation to convert RO-20 Window Open (wo) readings of paper smears in mR/hr to dpm Beta-gamma.

Background

There are times in High Contamination Areas that a paper smear will have too much activity on it to be able to count it with normally used instruments (Tennelec/GMs). This calculation will provide a rule of thumb to convert mR/hr Window Open (wo) readings using and RO-20 to dpm beta-gamma on paper smears.

Given

1. This is for paper smears only; cloth smears typically pick up more activity.
2. The primary beta-gamma isotopes are Cs-137 and Sr-90.
3. Smear is held close to contact to a RO-20 (in a plastic bag) with the wo.
4. The highest and lowest smear from the surveys were eliminated to avoid single smear bias (surveys 142175 and 121948).

Evaluation

See Attached Calculation Sheet.

Conclusions

When counting paper smears with a (wo) RO-20 in a plastic bag, 1mR/hr = approximately 67,000 dpm beta-gamma.

Prepared by: David Biela David Biela 12-26-07
Print Name / Signature / Date

Peer Reviewed by: Richard Black Richard Black 12/26/07
Print Name / Signature / Date

Radiological Engineering Calculation

Rule of thumb calculation to convert RO-20 Window Open (wo) readings of paper smears in mR/hr to dpm Beta-gamma.

SURVEY RESULTS

SURVEY NUMBER	mR/hr RO- 20 (wo)	dpm (based on gm conversion)	dpm / 1 mR/hr RO-20 (wo)
142175	0.8	62,500	78,125
142175	0.3	15,625	52,083
121948	15.0	1,250,000	83,333
121948	9.0	500,000	55,556
AVERAGE			67,274

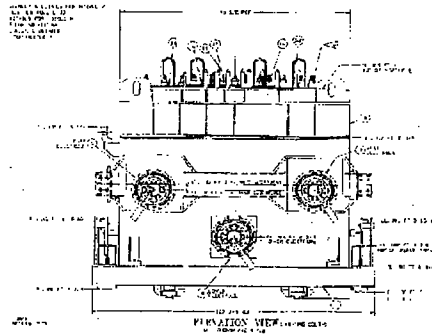
APPENDIX 12

Melter Surface Area Activity and Decay Correction Calculations (RADCALC)

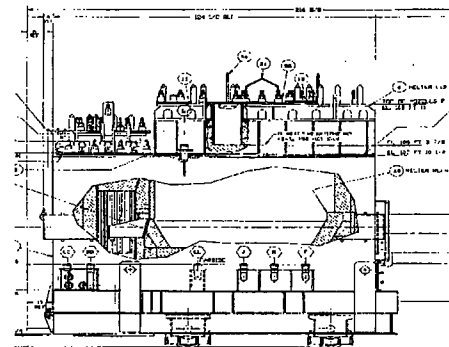
APPENDIX 12 - Melter Act and Decay Calc for Exterior Surface Contamination

Melter Surface Area

Electrode Face & Opposite side	Length (in)	Height (in)	Surface area (in ²)	Surface area (cm ²)	Surface area (cm ²) Both sides
Melter body	105.5	75.75	7991.625	51558.77	103117.54
Melter lid	105.5	24.5	2584.75	16675.77	33351.546
Melter base	129.75	12	1557	10045.34	20090.282



Sides Adjacent to Electrodes	Length (in)	Height (in)	Surface area (in ²)	Surface area (cm ²)	Surface area (cm ²) Both sides
Melter body & base	124.5	85.75	10675.88	68876.48	137752.95
Melter lid	85.125	24.5	2085.563	13455.22	26910.43
Top	Length (in)	Width (in)	Surface area (in ²)	Surface area (cm ²)	Surface area (cm ²) Both sections
Discharge Area (times 2)	36.875	47.8125	1763.086	11374.73	22749.45
Lid Assembly area	85.125	105.5	8980.688	57989.8	
Bottom	129.75	132.875	17240.53	111220	



Total surface area of Melter box = 513141.01 cm²

Ancillary Equipment on lid of MELTER

Number of Hems	Ave. Length (in)	Radius (in)	Surface area (in ²)	Surface area (cm ²)
100	4	0.5	1413.7	9120.8

Total surface area of MELTER = 522261.61 cm²

Total Activity Calculation

Smear Result R/hr	Smear sample Area cm ²	Total Surface Area cm ²	Wipe Efficiency	dpm/cm ²	Total dpm	Total Act (Ci)
6	100	522261.6	10%	4020000	2.09949E+12	9.46

1. Per RP Engineer - 1mR/hr = 67,000 dpm B'

APPENDIX 12 - Activity Calculation for Surface Contamination of Exterior of MELTER

Airborne Sample Data		From Refractory		Final Isotopic Data Used for Characterization			
Isotope	Ave Data Set Scaling Factor (from Airborne)	Isotope	Scaling Factors	Isotope	Scaling Factors	% Abundance	Act (Ci)
Cs-137	1.00E+00	Cs-137	1.00E+00	Cs-137	1.00E+00	67.975%	6.43E+00
Ba-137m				Ba-137m		0.944 times Cs-137	6.07E+00
Sr-90	3.48E-01	Sr-90	4.42E-01	Sr-90	4.42E-01	30.045%	2.84E+00
Y-90				Y-90		Same as Sr-90	2.84E+00
Pm-147	1.07E-02			Pm-147	1.07E-02	0.727%	6.88E-02
Am-241	5.33E-03	Am-241	2.66E-03	Am-241	5.33E-03	0.362%	3.43E-02
Eu-154	2.73E-03	Eu-154	4.57E-03	Eu-154	4.57E-03	0.311%	2.94E-02
Ni-63	2.41E-03			Ni-63	2.41E-03	0.164%	1.55E-02
Fe-55	1.45E-03			Fe-55	2.45E-03	0.167%	1.58E-02
Pu-238	5.89E-04	Pu-238	4.82E-04	Pu-238	5.89E-04	0.040%	3.79E-03
C-14	5.88E-04			C-14	5.88E-04	0.040%	3.78E-03
Co-60	1.81E-04	Co-60	2.04E-04	Co-60	2.04E-04	0.014%	1.31E-03
U-232	1.58E-04			U-232	1.58E-04	0.011%	1.02E-03
Pu-239	1.53E-04	Pu-239	1.16E-04	Pu-239	1.53E-04	0.010%	9.84E-04
Pu-240	1.06E-04	Pu-240	8.83E-05	Pu-240	1.06E-04	0.007%	6.82E-04
Ni-59	7.88E-05			Ni-59	7.88E-05	0.005%	5.07E-04
I-129	5.99E-05			I-129	5.99E-05	0.004%	3.85E-04
U-233	3.66E-06	U-233	1.82E-06	U-233	3.66E-06	0.000%	2.35E-05
Tc-99	3.42E-06	Tc-99	1.62E-04	Tc-99	1.62E-04	0.011%	1.04E-03
H-3	2.99E-06			H-3	2.99E-06	0.000%	1.92E-05
U-234	1.29E-06	U-234	8.68E-07	U-234	1.29E-06	0.000%	8.30E-06
U-238	9.48E-07	U-238	3.62E-07	U-238	9.48E-07	0.000%	6.10E-06
U-236	2.98E-07	U-236	6.46E-07	U-236	6.46E-07	0.000%	4.15E-06
U-235	1.28E-07	U-235	2.15E-07	U-235	2.15E-07	0.000%	1.38E-06
		Cm-242	2.13E-05	Cm-242	2.13E-05	0.001%	1.37E-04
		Am-243	2.09E-05	Am-243	2.09E-05	0.001%	1.34E-04
		Cm-243	1.25E-05	Cm-243	1.25E-05	0.001%	8.04E-05
		Th-228	7.08E-06	Th-228	7.08E-06	0.00048%	4.56E-05
		Np-237	2.63E-06	Np-237	2.63E-06	0.00018%	1.69E-05
		Th-232	1.30E-07	Th-232	1.30E-07	0.00001%	8.35E-07
		Th-230	4.73E-08	Th-230	4.73E-08	0.000003%	3.04E-07
		Pu-241	1.15E-03	Pu-241	1.15E-03	0.078%	7.42E-03
		Cm-244	3.34E-04	Cm-244	3.34E-04	0.023%	2.15E-03

1. Used maximum smear result from Survey Number 124255 to calculate total act on exterior of melter.
2. Used 67,000 dpm = 1 mR/hr to convert from Dose to Act/100 cm²
3. Used wiping efficiency of 10% (within DOT guidelines)
4. Activity calculated is presumed to be removable only - no value calculated for fixed.
5. Surface area of melter was derived from Reference Drawings and included ancillary equipment on top lid (electrodes, airlift, passive cooled feed nozzle) for 100 electrodes being 4" tall with a 0.5" radius
6. Decay was not included in activity determination since smear was taken 4/20/04
7. Isotopic distribution included the higher of the two scaling factors when comparing results from Airborne samples and the Average Geomean of all of the batches (refractory distribution). If isotopes did not appear a distribution, they were added at their respective abundance for that material resulting in a relative abundance of 1.47

Radcalc 4.1

9/9/2014 10:58 AM

File Name: Act Calc for Exterior Surface Contamination.rad

This report was generated using an unvalidated installation of Radcalc version 4.1.

Radcalc 4.1: C:\WVDP - Melter\Recharacterization Information\Exterior of Melter\Act Calc for Exterior Surface Contamination.rad

Performed By: Chris Brandjes
Checked By:

===== Input Information =====

Comments:
Activity Calc for Exterior Surface of Melter

Initial Source Data:

Isotope	Ci	Gm	TBq
H-3	1.920E-05	1.997E-09	7.104E-07
C-14	3.780E-03	8.439E-04	1.399E-04
Fe-55	1.580E-02	6.641E-06	5.846E-04
Co-60	1.310E-03	1.158E-06	4.847E-05
Ni-59	5.070E-04	6.352E-03	1.876E-05
Ni-63	1.550E-02	2.745E-04	5.735E-04
Sr-90	2.840E+00	2.056E-02	1.051E-01
Tc-99	1.040E-03	6.157E-02	3.848E-05
I-129	3.850E-04	2.235E+00	1.425E-05
Cs-137	6.430E+00	7.397E-02	2.379E-01
Pm-147	6.880E-02	7.417E-05	2.546E-03
Eu-154	2.940E-02	1.088E-04	1.088E-03
Th-228	4.560E-05	5.563E-08	1.687E-06
Th-230	3.040E-07	1.475E-05	1.125E-08
Th-232	8.350E-07	7.615E+00	3.090E-08
U-232	1.020E-03	4.621E-05	3.774E-05
U-233	2.350E-05	2.440E-03	8.695E-07
U-234	8.300E-06	1.335E-03	3.071E-07
U-235	1.380E-06	6.386E-01	5.106E-08
U-236	4.150E-06	6.494E-02	1.536E-07
U-238	6.100E-06	1.815E+01	2.257E-07
Np-237	1.690E-05	2.398E-02	6.253E-07
Pu-238	3.790E-03	2.213E-04	1.402E-04
Pu-239	9.840E-04	1.587E-02	3.641E-05
Pu-240	6.820E-04	3.005E-03	2.523E-05
Pu-241	7.420E-03	7.170E-05	2.745E-04
Am-241	3.430E-02	1.001E-02	1.269E-03
Am-243	1.340E-04	6.710E-04	4.958E-06
Cm-242	1.370E-04	4.138E-08	5.069E-06
Cm-243	8.040E-05	1.640E-06	2.975E-06
Cm-244	2.150E-03	2.642E-05	7.955E-05

Total Activity: 9.457E+00 3.499E-01

* Radionuclides with an A1/A2 fraction of less than 0.001 will not be shown in the output.

Container Data:

Container Void Volume:	0	m^3
Container Mass:	1	kg
Mass of solid beryllium, lead, graphite, and hydrogenous material enriched with deuterium:	0	kg
Gross Mass:	10430	kg

Waste Data:

Waste Form:	Normal
Waste State:	Solid
Waste Volume:	2 m^3

Radcalc 4.1

9/9/2014 10:58 AM

File Name: Act Calc for Exterior Surface Contamination.rad

Waste Mass:	10430	kg
Mass of solid lead:	0	kg
Mass of solid beryllium, graphite, and hydrogenous material enriched with deuterium:	0	kg
Waste Void Volume:	0	m ³

Decay Time Data:

Date to begin source decay:	4/20/2004
Date container sealed:	9/2/2014

===== Radioactive Decay Results =====

Decayed Source:

Isotope	Ci	Gm	TBq
H-3	1.072E-05	1.115E-09	3.966E-07
C-14	3.775E-03	8.429E-04	1.397E-04
Fe-55	1.141E-03	4.797E-07	4.223E-05
Co-60	3.351E-04	2.961E-07	1.240E-05
Ni-59	5.070E-04	6.352E-03	1.876E-05
Ni-63	1.443E-02	2.556E-04	5.340E-04
Sr-90	2.213E+00	1.602E-02	8.187E-02
Y-90	2.213E+00	4.070E-06	8.189E-02
Tc-99	1.040E-03	6.157E-02	3.848E-05
I-129	3.850E-04	2.235E+00	1.424E-05
Cs-137	5.062E+00	5.823E-02	1.873E-01
Ba-137m	4.778E+00	8.879E-09	1.768E-01
Pm-147	4.445E-03	4.792E-06	1.645E-04
Sm-147	1.593E-12	6.938E-05	5.893E-14
Eu-154	1.274E-02	4.713E-05	4.713E-04
Hg-206	3.774E-18	3.369E-26	1.396E-19
Tl-206	2.650E-16	1.220E-24	9.805E-18
Tl-207	4.377E-11	2.298E-19	1.620E-12
Tl-208	3.317E-04	1.120E-12	1.227E-05
Tl-209	4.920E-10	1.203E-18	1.820E-11
Tl-210	2.861E-13	4.153E-22	1.058E-14
Pb-209	2.278E-08	4.941E-15	8.428E-10
Pb-210	1.986E-10	2.585E-12	7.349E-12
Pb-211	4.389E-11	1.778E-18	1.624E-12
Pb-212	9.232E-04	6.645E-10	3.416E-05
Pb-214	1.362E-09	4.154E-17	5.039E-11
Bi-209	4.268E-27	4.740E-11	1.579E-28
Bi-210	1.979E-10	1.595E-15	7.322E-12
Bi-211	4.389E-11	1.069E-19	1.624E-12
Bi-212	9.232E-04	6.301E-11	3.416E-05
Bi-213	2.278E-08	1.176E-15	8.428E-10
Bi-214	1.362E-09	3.085E-17	5.040E-11
Bi-215	3.602E-17	3.048E-25	1.333E-18
Po-210	1.789E-10	3.982E-14	6.621E-12
Po-211	1.198E-13	1.156E-24	4.433E-15
Po-212	5.914E-04	3.311E-21	2.188E-05
Po-213	2.229E-08	1.767E-24	8.247E-10
Po-214	1.362E-09	4.229E-24	5.039E-11
Po-215	4.389E-11	1.489E-24	1.624E-12
Po-216	9.232E-04	2.651E-15	3.416E-05
Po-218	1.362E-09	4.893E-18	5.040E-11
At-215	1.756E-16	3.346E-31	6.496E-18
At-217	2.278E-08	1.415E-20	8.429E-10
At-218	2.588E-13	7.502E-24	9.576E-15
At-219	3.714E-17	3.893E-26	1.374E-18
Rn-217	2.734E-12	2.839E-26	1.011E-13
Rn-218	2.588E-16	1.750E-28	9.576E-18
Rn-219	4.389E-11	3.374E-21	1.624E-12

Radcalc 4.1

9/9/2014 10:58 AM

File Name: Act Calc for Exterior Surface Contamination.rad

Rn-220	9.232E-04	1.005E-12	3.416E-05
Rn-222	1.362E-09	8.855E-15	5.040E-11
Fr-221	2.278E-08	1.312E-16	8.429E-10
Fr-223	6.190E-13	1.600E-20	2.290E-14
Ra-223	4.389E-11	8.569E-16	1.624E-12
Ra-224	9.232E-04	5.765E-09	3.416E-05
Ra-225	2.287E-08	5.833E-13	8.461E-10
Ra-226	1.364E-09	1.380E-09	5.047E-11
Ra-228	5.957E-07	2.185E-09	2.204E-08
Ac-225	2.278E-08	3.926E-13	8.429E-10
Ac-227	4.485E-11	6.202E-13	1.660E-12
Ac-228	5.957E-07	2.666E-13	2.204E-08
Th-227	4.364E-11	1.420E-15	1.615E-12
Th-228	9.232E-04	1.126E-06	3.416E-05
Th-229	2.300E-08	1.081E-07	8.509E-10
Th-230	3.048E-07	1.479E-05	1.128E-08
Th-231	1.380E-06	2.596E-12	5.106E-08
Th-232	8.350E-07	7.615E+00	3.090E-08
Th-234	6.100E-06	2.634E-10	2.257E-07
Pa-231	3.026E-10	6.406E-09	1.120E-11
Pa-233	1.701E-05	8.198E-10	6.295E-07
Pa-234	9.149E-09	4.633E-15	3.385E-10
Pa-234m	6.100E-06	8.883E-15	2.257E-07
U-232	9.202E-04	4.169E-05	3.405E-05
U-233	2.350E-05	2.440E-03	8.695E-07
U-234	8.406E-06	1.352E-03	3.110E-07
U-235	1.380E-06	6.386E-01	5.106E-08
U-235m	9.832E-04	3.195E-11	3.638E-05
U-236	4.150E-06	6.494E-02	1.536E-07
U-237	1.107E-07	1.356E-12	4.095E-09
U-238	6.100E-06	1.815E+01	2.257E-07
Np-237	1.701E-05	2.414E-02	6.295E-07
Np-239	1.339E-04	5.772E-10	4.953E-06
Pu-238	3.492E-03	2.039E-04	1.292E-04
Pu-239	9.838E-04	1.586E-02	3.640E-05
Pu-240	6.832E-04	3.011E-03	2.528E-05
Pu-241	4.494E-03	4.342E-05	1.663E-04
Am-241	3.383E-02	9.873E-03	1.252E-03
Am-243	1.339E-04	6.703E-04	4.953E-06
Cm-242	1.380E-11	4.168E-15	5.106E-13
Cm-243	6.327E-05	1.291E-06	2.341E-06
Cm-244	1.442E-03	1.772E-05	5.336E-05
Total Activity:	1.436E+01		5.313E-01
w/o Daughters:	7.361E+00		2.724E-01

Decay Heat:

Heat Generated on Start Date:	0.01185	W
Heat Generated on Seal Date:	0.04054	W

===== Regulatory Requirements Warning =====

Radcalc utilizes numerically based criteria to classify packages against the regulations. Many regulations also include subjective criteria that Radcalc does not consider. The user must check to ensure that all requirements in the regulations are met.

===== DOT Classification Results =====

* DOT classification calculations are made at the end of the user-specified decay time.

Radioactive Determination:

Radioactive:	Yes	(ACEMs and ALECs > 1.0)
--------------	-----	-------------------------

Radcalc 4.1

9/9/2014 10:58 AM

File Name: Act Calc for Exterior Surface Contamination.rad

ACEM Limit Fraction:	2022	ACEMs	(Number of ACEMs)
ALEC Limit Fraction:	27130000	ALECs	(Number of ALECs)
* This package is not exempt from 49 CFR Subchapter C.			
Effective A2s for Mixture:	1.275E+11	Bq	
Type Determination:			
Type:	B		(A2s > 1.0)
A2 Limit Fraction:	2.136	A2s	(Number of A2s)
Limited Quantity Determination:			
Limited Quantity:	No		(Solid, activity > 0.001 A2)
Activity:	2.136	A2	
	14.36	Ci	
	0.5313	TBq	
Fissile:	Yes		
Fissile Excepted:	Yes (a)		
LSA Determination:			
LSA-I:	No		(Fissile excepted, ACEMs > 30 x rad limits)
LSA-II:	Yes		(A2s/gm <= 0.0001)
LSA-III:	Yes		(A2s/gm <= 0.002)
Specific Activity:	2.047E-07	A2/gm	
	1.376E-06	Ci/gm	
HRCQ Determination:			
HRCQ:	No		(A2s <= 3000, Activity <= 1000 TBq)
A2 Limit Fraction:	2.136	A2s	
Activity:	14.36	Ci	
	0.5313	TBq	
Fissile Determination:			
Fissile:	Yes		(Contains fissile isotopes per 49 CFR 173.403)
Fissile Excepted Determination:			
Fissile Excepted:	Yes (a)		(Fissile isotopes <= 2 grams)
Fissile Mass:	0.6569	gm	
Container beryllium, lead, graphite, and hydrogenous material enriched with deuterium:	0	gm	
Container Mass:	1000	gm	
Waste lead:	0	gm	
Waste beryllium, graphite, and hydrogenous material enriched with deuterium:	0	gm	
Waste Mass:	10430000	gm	
Solid Non-Fissile Mass:	0	gm	
Total Uranium Mass:	18.86	gm	
U-233 Mass:	0.00244	gm	
U-235 Mass:	0.6386	gm	
Uranium Enrichment:	3.387	%	
Total Plutonium Mass:	0.01912	gm	
Pu-239 Mass:	0.01586	gm	
Pu-241 Mass:	4.342E-05	gm	
Reportable Quantity Determination:			
Reportable Quantity:	Yes		(RQs >= 1.0)
RQ Limit Fraction:	36.84	RQs	(Number of RQs)
Shipping Papers and Labels:			
Isotope	Number of A2s	Fraction of A2s	Cumulative A2s
+ Am-241	1.252	0.586	1.252
			Cumulative Fraction of A2s
			0.586

Radcalc 4.1

9/9/2014 10:58 AM

File Name: Act Calc for Exterior Surface Contamination.rad

+ Cs-137	0.3121	0.1461	1.564	0.7322
+ Sr-90	0.2729	0.1278	1.837	0.8599
+ Pu-238	0.1292	0.0605	1.966	0.9204
+ Pu-239	0.0364	0.01704	2.002	0.9374
+ Th-228	0.03416	0.01599	2.037	0.9534
U-232	0.03405	0.01594	2.071	0.9694
Cm-244	0.02668	0.01249	2.097	0.9819
Pu-240	0.02528	0.01183	2.123	0.9937
Am-243	0.004953	0.002319	2.128	0.996
Pu-241	0.002771	0.001297	2.13	0.9973
Cm-243	0.002341	0.001096	2.133	0.9984

+ Contains 95% of the total A2s and must be included per 49 CFR 173.433.

* Radionuclides comprising less than 0.1% of the total A2s are not shown in the list.

===== DOE Classification Results =====

* DOE classification calculations are made at the end of the user-specified decay time.

DOE-STD-1027 Category Determination:

Category: < Cat 3 (Cat3s <= 1.0)

Cat 2 Limit Fraction: 0.000995

Cat 3 Limit Fraction: 0.309

* The DOE-STD-1027 category determination is based on dose-related limits.
The user must apply any criticality-related limits separately.

Dose-Equivalent Curies:

ICRP-72 DE-Ci: 0.0374

FGR-11 DE-Ci: 0.05027

TRU Waste Determination:

TRU Waste: No (TRU activity <= 100 nCi/gm)

TRU Activity: 3.758 nCi/g

WIPP Quantities:

FGE Value: 0.4294

PE-Ci Value: 0.04041

===== NRC Classification Results =====

* NRC classification calculations are made at the end of the user-specified decay time.

NRC Container Category:

Container Category: III

LSA-I: No

LSA-II: Yes

LSA-III: Yes

Total Activity: 14.36 Ci

A2 Limit Fraction: 2.136 A2s

Drawing 1

Melter Refractory Assembly Drawings

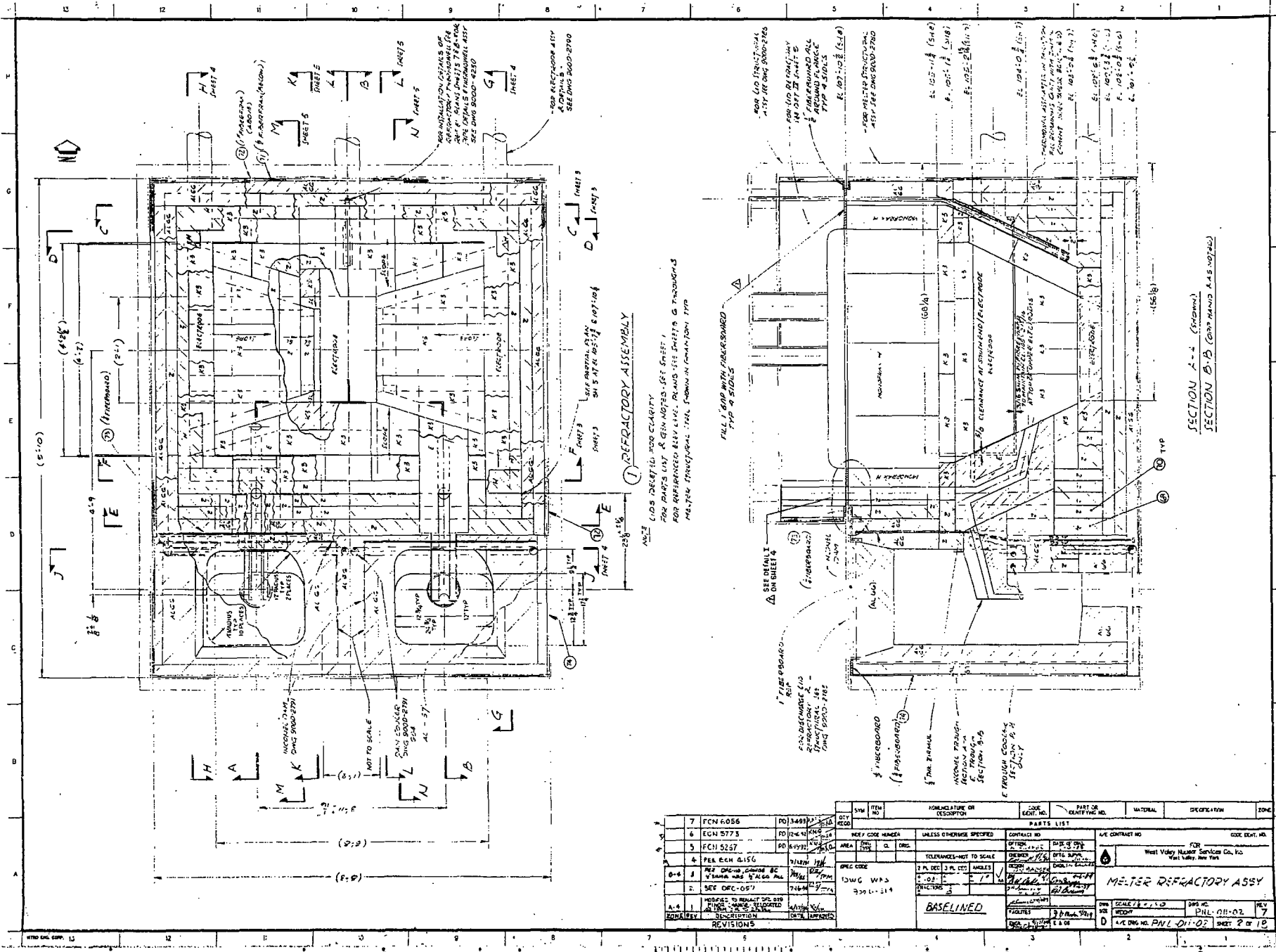
GENERAL NOTES
(UNLESS OTHERWISE SPECIFIED)

- | | | | | | | | |
|-----|------|--------------------------------|------|------------------------|------------|---------------|----|
| AK | 75 | LINER 1" THICK | | | FIBERBOARD | SEE NOTE 10 | |
| AK | 74 | LINER 1/2" THICK DURALBOARD LD | | | | | |
| ZX | 73 | LINER 1/2" THICK DURALBOARD HD | | | | | |
| AR | 72 | LINER 1" THICK | | | | | |
| AR | 71 | LINER 1/2" THICK | | | FIBERBOARD | SEE NOTE 10 | |
| AK | 70 | BLOCK 5"x12"x18" | | | Z | SEE NOTE 6 | |
| AR | 69 | BLOCK 4"x12"x18" | | | Z | SEE NOTE 4 | |
| AR | 68 | ADHESIVE | | QP-180 | | SEE NOTE 10 | |
| Z | 67 | | | | Z | | |
| Z | 66 | | | | | | |
| Z | 65 | | | | | | |
| E | 64 | | | | | | |
| Z | 63 | | | | | | |
| E | 62 | BLOCK | | PNF-Q116 | Z | SEE NOTE 6 | |
| QTY | UNIT | DESCRIPTION | CODE | PART OR IDENTIFYING NO | MATERIAL | SPECIFICATION | DO |

2	61	BLOCK	PAL-D11-10	Z	SEE NOTE 4
2	50				
2	59				
2	54				
1	58				
2	57				
2	59		PAL-D11-5		
2	55				
4	54				
2	53				
2	52				
2	51				
4	50				
2	49				
2	48				
2	47				
2	46		PAL-D11-5	Z	SEE NOTE 4
2	44				
2	43		PAL-D11-6	B	SEE NOTE 2
7	42		PAL-D11-3	H	SEE NOTE 3
2	41			H	
12	40			H	SEE NOTE 3
2	39			H3	SEE NOTE 1
2	38				
1	37				
2	36				
2	35				
1	34				
4	34			K3	
1	33			E	
2	32			K3	
2	31				
2	30				
2	29		PAL-D11-3		
1	28		PAL-D11-7		
1	27				
1	26				
1	25				
1	24				
1	23				
2	22				
3	21				
2	20				
3	19				
1	18				
1	17				
2	16				
1	15				
1	14		PAL-D11-2		
1	13		PAL-D11-1		
1	12				
2	11				
1	10				
1	9				
1	8				
1	7				
1	6				
1	5				
1	4				
2	3				
2	2	BLOCK	PAL-D11-1	K3	SEE NOTE 1
X	1	MOLTER REFRACTORY ASSEMBLY			
SYM	SYM	MODULATING OR EXHAUSTION	CODE PAGE 50	MATERIAL	SPECIFICATION

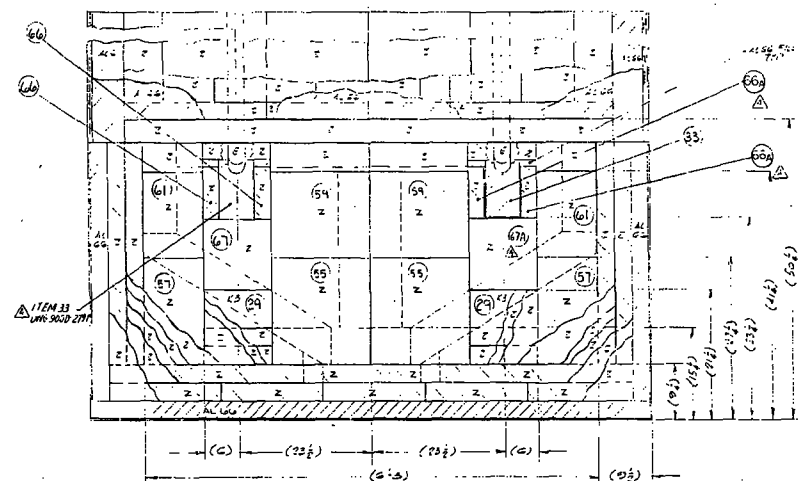
[illegible]

9000-314 SH. 2
PNI-011-02



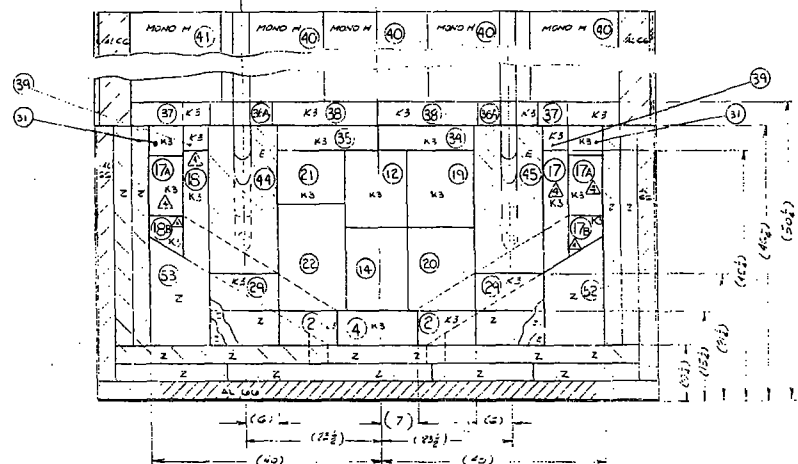
REV	DESCRIPTION	DATE	BY	CHK	APP
1	FOR LID STRUCTURAL	10/10/00	J. J. J.	J. J. J.	J. J. J.
2	FOR LID ELECTRICAL	10/10/00	J. J. J.	J. J. J.	J. J. J.
3	FOR LID MECHANICAL	10/10/00	J. J. J.	J. J. J.	J. J. J.
4	FOR LID THERMAL	10/10/00	J. J. J.	J. J. J.	J. J. J.
5	FOR LID VIBRATORY	10/10/00	J. J. J.	J. J. J.	J. J. J.
6	FOR LID ACoustic	10/10/00	J. J. J.	J. J. J.	J. J. J.
7	FOR LID OPTICAL	10/10/00	J. J. J.	J. J. J.	J. J. J.
8	FOR LID MAGNETIC	10/10/00	J. J. J.	J. J. J.	J. J. J.
9	FOR LID CHEMICAL	10/10/00	J. J. J.	J. J. J.	J. J. J.
10	FOR LID BIOLOGICAL	10/10/00	J. J. J.	J. J. J.	J. J. J.
11	FOR LID COSMETIC	10/10/00	J. J. J.	J. J. J.	J. J. J.
12	FOR LID MEDICAL	10/10/00	J. J. J.	J. J. J.	J. J. J.
13	FOR LID AGRICULTURAL	10/10/00	J. J. J.	J. J. J.	J. J. J.
14	FOR LID INDUSTRIAL	10/10/00	J. J. J.	J. J. J.	J. J. J.
15	FOR LID DOMESTIC	10/10/00	J. J. J.	J. J. J.	J. J. J.
16	FOR LID RECREATIONAL	10/10/00	J. J. J.	J. J. J.	J. J. J.
17	FOR LID EDUCATIONAL	10/10/00	J. J. J.	J. J. J.	J. J. J.
18	FOR LID RESEARCH	10/10/00	J. J. J.	J. J. J.	J. J. J.
19	FOR LID DEVELOPMENT	10/10/00	J. J. J.	J. J. J.	J. J. J.
20	FOR LID PRODUCTION	10/10/00	J. J. J.	J. J. J.	J. J. J.
21	FOR LID DISTRIBUTION	10/10/00	J. J. J.	J. J. J.	J. J. J.
22	FOR LID SALES	10/10/00	J. J. J.	J. J. J.	J. J. J.
23	FOR LID SERVICE	10/10/00	J. J. J.	J. J. J.	J. J. J.
24	FOR LID SUPPORT	10/10/00	J. J. J.	J. J. J.	J. J. J.
25	FOR LID MAINTENANCE	10/10/00	J. J. J.	J. J. J.	J. J. J.
26	FOR LID REPAIR	10/10/00	J. J. J.	J. J. J.	J. J. J.
27	FOR LID REPLACEMENT	10/10/00	J. J. J.	J. J. J.	J. J. J.
28	FOR LID DISPOSAL	10/10/00	J. J. J.	J. J. J.	J. J. J.
29	FOR LID RECYCLING	10/10/00	J. J. J.	J. J. J.	J. J. J.
30	FOR LID REUSE	10/10/00	J. J. J.	J. J. J.	J. J. J.

West Valley Nuclear Services Co., Inc.
West Valley, New York
METER REFRACTORY ASSY
PNI-011-02
SHEET 2 OF 10



SECTION C-C FROM SHEET 2

SECTION E-E FROM SHEET 2



SECTION D-D FROM SHEET E

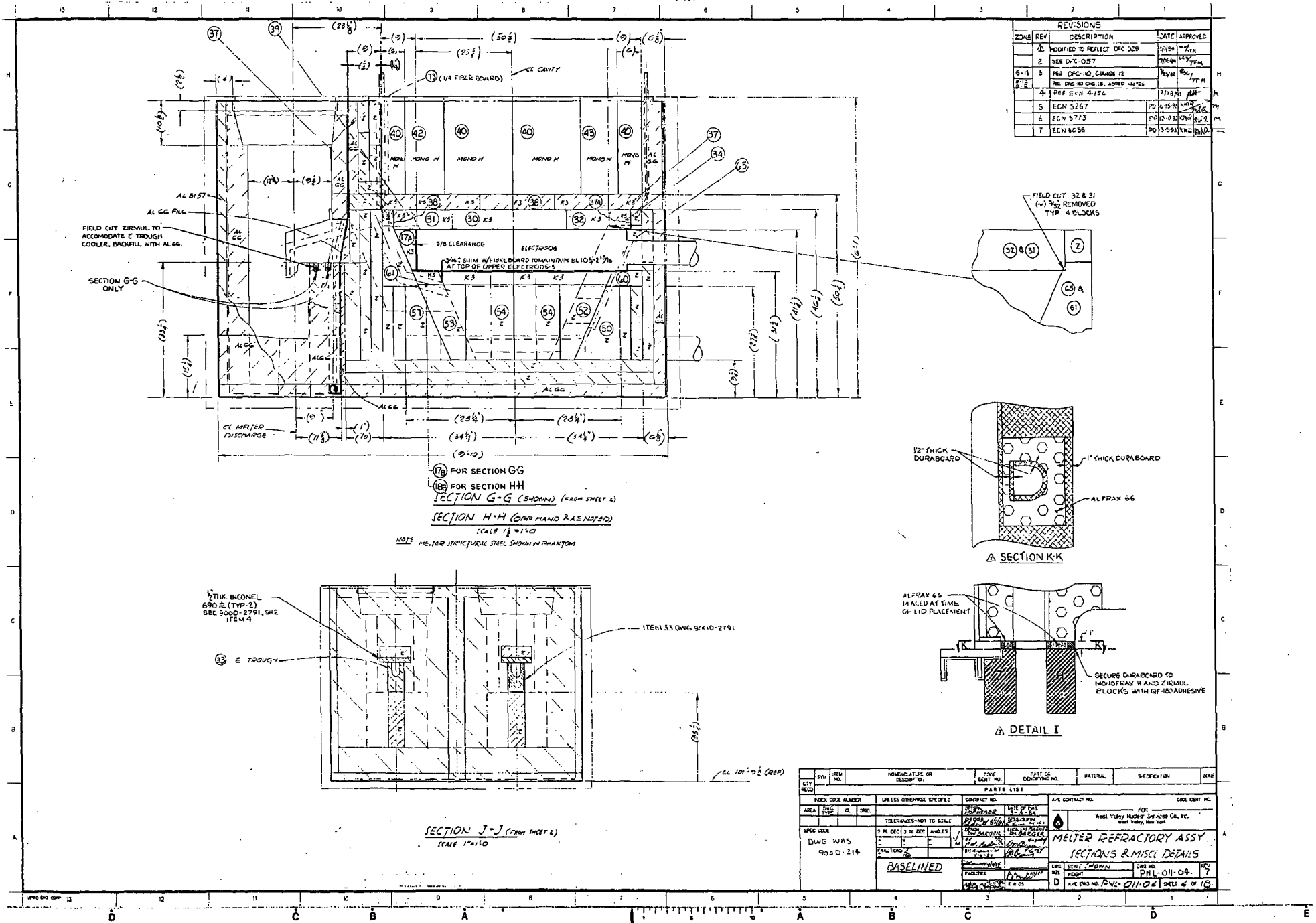
SECTION F-F FROM INLET ?

AGT All info- incl. Z.M.M. 05/4/50 FOR CLARITY

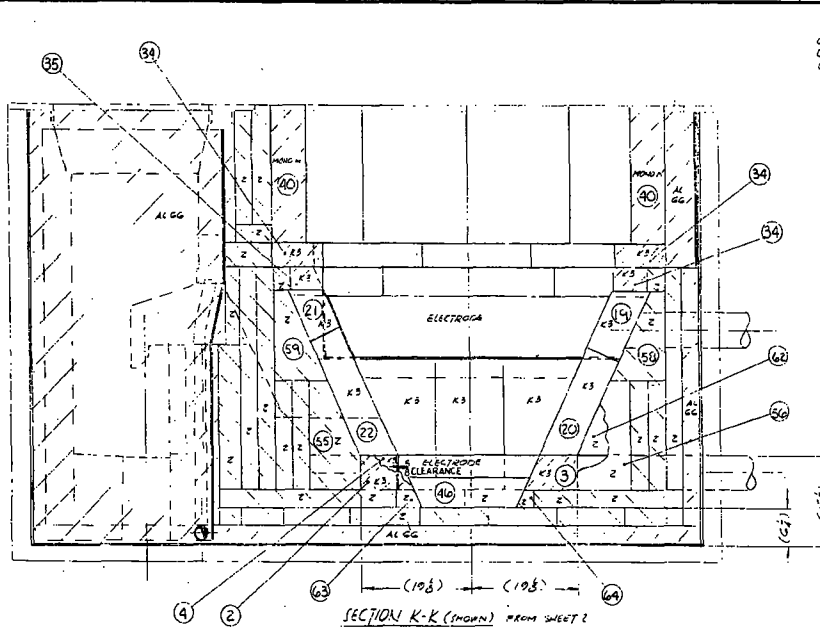
NOTE SOUTH WALL CAST EXHIBIT BEING FOR CLARITY

[illegible]

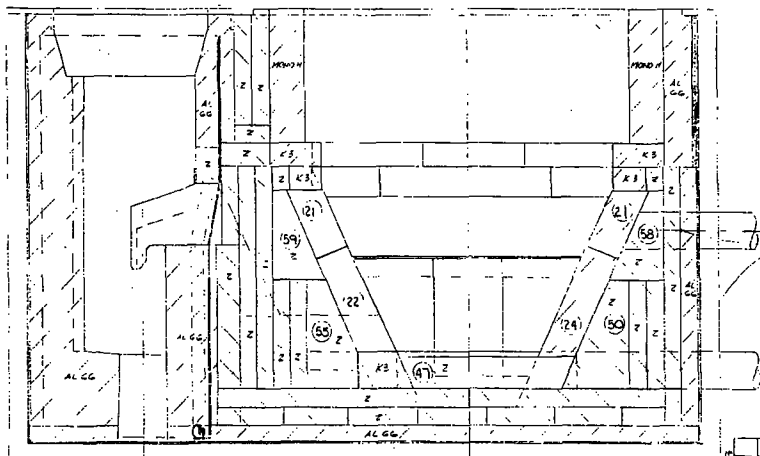
7000-577 Sh. 4
PNL-011-04



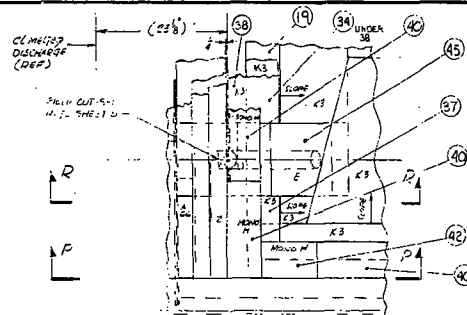
~~400B-314~~
PNL-011-05



NO. 2 STRUCTURAL MELTER STEEL SHOWN IN PLAN; OM -
R.M. INFORMATION NO. 7 SHOWN - SEE SECTION OF SHEET 4

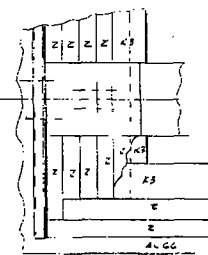


SECTION M-M (DOWN) FROM SHEET
SECTION N-N (O.D. MAINS)



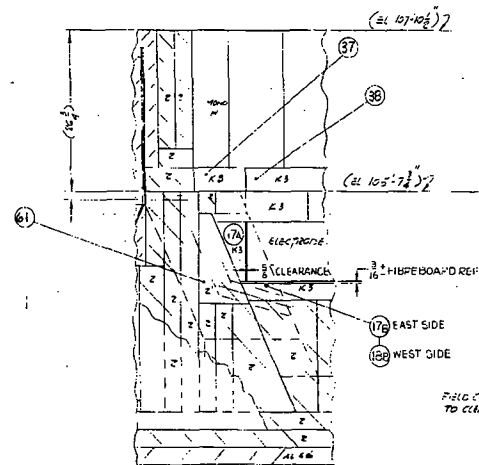
PARTIAL PLAN AT EL 107'-10"

NOTE EAST SIDE SHOWN - WEST SIDE OPPOSITE HAND
FIELD CUT DIM GIVEN ARE RECOMMENDED ONLY
ACTUAL FIELD CONDITIONS MAY VARY

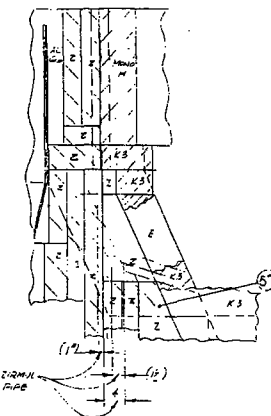


PARTIAL PLAN AT EL 105'-7 $\frac{3}{4}$ "

NOTE EAST SIDE MOON - 11637 SIDE OFP HAND

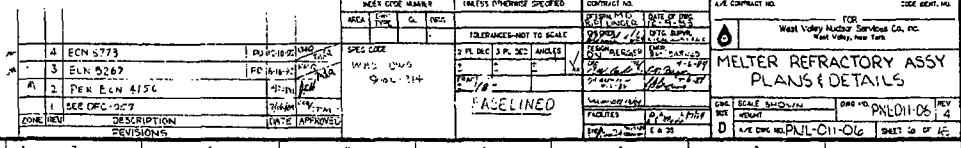


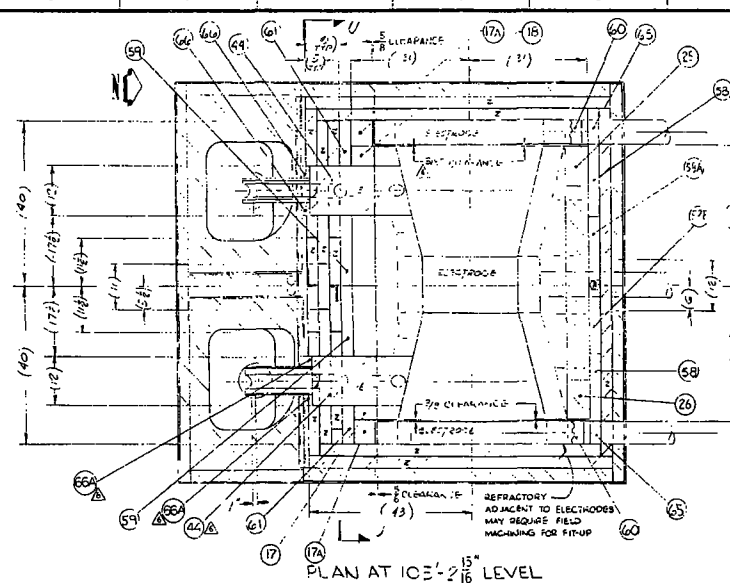
SECTION P-P



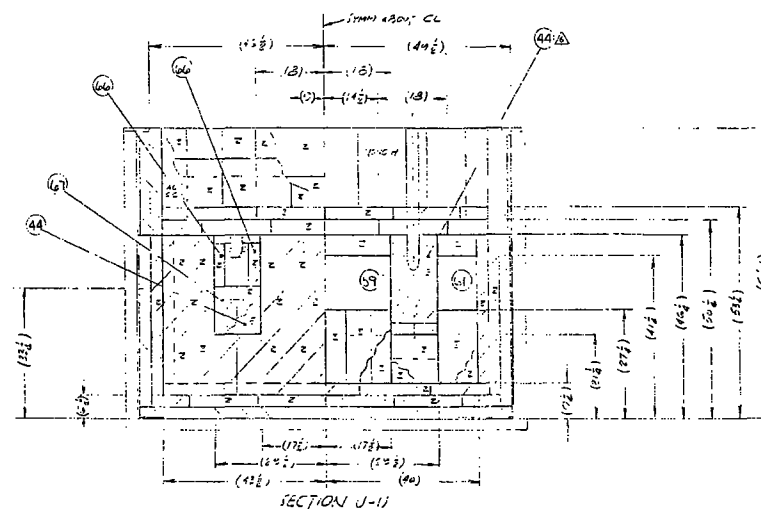
PARTIAL SECTION R-R

STN			ITEM NO	NOMENCLATURE OR DESCRIPTION		QTY	UNIT	PRICE	PART OR IDENTIFYING NO		MATERIAL	SPECIFICATION	DATE
PARTS LIST:													
REF CODE NUMBER				UNLESS OTHERWISE SPECIFIED				CONTRACT NO.		AVE CONTRACT NO.		OFFICE PHONE NO.	
AREA				TOLERANCES-UNLESS OTHERWISE SPECIFIED				DATE OF ORDER		FAC		GREAT VALLEY MFG. SERVICE CO., INC.	
DATE				2 PL. DIA. 2 PL									

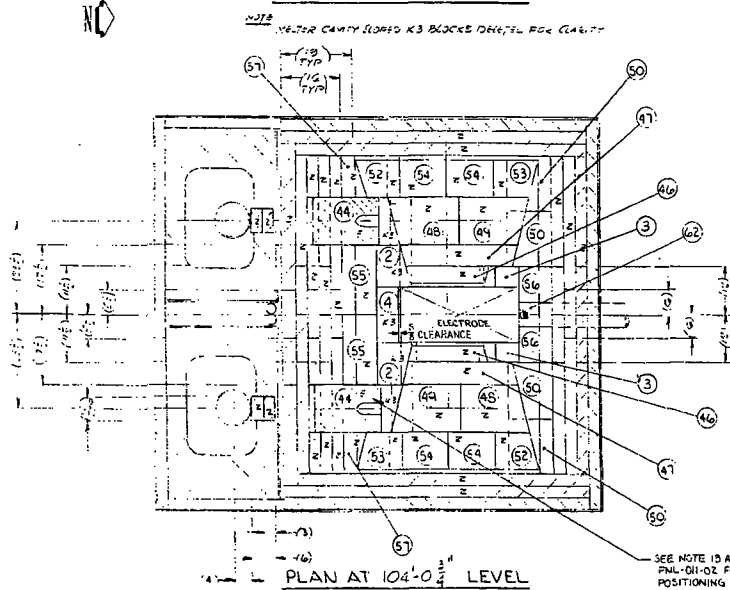




PLAN AT 103'-0 $\frac{3}{4}$ " LEVEL



SECTION J-1.

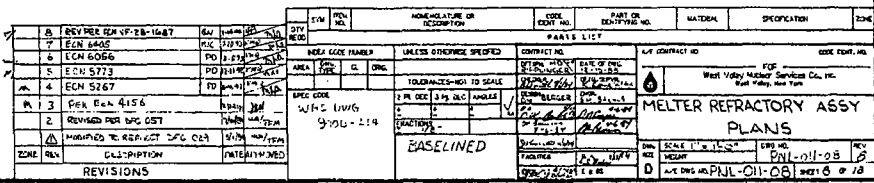


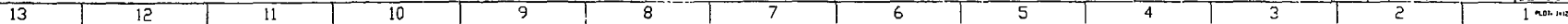
PLAN AT 104'-0" LEVEL

6	ECN 6050	PD	35-93	EW	W
5	ECN 5773	UD	11-24-73	WIS	W
4	FLN 5267	FL	11-26-73	NAC	W
3	DFA ECN 4156		11-27-73	W	W
2	PER DFC-110 CHANGE 90		11-27-73	W	W
1	SEE DFC 057		11-27-73	W	W
ICONE	REV	DESCRIPTION	DATE	APPROVED	
		REVISIONS			

[illegible]

PNL-011-08





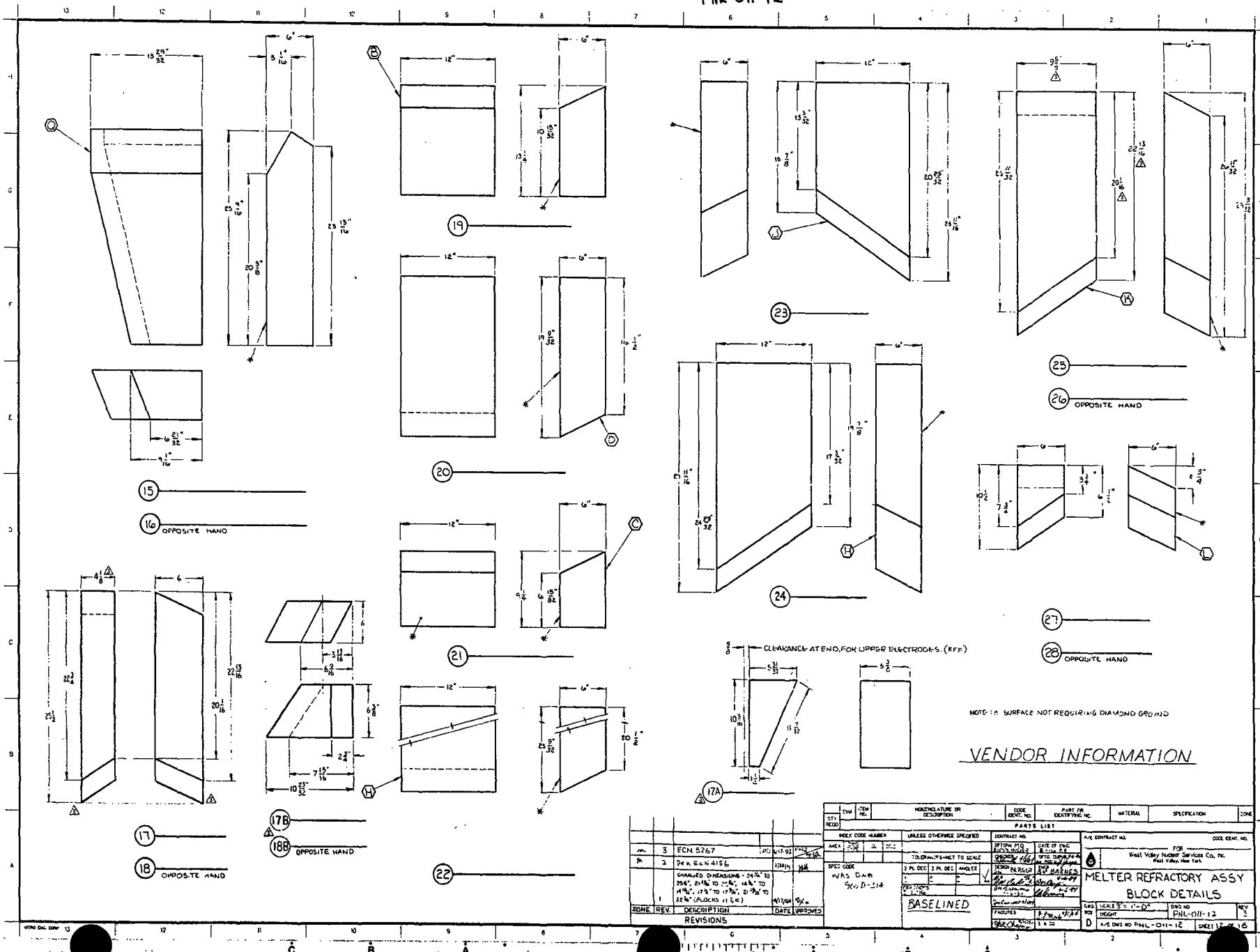
PNL-011-11



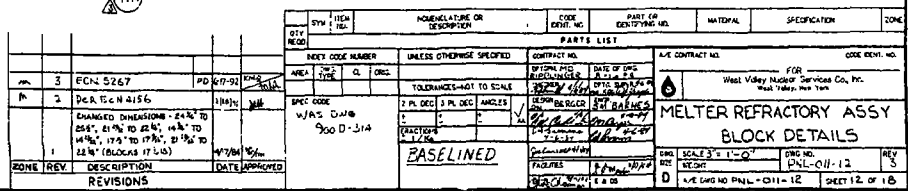
VENDOR INFORMATION

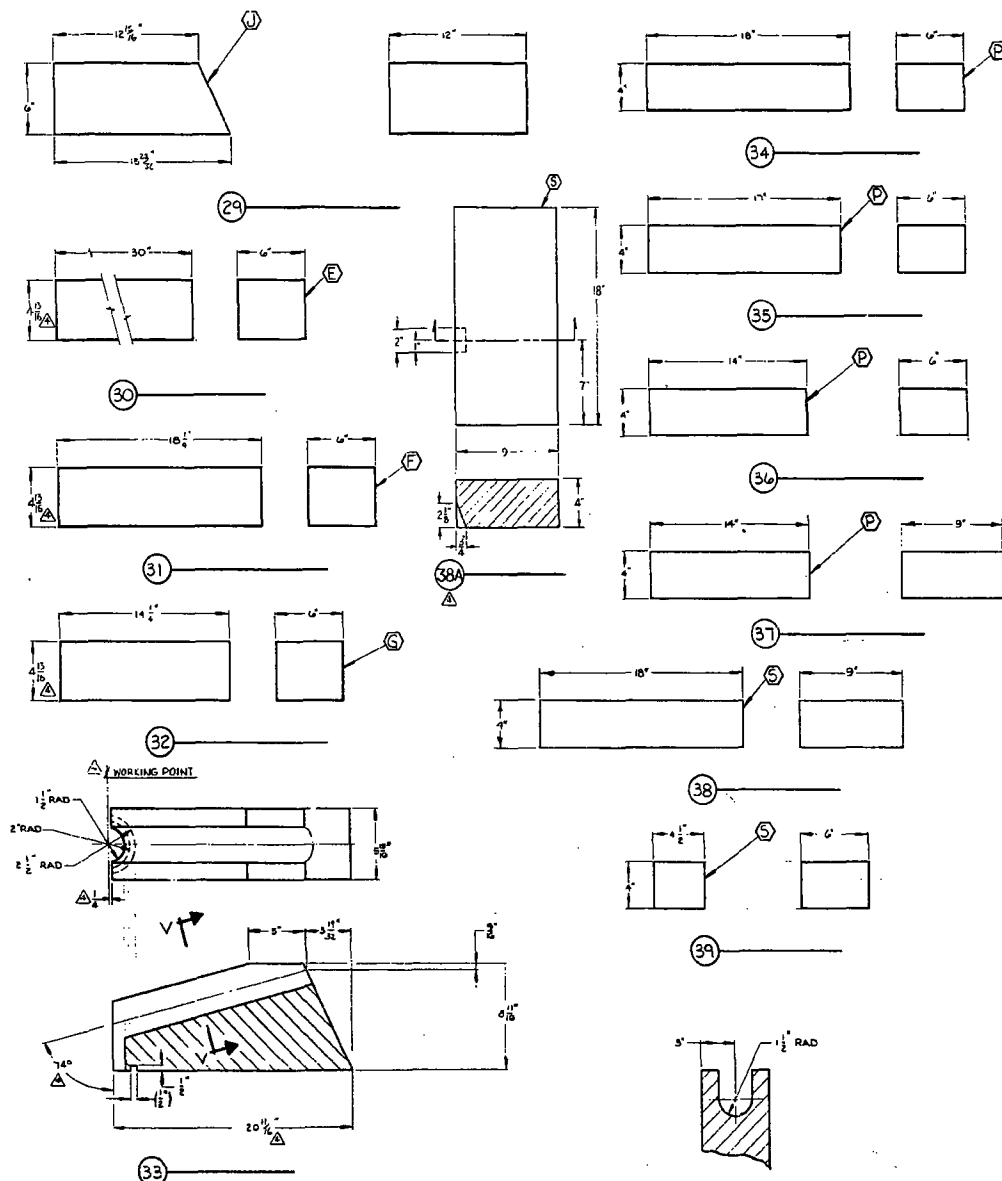
[illegible]

+	2	EL J 5247	PD	4/17/72	KMO
M	1	DER ECN 4156		2/10/76	JAL
REVISIONS					



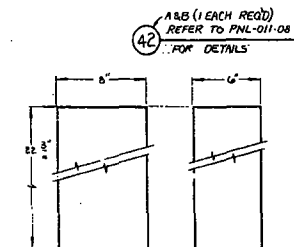
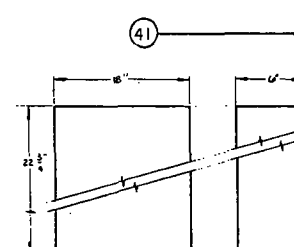
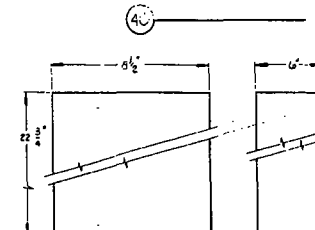
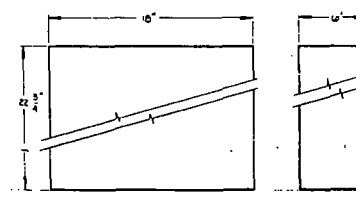
PNL-011-12





SECTION V-V

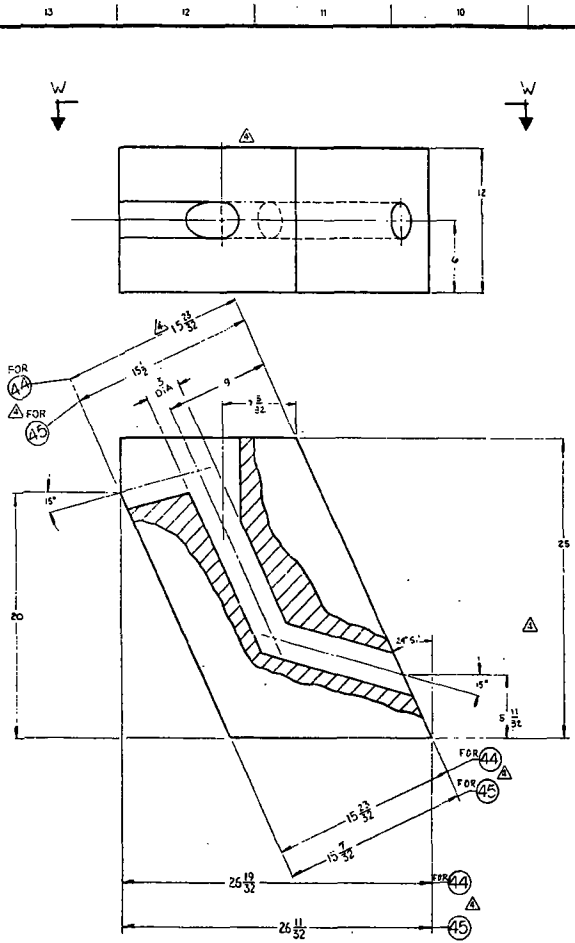
REVISIONS			
SOURCE	REV	DESCRIPTION	DATE APPROVED
	1	SEE DFC-057	2/20/85 EEC / P. 21
C-10	2	PER DFC-NO CHANGE (3" - 3/4" WAS 1" 3/4" WAS 3/4", 5/8" WAS 3/4"	2/20/85 ZEL / TEM
	3	PER ECH 4154	2/26/85 [Signature]
	4	ECN 5257	PD 3/17/92 [Signature]



VENDOR INFORMATION

QTY	SYM	ITEM NO	NAME/QUANTITY OR DESCRIPTION	CODE IDENT. NO.	UNIT OR IDENTIFYING NO.	MATERIAL	SPECIFICATION	ZONE
MEED CODE NUMBER			UNLESS OTHERWISE SPECIFIED		CONTRACT NO.		SEE DETAIL NO.	
ANGL	3	0001	TOLERANCES-NOT TO SCALE	DATE OF ORDER		FIRM		
UNIT CODE			2 PL DEC 3 PL DEC ANGLES	ORDER NUMBER ORDER DATE ORDER TIME		West Valley Nuclear Services Co., Inc. 10000 N. 10TH AVE. SUITE 100 DENVER, CO 80231		
WAS TWO 9000.314			ORDER NO. ORDER DATE ORDER TIME		MELTER REFRACTORY ASSY BLOCK DETAILS		REV 1 REV 2 REV 3	
BASELINED			ORDER NO. ORDER DATE ORDER TIME		SCALE 1" = 1'-0" ORDER NO. ORDER DATE ORDER TIME		REV 1 REV 2 REV 3	

9000-314 Sh. 14
PNL-011-14



ELEVATION W-W

- 44 SHOWN AS NOTED
- 45 SHOWN AS NOTED

REV	DESCRIPTION	DATE	APPROVED
1	MINOR CHANGES	2/1/94	WJW
2	SEE DEC-007	2/1/94	CCV
3	PER DEC-4154	2/1/94	WJW
4	PER DEC-5207	2/1/94	WJW

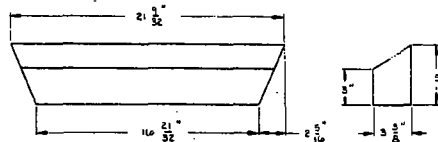
NOTE: THIS SURFACE DOES NOT REQUIRE DIAMOND GRINDING

VENDOR INFORMATION

QTY	SYM	ITEM NO.	MANUFACTURE OR DESCRIPTION	CODE NO.	PART OR IDENTIFYING NO.	MATERIAL	SPECIFICATION	ZONE
INDEX CODE NUMBER			UNLESS OTHERWISE SPECIFIED		CONTRACT NO.		A/E CONTRACT NO.	
AREA			TOLERANCES-NOT TO SCALE		SHEET NO.		SHEET TOTAL	
SPEC CODE			W.B.S. CHFC		MELTER REFRACTORY ASSY		BLOCK DETAILS	
9.70-314			BASELINED		DNL-GH-14		SHEET 14 OF 15	

9000-34 Sh.15
PNL-011-15

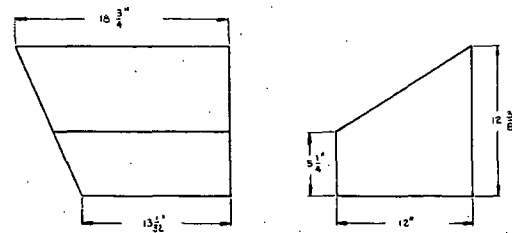
REVISIONS		DATE	APPROVED
1	SEE SPEC-039		
2	PER C.N. 4156		



46

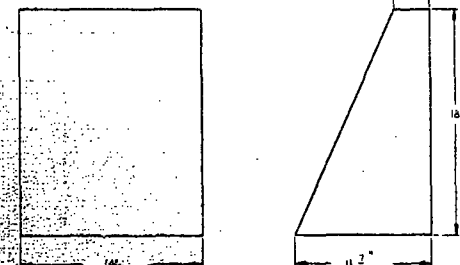


47

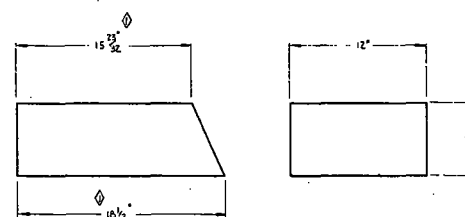


48

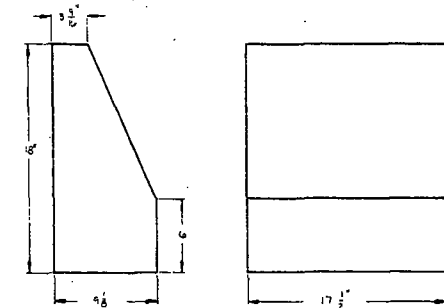
49 OPPOSITE HAND



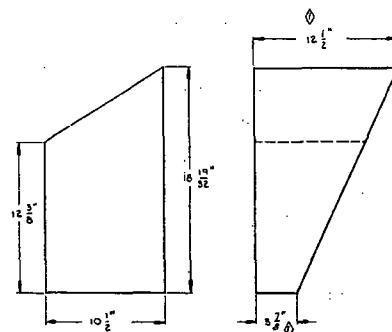
50



51

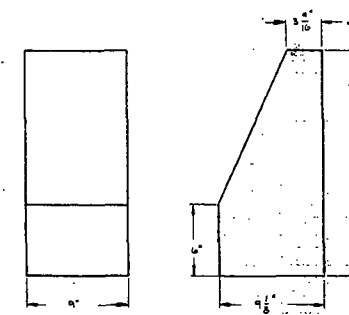


55

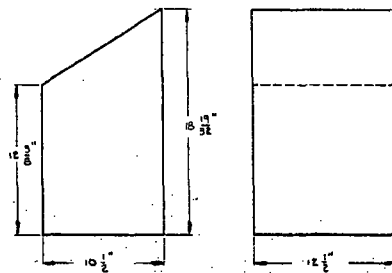


52

53 OPPOSITE HAND



56

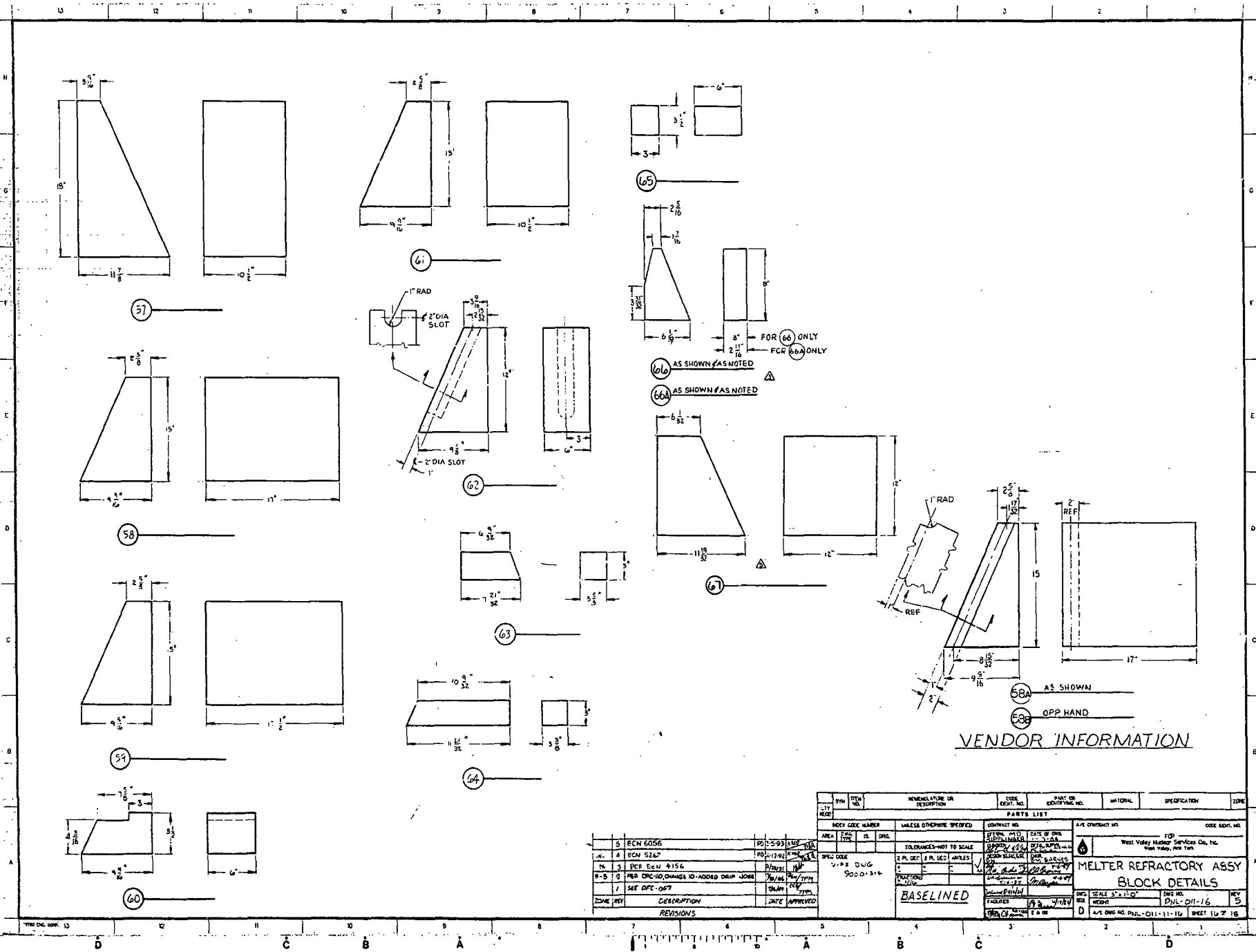


54

VENDOR INFORMATION

REV	REV	DESCRIPTION	DATE	BY	CHK												
1	1	WAS Dwg 9000-314															
PARTS LIST																	
<table border="1"> <tr> <th>QTY</th> <th>REV</th> <th>DESCRIPTION</th> <th>DATE</th> <th>BY</th> <th>CHK</th> </tr> <tr> <td>1</td> <td>1</td> <td>WAS Dwg 9000-314</td> <td></td> <td></td> <td></td> </tr> </table>						QTY	REV	DESCRIPTION	DATE	BY	CHK	1	1	WAS Dwg 9000-314			
QTY	REV	DESCRIPTION	DATE	BY	CHK												
1	1	WAS Dwg 9000-314															
<table border="1"> <tr> <th>QTY</th> <th>REV</th> <th>DESCRIPTION</th> <th>DATE</th> <th>BY</th> <th>CHK</th> </tr> <tr> <td>1</td> <td>1</td> <td>WAS Dwg 9000-314</td> <td></td> <td></td> <td></td> </tr> </table>						QTY	REV	DESCRIPTION	DATE	BY	CHK	1	1	WAS Dwg 9000-314			
QTY	REV	DESCRIPTION	DATE	BY	CHK												
1	1	WAS Dwg 9000-314															

1008-34 Sh. 16
PNL-011-16



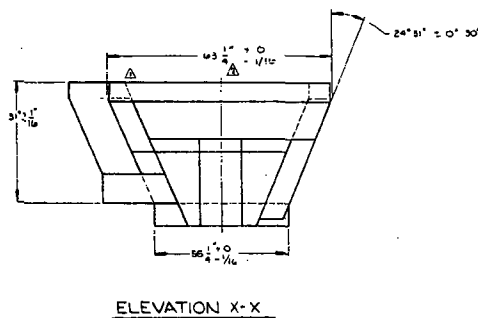
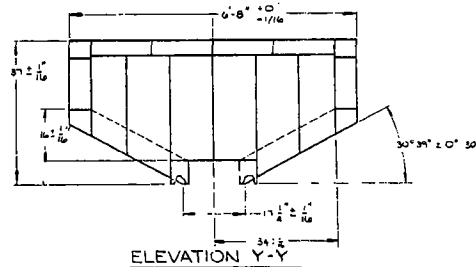
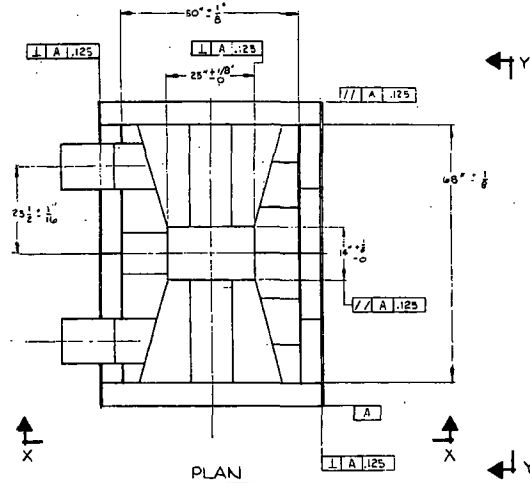
VENDOR INFORMATION

SYM	ITEM	DESCRIPTION	QTY	UNIT	REVISIONS	DATE	APPROVED
5	ECN 6056	PO 1-5-93	1	EA			
6	ECN 5167	PO 1-17-93	1	EA			
7	ECN 4154	PO 1-17-93	1	EA			
8	ECN 4154	PO 1-17-93	1	EA			
9	ECN 4154	PO 1-17-93	1	EA			
10	ECN 4154	PO 1-17-93	1	EA			
11	ECN 4154	PO 1-17-93	1	EA			
12	ECN 4154	PO 1-17-93	1	EA			
13	ECN 4154	PO 1-17-93	1	EA			
14	ECN 4154	PO 1-17-93	1	EA			
15	ECN 4154	PO 1-17-93	1	EA			
16	ECN 4154	PO 1-17-93	1	EA			
17	ECN 4154	PO 1-17-93	1	EA			
18	ECN 4154	PO 1-17-93	1	EA			
19	ECN 4154	PO 1-17-93	1	EA			
20	ECN 4154	PO 1-17-93	1	EA			
21	ECN 4154	PO 1-17-93	1	EA			
22	ECN 4154	PO 1-17-93	1	EA			
23	ECN 4154	PO 1-17-93	1	EA			
24	ECN 4154	PO 1-17-93	1	EA			
25	ECN 4154	PO 1-17-93	1	EA			
26	ECN 4154	PO 1-17-93	1	EA			
27	ECN 4154	PO 1-17-93	1	EA			
28	ECN 4154	PO 1-17-93	1	EA			
29	ECN 4154	PO 1-17-93	1	EA			
30	ECN 4154	PO 1-17-93	1	EA			
31	ECN 4154	PO 1-17-93	1	EA			
32	ECN 4154	PO 1-17-93	1	EA			
33	ECN 4154	PO 1-17-93	1	EA			
34	ECN 4154	PO 1-17-93	1	EA			
35	ECN 4154	PO 1-17-93	1	EA			
36	ECN 4154	PO 1-17-93	1	EA			
37	ECN 4154	PO 1-17-93	1	EA			
38	ECN 4154	PO 1-17-93	1	EA			
39	ECN 4154	PO 1-17-93	1	EA			
40	ECN 4154	PO 1-17-93	1	EA			
41	ECN 4154	PO 1-17-93	1	EA			
42	ECN 4154	PO 1-17-93	1	EA			
43	ECN 4154	PO 1-17-93	1	EA			
44	ECN 4154	PO 1-17-93	1	EA			
45	ECN 4154	PO 1-17-93	1	EA			
46	ECN 4154	PO 1-17-93	1	EA			
47	ECN 4154	PO 1-17-93	1	EA			
48	ECN 4154	PO 1-17-93	1	EA			
49	ECN 4154	PO 1-17-93	1	EA			
50	ECN 4154	PO 1-17-93	1	EA			
51	ECN 4154	PO 1-17-93	1	EA			
52	ECN 4154	PO 1-17-93	1	EA			
53	ECN 4154	PO 1-17-93	1	EA			
54	ECN 4154	PO 1-17-93	1	EA			
55	ECN 4154	PO 1-17-93	1	EA			
56	ECN 4154	PO 1-17-93	1	EA			
57	ECN 4154	PO 1-17-93	1	EA			
58	ECN 4154	PO 1-17-93	1	EA			
59	ECN 4154	PO 1-17-93	1	EA			
60	ECN 4154	PO 1-17-93	1	EA			
61	ECN 4154	PO 1-17-93	1	EA			
62	ECN 4154	PO 1-17-93	1	EA			
63	ECN 4154	PO 1-17-93	1	EA			
64	ECN 4154	PO 1-17-93	1	EA			
65	ECN 4154	PO 1-17-93	1	EA			
66	ECN 4154	PO 1-17-93	1	EA			
67	ECN 4154	PO 1-17-93	1	EA			
68	ECN 4154	PO 1-17-93	1	EA			
69	ECN 4154	PO 1-17-93	1	EA			
70	ECN 4154	PO 1-17-93	1	EA			
71	ECN 4154	PO 1-17-93	1	EA			
72	ECN 4154	PO 1-17-93	1	EA			
73	ECN 4154	PO 1-17-93	1	EA			
74	ECN 4154	PO 1-17-93	1	EA			
75	ECN 4154	PO 1-17-93	1	EA			
76	ECN 4154	PO 1-17-93	1	EA			
77	ECN 4154	PO 1-17-93	1	EA			
78	ECN 4154	PO 1-17-93	1	EA			
79	ECN 4154	PO 1-17-93	1	EA			
80	ECN 4154	PO 1-17-93	1	EA			
81	ECN 4154	PO 1-17-93	1	EA			
82	ECN 4154	PO 1-17-93	1	EA			
83	ECN 4154	PO 1-17-93	1	EA			
84	ECN 4154	PO 1-17-93	1	EA			
85	ECN 4154	PO 1-17-93	1	EA			
86	ECN 4154	PO 1-17-93	1	EA			
87	ECN 4154	PO 1-17-93	1	EA			
88	ECN 4154	PO 1-17-93	1	EA			
89	ECN 4154	PO 1-17-93	1	EA			
90	ECN 4154	PO 1-17-93	1	EA			
91	ECN 4154	PO 1-17-93	1	EA			
92	ECN 4154	PO 1-17-93	1	EA			
93	ECN 4154	PO 1-17-93	1	EA			
94	ECN 4154	PO 1-17-93	1	EA			
95	ECN 4154	PO 1-17-93	1	EA			
96	ECN 4154	PO 1-17-93	1	EA			
97	ECN 4154	PO 1-17-93	1	EA			
98	ECN 4154	PO 1-17-93	1	EA			
99	ECN 4154	PO 1-17-93	1	EA			
100	ECN 4154	PO 1-17-93	1	EA			

CONTRACT NO.	DATE OF ORDER	DATE OF DELIVERY
1008-34	11-16-16	11-16-16
MELTER REFRACTORY ASSY BLOCK DETAILS		
SCALE 3" = 1'-0"		
DNL-011-16		
REV 5		
DNL-011-16		
SHEET 16 OF 16		

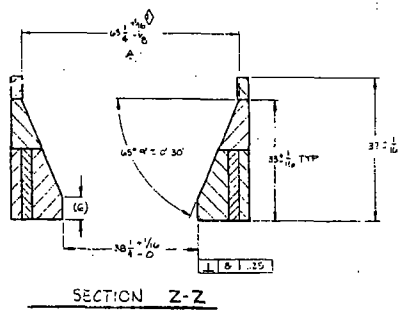
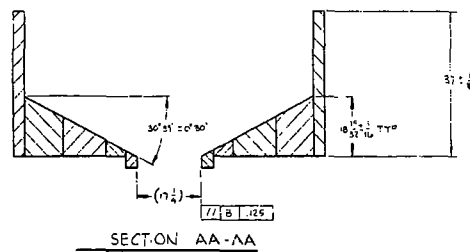
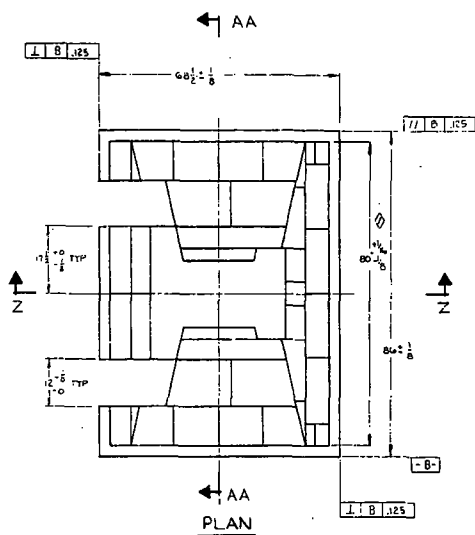
Sh. 17
WVDP-577

REVISIONS			
DATE	BY	DESCRIPTION	APPROVED
2-12	Δ	MODIFIED TO REFLECT DPC QSP #440/774	
2	REV. P&E DEC-10		3/11/14 1/16/15



VENDOR INFORMATION

ITEM NO.	QUANTITY	DESCRIPTION	UNIT	PRICE	TOTAL
PARTS LIST					
INDEX CODE NUMBER		UNLESS OTHERWISE SPECIFIED			
AREA	TYPE	CL	QTY	PRICE	TOTAL
SPEC CODE		UNLESS OTHERWISE SPECIFIED			
BASELINED		UNLESS OTHERWISE SPECIFIED			
MELTER REFRACTORY ASSY		K-3 INSERT			
SCALE 1" = 1'-0"		Dwg No. 3000-3-4			
DATE 11-11-10		SHEET 17 OF 18			



REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	SEE DPC-057	2/1/04	CCG
	2	REV. PER DPC-110	3/1/04	RL

VENDOR INFORMATION

SYN	ITEM NO.	DESCRIPTION OF DISPOSITION	CODE	UNIT	7 - PARTS OF DISPOSITION NO.	MATERIAL	SPECIFICATION	ZONE
			MATERIAL LIST					
MFG CODE & NAME		MATERIAL DISPOSITION OFFICE		MATERIAL LIST		WEIGHTS		DATE EXPIRED
AREA	DATE	BY	CHK					
		TOLUENE-SHIMITE 100 LBS		1. IN. 2. IN. 3. IN. 4. IN. 5. IN. 6. IN. 7. IN. 8. IN. 9. IN. 10. IN. 11. IN. 12. IN. 13. IN. 14. IN. 15. IN. 16. IN. 17. IN. 18. IN. 19. IN. 20. IN. 21. IN. 22. IN. 23. IN. 24. IN. 25. IN. 26. IN. 27. IN. 28. IN. 29. IN. 30. IN. 31. IN. 32. IN. 33. IN. 34. IN. 35. IN. 36. IN. 37. IN. 38. IN. 39. IN. 40. IN. 41. IN. 42. IN. 43. IN. 44. IN. 45. IN. 46. IN. 47. IN. 48. IN. 49. IN. 50. IN. 51. IN. 52. IN. 53. IN. 54. IN. 55. IN. 56. IN. 57. IN. 58. IN. 59. IN. 60. IN. 61. IN. 62. IN. 63. IN. 64. IN. 65. IN. 66. IN. 67. IN. 68. IN. 69. IN. 70. IN. 71. IN. 72. IN. 73. IN. 74. IN. 75. IN. 76. IN. 77. IN. 78. IN. 79. IN. 80. IN. 81. IN. 82. IN. 83. IN. 84. IN. 85. IN. 86. IN. 87. IN. 88. IN. 89. IN. 90. IN. 91. IN. 92. IN. 93. IN. 94. IN. 95. IN. 96. IN. 97. IN. 98. IN. 99. IN. 100. IN. 101. IN. 102. IN. 103. IN. 104. IN. 105. IN. 106. IN. 107. IN. 108. IN. 109. IN. 110. IN. 111. IN. 112. IN. 113. IN. 114. IN. 115. IN. 116. IN. 117. IN. 118. IN. 119. IN. 120. IN. 121. IN. 122. IN. 123. IN. 124. IN. 125. IN. 126. IN. 127. IN. 128. IN. 129. IN. 130. IN. 131. IN. 132. IN. 133. IN. 134. IN. 135. IN. 136. IN. 137. IN. 138. IN. 139. IN. 140. IN. 141. IN. 142. IN. 143. IN. 144. IN. 145. IN. 146. IN. 147. IN. 148. IN. 149. IN. 150. IN. 151. IN. 152. IN. 153. IN. 154. IN. 155. IN. 156. IN. 157. IN. 158. IN. 159. IN. 160. IN. 161. IN. 162. IN. 163. IN. 164. IN. 165. IN. 166. IN. 167. IN. 168. IN. 169. IN. 170. IN. 171. IN. 172. IN. 173. IN. 174. IN. 175. IN. 176. IN. 177. IN. 178. IN. 179. IN. 180. IN. 181. IN. 182. IN. 183. IN. 184. IN. 185. IN. 186. IN. 187. IN. 188. IN. 189. IN. 190. IN. 191. IN. 192. IN. 193. IN. 194. IN. 195. IN. 196. IN. 197. IN. 198. IN. 199. IN. 200. IN. 201. IN. 202. IN. 203. IN. 204. IN. 205. IN. 206. IN. 207. IN. 208. IN. 209. IN. 210. IN. 211. IN. 212. IN. 213. IN. 214. IN. 215. IN. 216. IN. 217. IN. 218. IN. 219. IN. 220. IN. 221. IN. 222. IN. 223. IN. 224. IN. 225. IN. 226. IN. 227. IN. 228. IN. 229. IN. 230. IN. 231. IN. 232. IN. 233. IN. 234. IN. 235. IN. 236. IN. 237. IN. 238. IN. 239. IN. 240. IN. 241. IN. 242. IN. 243. IN. 244. IN. 245. IN. 246. IN. 247. IN. 248. IN. 249. IN. 250. IN. 251. IN. 252. IN. 253. IN. 254. IN. 255. IN. 256. IN. 257. IN. 258. IN. 259. IN. 260. IN. 261. IN. 262. IN. 263. IN. 264. IN. 265. IN. 266. IN. 267. IN. 268. IN. 269. IN. 270. IN. 271. IN. 272. IN. 273. IN. 274. IN. 275. IN. 276. IN. 277. IN. 278. IN. 279. IN. 280. IN. 281. IN. 282. IN. 283. IN. 284. IN. 285. IN. 286. IN. 287. IN. 288. IN. 289. IN. 290. IN. 291. IN. 292. IN. 293. IN. 294. IN. 295. IN. 296. IN. 297. IN. 298. IN. 299. IN. 300. IN. 301. IN. 302. IN. 303. IN. 304. IN. 305. IN. 306. IN. 307. IN. 308. IN. 309. IN. 310. IN. 311. IN. 312. IN. 313. IN. 314. IN. 315. IN. 316. IN. 317. IN. 318. IN. 319. IN. 320. IN. 321. IN. 322. IN. 323. IN. 324. IN. 325. IN. 326. IN. 327. IN. 328. IN. 329. IN. 330. IN. 331. IN. 332. IN. 333. IN. 334. IN. 335. IN. 336. IN. 337. IN. 338. IN. 339. IN. 340. IN. 341. IN. 342. IN. 343. IN. 344. IN. 345. IN. 346. IN. 347. IN. 348. IN. 349. IN. 350. IN. 351. IN. 352. IN. 353. IN. 354. IN. 355. IN. 356. IN. 357. IN. 358. IN. 359. IN. 360. IN. 361. IN. 362. IN. 363. IN. 364. IN. 365. IN. 366. IN. 367. IN. 368. IN. 369. IN. 370. IN. 371. IN. 372. IN. 373. IN. 374. IN. 375. IN. 376. IN. 377. IN. 378. IN. 379. IN. 380. IN. 381. IN. 382. IN. 383. IN. 384. IN. 385. IN. 386. IN. 387. IN. 388. IN. 389. IN. 390. IN. 391. IN. 392. IN. 393. IN. 394. IN. 395. IN. 396. IN. 397. IN. 398. IN. 399. IN. 400. IN. 401. IN. 402. IN. 403. IN. 404. IN. 405. IN. 406. IN. 407. IN. 408. IN. 409. IN. 410. IN. 411. IN. 412. IN. 413. IN. 414. IN. 415. IN. 416. IN. 417. IN. 418. IN. 419. IN. 420. IN. 421. IN. 422. IN. 423. IN. 424. IN. 425. IN. 426. IN. 427. IN. 428. IN. 429. IN. 430. IN. 431. IN. 432. IN. 433. IN. 434. IN. 435. IN. 436. IN. 437. IN. 438. IN. 439. IN. 440. IN. 441. IN. 442. IN. 443. IN. 444. IN. 445. IN. 446. IN. 447. IN. 448. IN. 449. IN. 450. IN. 451. IN. 452. IN. 453. IN. 454. IN. 455. IN. 456. IN. 457. IN. 458. IN. 459. IN. 460. IN. 461. IN. 462. IN. 463. IN. 464. IN. 465. IN. 466. IN. 467. IN. 468. IN. 469. IN. 470. IN. 471. IN. 472. IN. 473. IN. 474. IN. 475. IN. 476. IN. 477. IN. 478. IN. 479. IN. 480. IN. 481. IN. 482. IN. 483. IN. 484. IN. 485. IN. 486. IN. 487. IN. 488. IN. 489. IN. 490. IN. 491. IN. 492. IN. 493. IN. 494. IN. 495. IN. 496. IN. 497. IN. 498. IN. 499. IN. 500. IN. 501. IN. 502. IN. 503. IN. 504. IN. 505. IN. 506. IN. 507. IN. 508. IN. 509. IN. 510. IN. 511. IN. 512. IN. 513. IN. 514. IN. 515. IN. 516. IN. 517. IN. 518. IN. 519. IN. 520. IN. 521. IN. 522. IN. 523. IN. 524. IN. 525. IN. 526. IN. 527. IN. 528. IN. 529. IN. 530. IN. 531. IN. 532. IN. 533. IN. 534. IN. 535. IN. 536. IN. 537. IN. 538. IN. 539. IN. 540. IN. 541. IN. 542. IN. 543. IN. 544. IN. 545. IN. 546. IN. 547. IN. 548. IN. 549. IN. 550. IN. 551. IN. 552. IN. 553. IN. 554. IN. 555. IN. 556. IN. 557. IN. 558. IN. 559. IN. 560. IN. 561. IN. 562. IN. 563. IN. 564. IN. 565. IN. 566. IN. 567. IN. 568. IN. 569. IN. 570. IN. 571. IN. 572. IN. 573. IN. 574. IN. 575. IN. 576. IN. 577. IN. 578. IN. 579. IN. 580. IN. 581. IN. 582. IN. 583. IN. 584. IN. 585. IN. 586. IN. 587. IN. 588. IN. 589. IN. 590. IN. 591. IN. 592. IN. 593. IN. 594. IN. 595. IN. 596. IN. 597. IN. 598. IN. 599. IN. 600. IN. 601. IN. 602. IN. 603. IN. 604. IN. 605. IN. 606. IN. 607. IN. 608. IN. 609. IN. 610. IN. 611. IN. 612. IN. 613. IN. 614. IN. 615. IN. 616. IN. 617. IN. 618. IN. 619. IN. 620. IN. 621. IN. 622. IN. 623. IN. 624. IN. 625. IN. 626. IN. 627. IN. 628. IN. 629. IN. 630. IN. 631. IN. 632. IN. 633. IN. 634. IN. 635. IN. 636. IN. 637. IN. 638. IN. 639. IN. 640. IN. 641. IN. 642. IN. 643. IN. 644. IN. 645. IN. 646. IN. 647. IN. 648. IN. 649. IN. 650. IN. 651. IN. 652. IN. 653. IN. 654. IN. 655. IN. 656. IN. 657. IN. 658. IN. 659. IN. 660. IN. 661. IN. 662. IN. 663. IN. 664. IN. 665. IN. 666. IN. 667. IN. 668. IN. 669. IN. 670. IN. 671. IN. 672. IN. 673. IN. 674. IN. 675. IN. 676. IN. 677. IN. 678. IN. 679. IN. 680. IN. 681. IN. 682. IN. 683. IN. 684. IN. 685. IN. 686. IN. 687. IN. 688. IN. 689. IN. 690. IN. 691. IN. 692. IN. 693. IN. 694. IN. 695. IN. 696. IN. 697. IN. 698. IN. 699. IN. 700. IN. 701. IN. 702. IN. 703. IN. 704. IN. 705. IN. 706. IN. 707. IN. 708. IN. 709. IN. 710. IN. 711. IN. 712. IN. 713. IN. 714. IN. 715. IN. 716. IN. 717. IN. 718. IN. 719. IN. 720. IN. 721. IN. 722. IN. 723. IN. 724. IN. 725. IN. 726. IN. 727. IN. 728. IN. 729. IN. 730. IN. 731. IN. 732. IN. 733. IN. 734. IN. 735. IN. 736. IN. 737. IN. 738. IN. 739. IN. 740. IN. 741. IN. 742. IN. 743. IN. 744. IN. 745. IN. 746. IN. 747. IN. 748. IN. 749. IN. 750. IN. 751. IN. 752. IN. 753. IN. 754. IN. 755. IN. 756. IN. 757. IN. 758. IN. 759. IN. 760. IN. 761. IN. 762. IN. 763. IN. 764. IN. 765. IN. 766. IN. 767. IN. 768. IN. 769. IN. 770. IN. 771. IN. 772. IN. 773. IN. 774. IN. 775. IN. 776. IN. 777. IN. 778. IN. 779. IN. 780. IN. 781. IN. 782. IN. 783. IN. 784. IN. 785. IN. 786. IN. 787. IN. 788. IN. 789. IN. 790. IN. 791. IN. 792. IN. 793. IN. 794. IN. 795. IN. 796. IN. 797. IN. 798. IN. 799. IN. 800. IN. 801. IN. 802. IN. 803. IN. 804. IN. 805. IN. 806. IN. 807. IN. 808. IN. 809. IN. 810. IN. 811. IN. 812. IN. 813. IN. 814. IN. 815. IN. 816. IN. 817. IN. 818. IN. 819. IN. 820. IN. 821. IN. 822. IN. 823. IN. 824. IN. 825. IN. 826. IN. 827. IN. 828. IN. 829. IN. 830. IN. 831. IN. 832. IN. 833. IN. 834. IN. 835. IN. 836. IN. 837. IN. 838. IN. 839. IN. 840. IN. 841. IN. 842. IN. 843. IN. 844. IN. 845. IN. 846. IN. 847. IN. 848. IN. 849. IN. 850. IN. 851. IN. 852. IN. 853. IN. 854. IN. 855. IN. 856. IN. 857. IN. 858. IN. 859. IN. 860. IN. 861. IN. 862. IN. 863. IN. 864. IN. 865. IN. 866. IN. 867. IN. 868. IN. 869. IN. 870. IN. 871. IN. 872. IN. 873. IN. 874. IN. 875. IN. 876. IN. 877. IN. 878. IN. 879. IN. 880. IN. 881. IN. 882. IN. 883. IN. 884. IN. 885. IN. 886. IN. 887. IN. 888. IN. 889. IN. 890. IN. 891. IN. 892. IN. 893. IN. 894. IN. 895. IN. 896. IN. 897. IN. 898. IN. 899. IN. 900. IN. 901. IN. 902. IN. 903. IN. 904. IN. 905. IN. 906. IN. 907. IN. 908. IN. 909. IN. 910. IN. 911. IN. 912. IN. 913. IN. 914. IN. 915. IN. 916. IN. 917. IN. 918. IN. 919. IN. 920. IN. 921. IN. 922. IN. 923. IN. 924. IN. 925. IN. 926. IN. 927. IN. 928. IN. 929. IN. 930. IN. 931. IN. 932. IN. 933. IN. 934. IN. 935. IN. 936. IN. 937. IN. 938. IN. 939. IN. 940. IN. 941. IN. 942. IN. 943. IN. 944. IN. 945. IN. 946. IN. 947. IN. 948. IN. 949. IN. 950. IN. 951. IN. 952. IN. 953. IN. 954. IN. 955. IN. 956. IN. 957. IN. 958. IN. 959. IN. 960. IN. 961. IN. 962. IN. 963. IN. 964. IN. 965. IN. 966. IN. 967. IN. 968. IN. 969. IN. 970. IN. 971. IN. 972. IN. 973. IN. 974. IN. 975. IN. 976. IN. 977. IN. 978. IN. 979. IN. 980. IN. 981. IN. 982. IN. 983. IN. 984. IN. 985. IN. 986. IN. 987. IN. 988. IN. 989. IN. 990. IN. 991. IN. 992. IN. 993. IN. 994. IN. 995. IN. 996. IN. 997. IN. 998. IN. 999. IN. 1000. IN. 1001. IN. 1002. IN. 1003. IN. 1004. IN. 1005. IN. 1006. IN. 1007. IN. 1008. IN. 1009. IN. 1010. IN. 1011. IN. 1012. IN. 1013. IN. 1014. IN. 1015. IN. 1016. IN. 1017. IN. 1018. IN. 1019. IN. 1020. IN. 1021. IN. 1022. IN. 1023. IN. 1024. IN. 1025. IN. 1026. IN. 1027. IN. 1028. IN. 1029. IN. 1030. IN. 1031. IN. 1032. IN. 1033. IN. 1034. IN. 1035. IN. 1036. IN. 1037. IN. 1038. IN. 1039. IN. 1040. IN. 1041. IN. 1042. IN. 1043. IN. 1044. IN. 1045. IN. 1046. IN. 1047. IN. 1048. IN. 1049. IN. 1050. IN. 1051. IN. 1052. IN. 1053. IN. 1054. IN. 1055. IN. 1056. IN. 1057. IN. 1058. IN. 1059. IN. 1060. IN. 1061. IN. 1062. IN. 1063. IN. 1064. IN. 1065. IN. 1066. IN. 1067. IN. 1068. IN. 1069. IN. 1070. IN. 1071. IN. 1072. IN. 1073. IN. 1074. IN. 1075. IN. 1076. IN. 1077. IN. 1078. IN. 1079. IN. 1080. IN. 1081. IN. 1082. IN. 1083. IN. 1084. IN. 1085. IN. 1086. IN. 1087. IN. 1088. IN. 1089. IN. 1090. IN. 1091. IN. 1092. IN. 1093. IN. 1094. IN. 1095. IN. 1096. IN. 1097. IN. 1098. IN. 1099. IN. 1100. IN. 1101. IN. 1102. IN. 1103. IN. 1104. IN. 1105. IN. 1106. IN. 1107. IN. 1108. IN. 1109. IN. 1110. IN. 1111. IN. 1112. IN. 1113. IN. 1114. IN. 1115. IN. 1116. IN. 1117. IN. 1118. IN. 1119. IN. 1120. IN. 1121. IN. 1122. IN. 1123. IN. 1124. IN. 1125. IN. 1126. IN. 1127. IN. 1128. IN. 1129. IN. 1130. IN. 1131. IN. 1132. IN. 1133. IN. 1134. IN. 1135. IN. 1136. IN. 1137. IN. 1138. IN. 1139. IN. 1140. IN. 1141. IN. 1142. IN. 1143. IN. 1144. IN. 1145. IN. 1146. IN. 1147. IN. 1148. IN. 1149. IN. 1150. IN. 1151. IN. 1152. IN. 1153. IN. 1154. IN. 1155. IN. 1156. IN. 1157. IN. 1158. IN. 1159. IN. 1160. IN. 1161. IN. 1162. IN. 1163. IN. 1164. IN. 1165. IN. 1166. IN. 1167. IN. 1168. IN. 1169. IN. 1170. IN. 1171. IN. 1172. IN. 1173. IN. 1174. IN. 1175. IN. 1176. IN. 1177. IN. 1178. IN. 1179. IN. 1180. IN. 1181. IN. 1182. IN. 1183. IN. 1184. IN. 1185. IN. 1186. IN. 1187. IN. 1188. IN. 1189. IN. 1190. IN. 1191. IN. 1192. IN. 1193. IN. 1194. IN. 1195. IN. 1196. IN. 1197. IN. 1198. IN. 1199. IN. 1200. IN. 1201. IN. 1202. IN. 1203. IN. 1204. IN. 1205. IN. 1206. IN. 1207. IN. 1208. IN. 1209. IN. 1210. IN. 1211. IN. 1212. IN. 1213. IN. 1214. IN. 1215. IN. 1216. IN. 1217. IN. 1218. IN. 1219. IN. 1220. IN. 1221. IN. 1222. IN. 1223. IN. 1224. IN. 1225. IN. 1226. IN. 1227. IN. 1228. IN. 1229. IN. 1230. IN. 1231. IN. 1232. IN. 1233. IN. 1234. IN. 1235. IN. 1236. IN. 1237. IN. 1238. IN. 1239. IN. 1240. IN. 1241. IN. 1242. IN. 1243. IN. 1244. IN. 1245. IN. 1246. IN. 1247. IN. 1248. IN. 1249. IN. 1250. IN. 1251. IN. 1252. IN. 1253. IN. 1254. IN. 1255. IN. 1256. IN. 1257. IN. 1258. IN. 1259. IN. 1260. IN. 1261. IN. 1262. IN. 1263. IN. 1264. IN. 1265. IN. 1266. IN. 1267. IN. 1268. IN. 1269. IN. 1270. IN. 1271. IN. 1272. IN. 1273. IN. 1274. IN. 1275. IN. 1276. IN. 1277. IN. 1278. IN. 1279. IN. 1280. IN. 1281. IN. 1282. IN. 1283. IN. 1284. IN. 1285. IN. 1286. IN. 1287. IN. 1288. IN. 1289. IN. 1290. IN. 1291. IN. 1292. IN. 1293. IN. 1294. IN. 1295. IN. 1296. IN. 1297. IN. 1298. IN. 1299. IN. 1300. IN. 1301. IN. 1302. IN. 1303. IN. 1304. IN. 1305. IN. 1306. IN. 1307. IN. 1308. IN. 1309. IN. 1310. IN. 1311. IN. 1312. IN. 1313. IN. 1314. IN. 1315. IN. 1316. IN. 1317. IN. 1318. IN. 1319. IN. 1320. IN. 1321. IN. 1322. IN. 1323. IN. 1324. IN. 1325. IN. 1326. IN. 1327. IN. 1328. IN. 1329. IN. 1330. IN. 1331. IN. 1332. IN. 1333. IN. 1334. IN. 1335. IN. 1336. IN. 1337. IN. 1338. IN. 1339. IN. 1340. IN. 1341. IN. 1342. IN. 1343. IN. 1344. IN. 1345. IN. 1346. IN. 1347. IN. 1348. IN. 1349. IN. 1350. IN. 1351. IN. 1352. IN. 1353. IN. 1354. IN. 1355. IN. 1356. IN. 1357. IN. 1358. IN. 1359. IN. 1360. IN. 1361. IN. 1362. IN. 1363. IN. 1364. IN. 1365. IN. 1366. IN. 1367. IN. 1368. IN. 1369. IN. 1370. IN. 1371. IN. 1372. IN. 1373. IN. 1374. IN. 1375. IN. 1376. IN. 1377. IN. 1378. IN. 1379. IN. 1380. IN. 1381. IN. 1382. IN. 1383. IN. 1384. IN. 1385. IN. 1386. IN. 1387. IN. 1388. IN. 1389. IN. 1390. IN. 1391. IN. 1392. IN. 1393. IN. 1394. IN. 1395. IN. 1396. IN. 1397. IN. 1398. IN. 1399. IN. 1400. IN. 1401. IN. 1402. IN. 1403. IN. 1404. IN. 1405. IN. 1406. IN. 1407. IN. 1408. IN. 1409. IN. 1410. IN. 1411. IN. 1412. IN. 1413. IN. 1414. IN. 1415. IN. 1416. IN. 1417. IN. 1418. IN. 1419. IN. 1420. IN. 1421. IN. 1422. IN. 1423. IN. 1424. IN. 1425. IN. 1426. IN. 1427. IN. 1428. IN. 1429. IN. 1430. IN. 1431. IN. 1432. IN. 1433. IN. 1434. IN. 1435. IN. 1436. IN. 1437. IN. 1438. IN. 1439. IN. 1440. IN. 1441. IN. 1442. IN. 1443. IN. 1444. IN. 1445. IN. 1446. IN. 1447. IN. 1448. IN. 1449. IN. 1450. IN. 1451. IN. 1452. IN. 1453. IN. 1454. IN. 1455. IN. 1456. IN. 1457. IN. 1458. IN. 1459. IN. 1460. IN. 1461. IN. 1462. IN. 1463. IN. 1464. IN. 1465. IN. 1466. IN. 1467. IN. 1468. IN. 1469. IN. 1470. IN. 1471. IN. 1472. IN. 1473. IN. 1474. IN. 1475. IN. 1476. IN. 1477. IN. 1478. IN. 1479. IN. 1480. IN. 1481. IN. 1482. IN. 1483. IN. 1484. IN. 1485. IN. 1486. IN. 1487. IN. 1488. IN. 1489. IN. 1490. IN. 1491. IN. 1492. IN. 1493. IN. 1494. IN. 1495. IN. 1496. IN. 1497. IN. 1498. IN. 1499. IN. 1500. IN. 1501. IN. 1502. IN. 1503. IN. 1504. IN. 1505. IN. 1506. IN. 1507. IN. 1508. IN. 1509. IN. 1510. IN. 1511. IN. 1512. IN. 1513. IN. 1514. IN. 1515. IN. 1516. IN. 1517. IN. 1518. IN. 1519. IN. 1520. IN. 1521. IN. 1522. IN. 1523. IN. 1524. IN. 1525. IN. 1526. IN. 1527. IN. 1528. IN. 1529. IN. 1530. IN. 1531. IN. 1532. IN. 1533. IN. 1534. IN. 1535. IN. 1536. IN. 1537. IN. 1538. IN. 1539. IN. 1540. IN. 1541. IN. 1542. IN. 1543. IN. 1544. IN. 1545. IN. 1546. IN. 1547. IN. 1548. IN. 1549. IN. 1550. IN. 1551. IN. 1552. IN. 1553. IN. 1554. IN. 1555. IN. 1556. IN. 1557. IN. 1558. IN. 1559. IN. 1560. IN. 1561. IN. 1562. IN. 1563. IN. 1564. IN. 1565. IN. 1566. IN. 1567. IN. 1568. IN. 1569. IN. 1570. IN. 1571. IN. 1572. IN. 1573. IN. 1574. IN. 1575. IN. 1576. IN. 1577. IN. 1578. IN. 1579. IN. 1580. IN. 1581. IN. 1582. IN. 1583. IN. 1584. IN. 1585. IN. 1586. IN. 1587. IN. 1588. IN. 1589. IN. 1590. IN. 1591. IN. 1592. IN. 1593. IN. 1594. IN. 1595. IN. 1596. IN. 1597. IN. 1598. IN. 1599. IN. 1600. IN. 1601. IN. 1602. IN. 1603. IN. 1604. IN. 1605. IN. 1606. IN. 1607. IN. 1608. IN. 1609. IN. 1610. IN. 1611. IN. 1612. IN. 1613. IN. 1614. IN. 1615. IN. 1616. IN. 1617. IN. 1618. IN. 1619. IN. 1620. IN. 1621. IN. 1622. IN. 1623. IN. 1624. IN. 1625. IN. 1626. IN. 1627. IN. 1628. IN. 1629. IN. 1630. IN. 1631. IN. 1632. IN. 1633. IN. 1634. IN. 1635. IN. 1636. IN. 1637. IN. 1638. IN. 1639. IN. 1640. IN. 1641. IN. 1642. IN. 1643. IN. 1644. IN. 1645. IN. 1646. IN. 1647. IN. 1648. IN. 1649. IN. 1650. IN. 1651. IN. 1652. IN. 1653. IN. 1654. IN. 1655. IN. 165				

WVDP RECORD OF REVISION

Rev. No.	Description of Changes	Revision On Page(s)	Dated
0	Original Issue This document affects the Waste Planning & Disposition Department	All	09/18/14

WVMP SAR Reference 1-12

West Valley Melter Package (WVMP) — Comparison of AWS
D1.1, Structural Welding Code and ASME Section III,
Subsection ND Welding Requirements, SRNL-L4430-2015-
00001, D.N. Maxwell, SRNL Material Science and Technology.
March 2015

SRNL-L4430-2015-00001

Date: 3/27/2015

To: J.L. England
Program Manager, Packaging Technology
R&D Engineering

From: D.N. Maxwell 
SRNL/MS&T, Material Science and Technology

West Valley Melter Package (WVMP) – Comparison of AWS D1.1, Structural Welding Code and ASME Section III, Subsection ND Welding Requirements

The WVMP is fabricated of low alloy carbon steel materials joined by using the welding processes of flux core arc welding (FCAW), gas tungsten arc welding (GTAW), shielded metal arc welding (SMAW), and submerged arc welding (SAW). Requirements for use of these welding processes, fabrication, and all welding performed on this melter package were in accordance with the American Welding Society (AWS) D1.1 Structural Welding Code – Steel, 1998 Edition (AWS D1.1).

The melter package was manufactured by American Tank and Fabricating of Cleveland, Ohio.

Prior to use, the melter package is required to meet or provide an equivalent level of safety to NUREG/CR -3019, UCRL-53044, RM, *Recommended Welding Criteria for Use in the Fabrication of Shipping Containers for Radioactive Materials* (NUREG/CR-3019), Category II containment related welds. This criterion is based on the requirements of the American Society of Mechanical Engineers (ASME) Section III, Division 1, Subsection ND, 2004 Edition (ASME Section III ND).

The following entails a comparison of the welding requirements set forth by the specified code and standards based on review of the WVMP welding documentation package¹.

¹ Welding Documentation Package included - WMG Inc, West Valley Melter Container drawings 4005-DW-001, pages 1 thru 8, weld records, weld map, MT & VT reports, CMTR's, load test, welder qualifications, WPS's & PQRs, and NDE qualifications.

We put science to work.™

WELDING REQUIREMENTS			
NUREG/CR-3019 – Containment Related Welds, Category I; ASME Section III, Sub. ND	Fabrication Recorded Attributes/Code of Record – AWS D1.1, 1998 Edition	Equivalency	Differences Identified
<p>Base Materials – <i>ND-2000</i> (except <i>ND-2300</i> and <i>ND-4100</i>)</p> <p>NUREG/CR-3019 and ASME Subsection ND require fracture toughness testing.</p> <p>ND-2121(a) - Pressure retaining material shall conform to the requirements of one of the specifications for materials listed in Tables 1A, 1B, and 3, Section II, Part D, Subpart 1.....</p> <p>ND 2121(e) – “Welding and brazing materials used in manufacture of items shall comply with an SFA specification in Section II, Part C, except as otherwise permitted in Section IX, and shall also comply with the applicable requirements of this Article.</p> <p>ND2531 - Plates shall be examined in accordance with the requirements of the material specification.</p>	<p>Base materials approved for use – A36, A572 grade 50/60 (sub. A633 E/C), A516 grade 70 – Thickness (1/8” 1/2”, 1”, 2”, 4” 6”)</p> <p>Welding materials approved for use – E71T-1 (spec. A5.20), ER70S-3 (spec. A5.18), E81T1- A1M (spec. A5.29), E7018 (spec. A5.1), and EA1 (spec. A5.23). Each material met the applicable AWS A5.X specification.</p> <p>Visual examination performed on base material prior to welding.</p>	<p>Base materials approved by ASME and AWS, same SA (ASME specification designation) and ASTM specifications as applicable.</p> <p>SFA Specifications (ASME) required in Section III, ND, are identical to that listed in AWS A5.X Specifications.</p> <p>Plates were examined prior to welding.</p>	<p>No fracture toughness documentation is contained in the welding documentation package for base or weld material except for ASTM A633 Grade E (3” x 93” x 330”). A633 was an allowable substitution for A572 Grade 60 material. Reference drawing 4005-DW-001, Revision 4, Sheet 1 of 8, General Note 13.</p> <p>Reference <i>Welding Materials</i>, ND-2400</p> <p>No purchase order specification available. Therefore, plate examination requirements unknown. However, receipt inspection records document that MT examination was performed on the SA/A516 6” thick material.</p>

We put science to work.™

<p>Welding Materials – <i>ND-2400</i></p> <p>NUREG/CR-3019 and ASME Subsection ND require fracture toughness testing.</p> <p>ASME Section III, Subsection ND requires filler material testing for tensile and chemistry.</p> <p>ND-2440 - Suitable storage and handling of electrodes, flux, and other welding material shall be maintained. Precautions shall be taken to minimize absorption of moisture by fluxes and cored, fabricated, and coated electrodes.</p>	<p>Welding Materials Used – E71T-1 (spec. A5.20), ER70S-3 (spec. A5.18), E81T1-A1M (spec. A5.29), E7018 (spec. A5.1), and EA1 (spec. A5.23)</p> <p>Section 5.3 establishes in detail the storage and handling requirements for welding consumables and electrodes.</p>	<p>Although fracture toughness, chemical, and tensile test results are not available through CMTRs, the filler material used in the FCAW, SMAW and SAW process met these requirements through due process by the manufacturer in order to meet the applicable AWS A5.X Specification as specified in the welding procedure specification (WPS).</p> <p>Storage and handling requirements of welding materials are equivalent.</p>	<p>The filler material certified material test reports (CMTRs) verifying fracture toughness, tensile, and chemistry are not available.</p> <p>None</p>
<p>Joint Design/Fabrication – <i>ND-4200/4400</i></p> <p>ASME Section III, Subsection ND requires full penetration butt welds for Category A, B, C, and D weld joints except for Category D branch connections. Partial penetration welds are allowed for branch connections.</p> <p>ASME Section IX approved welding processes.</p> <p>Welding preparation and welding profile requirements.</p>	<p>Weld Joint/Welds - Complete/partial joint penetration v-groove, fillet and plug welds meet AWS prequalified joint design.</p> <p>Welding Processes – FCAW, GTAW, SMAW, and SAW</p> <p>Welding preparation and welding profile requirements.</p>	<p>The WVMP full penetration welds are the ones associated with the lifting lugs, railcar securement lugs, and sacrificial shock absorbers and do not allow radiographic examination due to joint geometry.</p> <p>Welding processes used (FCAW, GTAW, SMAW, and SAW) are approved for use by ASME Section IX.</p> <p>Weld joint preparation, groove type, weld type, and welding profiles used in the fabrication.</p>	<p>Partial penetration welds are not allowed for corner joints.</p> <p>None</p> <p>None</p>

We put science to work.™

<p>Heat Treatment – <i>ND-4600</i></p> <p>ASME Section III, Subsection ND requires heat treatment for the thickness and material used. PWHT exemptions are allowed when specific preheats are performed (250° F min. and an intermediate post weld soak at 300° F min. for 2hr. for material over 3" thick).</p>	<p>AWS requires heat treatment when specified contractually.</p> <p>Preheat requirements are 225° F minimum for material thickness equal to or greater than 2 1/2" for the base material used.</p>	<p>Both codes require preheat.</p>	<p>WPSs used are prequalified to meet the AWS D1.1 requirements for minimum preheat (225° F) and PWHT in accordance with the Purchase Order.</p> <p>Preheat requirements below the minimum specified to meet Section III, Subsection ND.</p> <p>Purchase Order and documentation recording of any PWHT are not available.</p>
<p>Qualification Procedure/Personnel – <i>ND-4300</i></p> <p>ASME Section III, Subsection ND requires qualification to be performed in accordance with ASME Section IX and additional requirements specified in ND-4300.</p>	<p>Welding Procedure Specifications – Prequalified and qualified in accordance with AWS requirements.</p> <p>AWS allows the use of welder qualifications performed in accordance with other standards at the Engineers' discretion.</p> <p>"Engineer - "Engineer" shall be defined as a duly designated individual who acts for, and in behalf of, the Owner on all matters within the scope of the code."</p>	<p>The essential and nonessential variables and mechanical testing of the AWS prequalified and qualified WPSs are equivalent to ASME Section IX and ASME Section III, Subsection ND requirements.</p> <p>The welder performance qualifications were performed in accordance with ASME Section IX.</p>	<p>Welding Procedure Specifications are required to be qualified in accordance with ASME Section IX which requires acceptable mechanical testing of prescribed welded coupons by the fabricator. Prequalified welding procedure specifications are not allowed.</p>

We put science to work.™

Examination – <i>ND-5000</i>			
ASME Section III, Subsection ND requires radiography on full penetration welds.	Weld Inspections – All welds are required to receive a Visual examination (VT).		Radiographic examination not conducive to the joint geometry of the full penetration welds (the lifting lugs, railcar securement lugs, and sacrificial shock absorbers).
ASME Section III, Subsection ND requires NDE (MT) examination on partial penetration and fillet welds.	Reports indicate that all structural welds received a VT and magnetic particle (MT) examination.	Full penetration, partial penetration, and fillet welds received MT examination.	No significant differences.
ASME Section III, Subsection ND requires NDE personnel certification in accordance with SNT-TC-1A.	Weld Inspection Personnel – NDE certification in accordance SNT-TC-1A and visual examination performed by certified weld inspectors (CWI).	Documents contained in the welding documentation package are showing NDE certification to SNT-TC-1A and CWI. This includes eye examination, training, and testing reports.	None

We put science to work.™

Conclusion

To achieve code compliance or to claim equivalency all aspects, (material, design, fabrication and installation, examination, and testing requirements) of the governing code must be met.

As revealed in the welding requirements chart, differences exist with ASME Section III, Subsection ND mandatory requirements as compared to similar AWS D1.1 requirements, which are only implemented at the discretion of the Engineer² and/or purchase specification.

Review of the WVMP welding documentation package revealed the following differences³:

- Base metal fracture toughness requirements,
- Filler material – Certified Material Test Report (fracture toughness requirements, chemistry and tensile results),
- Use of prequalified welding procedure specifications,
- Partial penetration groove weld approval for specified joint designs,
- Heat treat requirements both preheat and postweld heat treatment.

This comparison does not conclude any inadequacies with the AWS D1.1, Structural Welding Code. Both the AWS D1.1 and the ASME Section III design codes establish welding requirements (material certification, weld joint design, fabrication requirements, procedure/personnel qualification, pre-heat/postweld heat treat requirements, weld examination, and weld examination personnel certification) that collectively produce a sound weld capable of functioning at the design level of safety.

Therefore, use of the AWS D1.1 Structural Welding Code – Steel could be used as an acceptable alternative providing the level of safety needed for a containment/transportation package.

² “**Engineer** - “Engineer” shall be defined as a duly designated individual who acts for, and in behalf of, the Owner on all matters within the scope of the code.”

³ Resolution of these differences is addressed in report SARWVMP-01, *Safety Analysis Report for the West Valley Melter Package*, Revision 1, Docket Number 71-9797.

We put science to work.™

WVMP SAR Reference 2-18

Receiving Inspection & Material Validation – Steel Plate,
Document 40945-000, West Valley Purchase Order 53634.

RECEIVING INSPECTION & MATERIAL VALIDATION—STEEL PLATE

1. Receiving Information:

Purchased by: ATF Supplier: 156 P.O. No. 53634
 Line Item No. 3 AT&F Job NO. 40945 AT&F Heat Code NA
 Receiver No. 7583 Date Rec'd. 6/18/04 Quantity Rec'd. 1

2. Dimensional Inspection:

Thickness: 6 6 6 6
 (4 corners)
 Width: 153 Length: 155

3. Material Marking or Stamping

Record the following information from Plate Stamping:

(example)

156 Plate Manufacturer (BLP)
SA516-70 MT Material Spec and Type or Grade (SA516-70-G MT LTV)
 (G, MT, LTV if applicable)
U2395 Plate Heat Number (402T6311)
2 Plate Slab Number (1)

UT Number (if applicable)

(UT SA435)

4. Remarks: (e.g. shipping damage, other stamping or noted nonconformance)

Plate conforms to the attached P.O. requirements and the attached Material Test Reports match the Plate Markings.

Inspected by: [Signature] Date 6/24/04 ☒ Accept ☐ Reject

Validated by: [Signature] Date 7-4-04 ☒ Accept ☐ Reject

Code No. QDR/SN

Material Identification & Verification
 (performed at time of fit-up)

1. Item Information:

Mfg. Serial # _____ AT&F Job No. _____ DWG./Item # _____ Rev. No. _____

2. Permanent Stamping Information: (Center of Plate edge 6" from weld or as req'd.)

_____ Plate Manufacturer
 _____ Material Spec and Type or Grade
 (G, MT, LTV if applicable)
 _____ Plate Heat No.
 _____ Plate Slab No.
 _____ UT Number (if applicable)

Mfg. Ser. No. _____ Manufacturers Serial Number

Plate verified to be same as receipt inspected, plate edges visually inspected for laminations and permanent stamping inspected per attached AT&F validated Material Test Report (s)

Verified by: _____ Date _____ Q/C Review: _____ Date _____

AI-Review: _____ Date _____

SP110-2F1 Rev. 1 4/11/02

ISG PLATE INC.

TEST CERTIFICATE

SHIP TO:

AMERICAN TANK & FABR. CO.
12314 ELMWOOD AVE.
DOOR #11
CLEVELAND OH 44111

PAGE NO: 01 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10291-002
MELT NO: U2395 ✓
SLAB NO: 2
DATE: 06/16/04

SOLD TO:

AMERICAN TANK & FAB. CO.
12314 ELMWOOD AVE.
CLEVELAND OH 44111

SEND TO:

TEST REPORT WITH SHIPMENT
FOR BOL # 44024

PLATE DIMENSIONS / DESCRIPTION

TOTAL QTY	GAUGE	WIDTH	LENGTH	DESCRIPTION	PIECE WEIGHT
	6"	153"	155"	RECTANGLE	40553#

CUSTOMER INFORMATION

CUSTOMER PO: 53634

SPECIFICATION(S)

THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATION(S).

ASTM A516 YR 90 GR 70
ASME SA516 2001 EDITION GRADE 70
MATERIAL PRODUCED UNDER A CERTIFIED QUALITY MGMT SYSTEM COMPLYING WITH
ISO 9001 ABS-QE CERT. NO. 30130

CHEMICAL COMPOSITION

	C	MN	P	S	CU	SI	NI	CR	MO
MELT: U2395 ✓	.24	.93	.008	.009	.25	.19	.12	.07	.05
	V	TI	AL	CB					
MELT: U2395	.002	.002	.022	.001					

MANUFACTURE

MCQUAID-EHN GRAIN SIZE PER E112 - 7-8

MEETS THE REQUIREMENTS

ASME SA 516-70 2001 edition
JRC 7-4-04 pg 1 of 2

HEAT TREAT CONDITION

NATL OR TEST	HEAT TREAT DESCRIPTION	NOM TEMP	HOLD MINS	COOL MTHD
PL/TEST	NORMALIZE	1650F	181	AIR COOL

PO# 53634

TENSILE PROPERTIES

40945-000

SLAB NO.	LOC	DIR	STRENGTH PSI X 100	STRENGTH PSI X 100	GAGE LENGTH	X
2	BOT.	TRANS.	423	766	2.00"	24.0

WE HEREBY CERTIFY THAT THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

SUPERVISOR - TEST REPORTING
ELINORE ZAPLITNY

MEETS THE REQUIREMENTS ✓

ASME SA516-70 2001 edition

for 7.404 pg 2062

40945-0000

ISG PLATE INC.

TEST CERTIFICATE

PAGE NO: 02 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10291-002
MELT NO: U2375
SLAB NO: 2
DATE: 06/16/04

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
MERCURY OR MERCURY COMPOUNDS ARE NOT USED
IN THE MANUFACTURE OF ISG PRODUCTS.

40945-0000

RECEIVING INSPECTION & MATERIAL VALIDATION—STEEL PLATE

1. Receiving Information :

Purchased by: ATF Supplier: ISG P.O. No. 53634
 Line Item No. 3 AT&F Job NO. 40945 AT&F Heat Code NIA
 Receiver No. 7615 Date Rec'd. 6/23/04 Quantity Rec'd. 1

2. Dimensional Inspection :

Thickness: 6 6 6 6
 (4 corners)
 Width: 153 Length: 155

3. Material Marking or Stamping

Record the following information from Plate Stamping:

(example ;

ISG Plate Manufacturer (BLP)
SA516-70 MT Material Spec and Type or Grade (SA516-70 GMT LTV)
 (G, MT, LTV if applicable)
42395 Plate Heat Number (402T6511)
3 Plate Slab Number (1)

UT Number (if applicable) (UT-SA435)
4. Remarks : (e.g. shipping damage, other stamping or noted nonconformance)

Plate conforms to the attached P.O. requirements and the attached Material Test Reports match the Plate Markings.

Inspected by: [Signature] Date 6/24/04 ☒ Accept ☐ Reject

Validated by: [Signature] Date 7-4-04 ☒ Accept ☐ Reject
 Code No. QDR S/N

Material Identification & Verification
 (performed at time of fit-up)

1. Item Information :

Mfg. Serial # AT&F Job No. DWG./ Item # Rev.No.

2. Permanent Stamping Information : (Center of Plate edge 6" from weld or as req'd.)

 Plate Manufacturer
 Material Spec and Type or Grade
 (G, MT, LTV if applicable)
 Plate Heat No.
 Plate Slab No.
 UT Number (if applicable)

Mfg. Ser. No. Manufacturers Serial Number

Plate verified to be same as receipt inspected, plate edges visually inspected for laminations and permanent stamping inspected per attached AT&F validated Material Test Report (s)

Verified by: Date Q/C Review: Date

AT-Review: Date

SP110-2F1 Rev.1 4/11/02

ISB PLATE INC.

TEST CERTIFICATE

SHIP TO:

AMERICAN TANK & FABR. CO.
12314 ELMWOOD AVE.
DOOR #11
CLEVELAND OH 44111

PAGE NO: 01 OF 02

FILE NO: 0325-01-05

MILL ORDER NO: 10291-002

MELT NO: U2395✓

SLAB NO: 3

DATE: 06/16/04

SOLD TO:

AMERICAN TANK & FAB. CO.
12314 ELMWOOD AVE.
CLEVELAND OH 44111

SEND TO:

TEST REPORT WITH SHIPMENT

FOR BOL # 44027

PLATE DIMENSIONS / DESCRIPTION

TOTAL QTY	GAUGE	WIDTH	LENGTH	DESCRIPTION	PIECE WEIGHT
	6"	153"	155"	RECTANGLE	40353#

CUSTOMER INFORMATION

CUSTOMER PO: 53634

SPECIFICATION(S)

THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATION(S).

ASTM A516 YR 90 GR 70

ASME SA516 2001 EDITION GRADE 70

MATERIAL PRODUCED UNDER A CERTIFIED QUALITY MGMT SYSTEM COMPLYING WITH
ISO 9001 ABS-QE CERT. NO. 30130

CHEMICAL COMPOSITION

	C	MN	P	S	CU	SI	NI	CR	MO
MELT:U2395	.24	.93	.008	.009	.25	.19	.12	.07	.05

	V	TI	AL	CB
MELT:U2395	.002	.002	.022	.001

MANUFACTURE

MCQUAID-EHN GRAIN SIZE PER E112 - 7-8

MEETS THE REQUIREMENTS ✓

ASME SA516-70 2001 Edition

JPR 7-8-04 pg 1 of 2

PA 53634

HEAT TREAT CONDITION

HATL OR TEST	HEAT TREAT DESCRIPTION	NOM TEMP	HOLD MINS	COOL MTHD
PL/TEST	NORMALIZE	1650F	241	AIR COOL

TENSILE PROPERTIES

40945-0000

SLAB NO.	LOC	DIR	STRENGTH PSI X 100	STRENGTH PSI X 100	GAGE LGTH	%
3	BOT.	TRANS.	423	763	2.00"	25.0

WE HEREBY CERTIFY THAT THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

SUPERVISOR - TEST REPORTING
ELINDRE ZAPLITNY

40945-0000

MEETS THE REQUIREMENTS ✓

~~meets~~ meets AIME SAS 16-70 2001 Ed. 4.

JR 7-9-04. 11/20/02

ISG PLATE INC.

TEST CERTIFICATE

PAGE NO: 02 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10291-002
MELT NO: U2395
SLAB NO: 3
DATE: 06/16/04

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
MERCURY OR MERCURY COMPOUNDS ARE NOT USED
IN THE MANUFACTURE OF ISG PRODUCTS.

40945-0000

RECEIVING INSPECTION & MATERIAL VALIDATION—STEEL PLATE

1. Receiving Information:

Purchased by: ATF Supplier: 15G P.O. No. 53634
 Line Item No. 2 AT&F Job NO. 40945 AT&F Heat Code NA
 Receiver No. 7582 Date Rec'd. 6/18/04 Quantity Rec'd. 1

2. Dimensional Inspection:

Thickness: 6 6 6 6
 (4 corners)
 Width: 154 Length: 153

3. Material Marking or Stamping

Record the following information from Plate Stamping:

(example)

15G Plate Manufacturer (BLP)
SA516-70 MT Material Spec and Type or Grade (SA516-70-G MT LTV)
 (G, MT, LTV if applicable)
U2465 Plate Heat Number (402T6511)
2 Plate Slab Number (1)

UT Number (if applicable)

(UT SA435)

4. Remarks: (e.g. shipping damage, other stamping or noted nonconformance)

Plate conforms to the attached P.O. requirements and the attached Material Test Reports match the Plate Markings.

Inspected by: [Signature] Date 6/24/04 ☒ Accept ☐ Reject

Validated by: [Signature] Date 7-9-04 ☒ Accept ☐ Reject

Code No. QDR S/N

Material Identification & Verification

(performed at time of fit-up)

1. Item Information:

Mfg. Serial # _____ AT&F Job No. _____ DWG./Item # _____ Rev. No. _____

2. Permanent Stamping Information: (Center of Plate edge 6" from weld or as req'd.)

_____ Plate Manufacturer
 _____ Material Spec and Type or Grade
 (G, MT, LTV if applicable)
 _____ Plate Heat No.
 _____ Plate Slab No.
 _____ UT Number (if applicable)

Mfg. Ser. No. _____ Manufacturers Serial Number

Plate verified to be same as receipt inspected, plate edges visually inspected for laminations and permanent stamping inspected per attached AT&F validated Material Test Report (s)

Verified by: _____ Date _____ Q/C Review: _____ Date _____

AI-Review: _____ Date _____

SP110-2F1 Rev. 1 4/11/02

ISO PLATE INC.

TEST CERTIFICATE

SHIP TO:

AMERICAN TANK & FABR. CO.
12314 ELMWOOD AVE.
DOOR #11
CLEVELAND OH 44111

PAGE NO: 01 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10291-001
MELT NO: U2465 ✓
SLAB NO: 2
DATE: 06/16/04

SOLD TO:

AMERICAN TANK & FAB. CO.
12314 ELMWOOD AVE.
CLEVELAND OH 44111

SEND TO:

TEST REPORT WITH SHIPMENT
FOR BOL # 44025

PLATE DIMENSIONS / DESCRIPTION

TOTAL QTY	GAUGE	WIDTH	LENGTH	DESCRIPTION	PIECE WEIGHT
	6" ✓	154"	153"	RECTANGLE	40093#

CUSTOMER INFORMATION

CUSTOMER PO: 53634

SPECIFICATION(S)

THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATION(S).

ASTM A516 YR 90 GR 70

ASME SA516 2001 EDITION GRADE 70

MATERIAL PRODUCED UNDER A CERTIFIED QUALITY MGMT SYSTEM COMPLYING WITH ISO 9001 ABS-QE CERT. NO. 30130

CHEMICAL COMPOSITION

	C	MN	P	S	CU	SI	NI	CR	MO
MELT:U2465	.23	.95	.010	.011	.26	.19	.11	.10	.03

	V	TI	AL	CB
MELT:U2465	.002	.001	.029	.001

MANUFACTURE

MCQUAID-EHN GRAIN SIZE PER E112 - 7-8

HEAT TREAT CONDITION

MATL OR TEST	HEAT TREAT DESCRIPTION	NOM TEMP	HOLD MINS	COOL MTHD
PL/TEST	NORMALIZE	1650F	180	AIR COOL

MEETS THE REQUIREMENTS ✓

ASME SA516-70 2001 edition

JR 7-4-04 pg 1 of 2

40945-000

PO# 53634

TENSILE PROPERTIES

SLAB NO.	LOC	DIR	YIELD STRENGTH PSI X 100	TENSILE STRENGTH PSI X 100	ELONGATION GAGE LGTH %
2 ✓	BOT.	TRANS.	423	781	2.00" 23.0

WE HEREBY CERTIFY THAT THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

SUPERVISOR - TEST REPORTING
ELINORE ZAPLITNY

40945-0000

MEETS THE REQUIREMENTS

ASME SA 516-70 - 2001 Ed. 1.0.2

J.P.A. 7-9-04 py 2012

ISG PLATE

TEST CERTIFICATE

PAGE NO: 02 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10291-001
MELT NO: U2465
SLAB NO: 2
DATE: 06/16/04

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
MERCURY OR MERCURY COMPOUNDS ARE NOT USED
IN THE MANUFACTURE OF ISG PRODUCTS.

40945 0000

ISG PLATE 1

TEST CERTIFICATE

PAGE NO: 02 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10291-001
MELT NO: U2465
SLAB NO: 2
DATE: 06/16/04

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
MERCURY OR MERCURY COMPOUNDS ARE NOT USED
IN THE MANUFACTURE OF ISG PRODUCTS.

40945 0000

SLAB NO.	LOC	DIR	YIELD STRENGTH PSI X 100	TENSILE STRENGTH PSI X 100	ELONGATION GAGE LGTH %
2 ✓	E01.	TRANS.	423	781	2.00" 23.0

WE HEREBY CERTIFY THAT THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

SUPERVISOR - TEST REPORTING
ELINORE ZAPLITNY

40945-0000

MEETS THE REQUIREMENTS ✓

ASME SA 516-70 - 2001 Ed. 1-1-2

JDA 7-9-04 pg 2 of 2

ISG PLATE

TEST CERTIFICATE

PAGE NO: 02 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10291-001
MELT NO: U2465
SLAB NO: 2
DATE: 06/16/04

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
MERCURY OR MERCURY COMPOUNDS ARE NOT USED
IN THE MANUFACTURE OF ISG PRODUCTS.

40945 0000

RECEIVING INSPECTION & MATERIAL VALIDATION—STEEL PLATE

1. Receiving Information:

Purchased by: ATF Supplier: 15G P.O. No. 53634
 Line Item No. 2 AT&F Job NO. 40945 AT&F Heat Code NA
 Receiver No. 7616 Date Rec'd. 6/23/04 Quantity Rec'd. 1

2. Dimensional Inspection:

Thickness: 6 6 6 6
 (4 corners)
 Width: 154 Length: 153

3. Material Marking or Stamping

Record the following information from Plate Stamping:

(example)

15G Plate Manufacturer (BLP)
SA516-70 MT Material Spec and Type or Grade (SA516-70 G MT LTV)
 ("G, MT, LTV if applicable")
U2465 Plate Heat Number (40276511)
1 Plate Slab Number (1)

UT Number (if applicable) (UT-SA435)

4. Remarks: (e.g. shipping damage, other stamping or noted nonconformance)

Plate conforms to the attached P.O. requirements and the attached Material Test Reports match the Plate Markings.

Inspected by: [Signature] Date 6/24/04 ☒ Accept ☐ Reject

Validated by: [Signature] Date 7-9-04 ☒ Accept ☐ Reject

Code No. QDR S/N

Material Identification & Verification
 (performed at time of fit-up)

1. Item Information:

Mfg. Serial # AT&F Job No. DWG./Item # Rev. No.

2. Permanent Stamping Information: (Center of Plate edge 6" from weld or as req'd.)

Plate Manufacturer
 Material Spec and Type or Grade
 (G, MT, LTV if applicable)
 Plate Heat No.
 Plate Slab No.
 UT Number (if applicable)

Mfg. Ser. No. Manufacturers Serial Number

Plate verified to be same as receipt inspected, plate edges visually inspected for laminations and permanent stamping inspected per attached AT&F validated Material Test Report (s)

Verified by: Date Q/C Review: Date

AI-Review: Date

SP110-2F1 Rev. 1 4/11/02

ISG PLATE INC.

TEST CERTIFICATE

SHIP TO:

AMERICAN TANK & FABR. CO.
12314 ELMWOOD AVE.
DOOR #11
CLEVELAND OH 44111

PAGE NO: 01 OF 02

FILE NO: 0325-01-05

MILL ORDER NO: 10291-001

MELT NO: U2465 ✓

SLAB NO: 1

DATE: 06/21/04

SOLD TO:

AMERICAN TANK & FAB. CO.
12314 ELMWOOD AVE.
CLEVELAND OH 44111

SEND TO:

TEST REPORT WITH SHIPMENT

FOR BOL # 44482

PLATE DIMENSIONS / DESCRIPTION

TOTAL QTY	GAUGE	WIDTH	LENGTH	DESCRIPTION	PIECE WEIGHT
	6"	154"	153"	RECTANGLE	40093#

CUSTOMER INFORMATION

CUSTOMER PO: 53634

SPECIFICATION(S)

THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATION(S).

ASTM A516 YR 90 GR 70

ASME SA516 2001 EDITION GRADE 70

MATERIAL PRODUCED UNDER A CERTIFIED QUALITY MGMT SYSTEM COMPLYING WITH

ISO 9001 ABS-QE CERT. NO. 30130

CHEMICAL COMPOSITION

	C	MN	P	S	CU	SI	NI	CR	MO
MELT:U2465	.23	.95	.010	.011	.26	.19	.11	.10	.03
	V	TI	AL	CB					
MELT:U2465	.002	.001	.029	.001					

MANUFACTURE

MCQUAID-EHN GRAIN SIZE PER E112 - 7-B

HEAT TREAT CONDITION

MATL OR TEST	HEAT TREAT DESCRIPTION	NOM TEMP	HOLD MINS	COOL MTHD
PL/TEST	NORMALIZE	1650F	190	AIR COOL

MEETS THE REQUIREMENTS ✓

ASME SA516-70 2001 Ed. 1st

f D L 7-2-04 10/2

COOL MTHD

PO# 53634

TENSILE PROPERTIES

SLAB NO.	LOC	DIR	FIELD STRENGTH PSI X 100	LABORATORY STRENGTH PSI X 100	GAGE LGTH	%
1	BOT.	TRANS.	385	758	2.00"	27.0

WE HEREBY CERTIFY THAT THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

SUPERVISOR - TEST REPORTING
ELINDRE ZAPLITNY

MEETS THE REQUIREMENTS ✓

40945-0000 2001 Edition
JDL 7-4-04 pg 2002

40945-0000

ISG PLATE INC.

TEST CERTIFICATE

PAGE NO: 02 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10291-001
MELT NO: U2465
SLAB NO: 1
DATE: 06/21/04

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
MERCURY OR MERCURY COMPOUNDS ARE NOT USED
IN THE MANUFACTURE OF ISG PRODUCTS.

40945-0000

ISG PLATE INC.

TEST CERTIFICATE

SHIP TO:
AMERICAN TANK & FABR. CO.
12314 ELMWOOD AVE.
DOOR #11
CLEVELAND OH 44111

PAGE NO: 01 OF 02
FILE NO: 0325-01-
MILL ORDER NO: 10291-00
MELT NO: U2395
SLAB NO: 1A
DATE: 07/16/03

SOLD TO:
AMERICAN TANK & FAB. CO.
12314 ELMWOOD AVE.
CLEVELAND OH 44111

SEND TO:
AMERICAN TANK & FABR. CO.
12314 ELMWOOD AVENUE
ATTN: WAREHOUSE DEPT.
CLEVELAND, OH 44111

03

PLATE DIMENSIONS / DESCRIPTION

TOTAL QTY	GAUGE	WIDTH	LENGTH	DESCRIPTION	PIECE WEIGHT
1	4"	151"	162"	RECTANGLE	27750#

CUSTOMER INFORMATION

CUSTOMER PO: 53634

SPECIFICATION(S)

THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATION(S).

ASTM A516 YR 90 GR 70
ASME SA516 2001 EDITION GRADE 70
MATERIAL PRODUCED UNDER A CERTIFIED QUALITY MGMT SYSTEM COMPLYING WITH
ISO 9001 ABS-QE CERT. NO. 30130

CHEMICAL COMPOSITION

MELT:U2395	C	MN	P	S	CU	SI	NI	CR
	.24	.93	.008	.009	.25	.19	.12	.07
MELT:U2395	V	TI	AL	CB				
	.002	.002	.022	.001				

MANUFACTURE

MCQUAID-EHN GRAIN SIZE PER E112 - 7-8

HEAT TREAT CONDITION

MATL OR TEST	HEAT TREAT DESCRIPTION	NOM TEMP	HOLD MINS	COOL MTHD
PL/TEST	NORMALIZE	1650F	134	AIR COOL

TENSILE PROPERTIES

SLAB NO.	LOC	DIR	YIELD STRENGTH PSI X 100	TENSILE STRENGTH PSI X 100	ELONGATION GAGE LGTH %
1A	BOT.	TRANS.	443	790	2.00" 26.0

WE HEREBY CERTIFY THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

Elinore Zaplitny
SUPERVISOR - TEST REPORTING
ELINORE ZAPLITNY

ISG PLATE INC.

TEST CERTIFICATE

PAGE NO: 02 OF 02
FILE NO: 0325-01-0
MILL ORDER NO: 10291-00:
MELT NO: U2395
SLAB NO: 1A
DATE: 07/16/04

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
MERCURY OR MERCURY COMPOUNDS ARE NOT USED
IN THE MANUFACTURE OF ISG PRODUCTS.

B/L #46938 CUSTOMER'S TRUCK

WE HEREBY CERTIFY THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

Elinore Zaplitny
SUPERVISOR TEST REPORTING
ELINORE ZAPLITNY

ISG PLATE INC.

TEST CERTIFICATE

SHIP TO:
AMERICAN TANK & FABR. CO.
12314 ELMWOOD AVE.
DOOR #11
CLEVELAND OH 44111

PAGE NO: 01 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10291-003
MELT NO: U2395
SLAB NO: 1B
DATE: 07/21/04

SOLD TO:
AMERICAN TANK & FAB. CO.
12314 ELMWOOD AVE.
CLEVELAND OH 44111

SEND TO:
AMERICAN TANK & FABR. CO.
12314 ELMWOOD AVENUE
ATTN: WAREHOUSE DEPT.
CLEVELAND, OH 44111

03-C

PLATE DIMENSIONS / DESCRIPTION

TOTAL QTY	GAUGE	WIDTH	LENGTH	DESCRIPTION	PIECE WEIGHT
1	4"	151"	162"	RECTANGLE	27750#

CUSTOMER INFORMATION

CUSTOMER PO: 53634

SPECIFICATION(S)

THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATION(S).

ASTM A516 YR 90 GR 70
ASME SA516 2001 EDITION GRADE 70
MATERIAL PRODUCED UNDER A CERTIFIED QUALITY MGMT SYSTEM COMPLYING WITH ISO 9001 ABS-QE CERT. NO. 30130

CHEMICAL COMPOSITION

MELT:U2395	C	MN	P	S	CU	SI	NI	CR	MO
	.24	.93	.008	.009	.25	.19	.12	.07	.05
MELT:U2395	V	TI	AL	CB					
	.002	.002	.022	.001					

MANUFACTURE

MCQUAID-EHN GRAIN SIZE PER E112 - 7-8

HEAT TREAT CONDITION

MATL OR TEST	HEAT TREAT DESCRIPTION	NOM TEMP	HOLD MINS	COOL MTHD
PL/TEST	NORMALIZE	1650F	133	AIR COOL

TENSILE PROPERTIES

SLAB NO.	LOC	DIR	YIELD STRENGTH PSI X 100	TENSILE STRENGTH PSI X 100	ELONGATION GAGE LGTH	%
1B	BOT.	TRANS.	426	787	2.00"	27.0

WE HEREBY CERTIFY THE ABOVE INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

Elinore Zaplitny
SUPERVISOR - TEST REPORTING
ELINORE ZAPLITNY

ISG PLATE INC.

TEST CERTIFICATE

PAGE NO: 02 OF 02
FILE NO: 0325-01-05
MILL ORDER NO: 10291-003
MELT NO: U2395
SLAB NO: 1B
DATE: 07/21/04

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
MERCURY OR MERCURY COMPOUNDS ARE NOT USED
IN THE MANUFACTURE OF ISG PRODUCTS.

B/L #47375 CUSTOMER'S TRUCK

WE HEREBY CERTIFY THE ABOVE
INFORMATION IS CORRECT:

QUALITY ASSURANCE LABORATORY
COATESVILLE, PA 19320

Elinore Zaplitny

SUPERVISOR - TEST REPORTING
ELINORE ZAPLITNY

PAGE 1

CERT. #: 00422400



2722 West Tucker Drive
South Bend, In 46624-1377

P.O. Box 1377
(574) 236-5100

CERTIFICATE OF ANALYSIS AND TESTS

FOR: AM. TANK & FAB CO.

DATE: 09/15/04

12314 ELMWOOD AVE.

YOUR P/O NUMBER 54275 ✓

CLEVELAND OH 44111

SHIPPER NUMBER 00652848

DOOR 6

OUR INVOICE NUMBER

OUR SALES ORDER 00646710

DESCRIPTION OF MATERIAL AND SPECIFICATIONS

1. HRTPHS 0001 11 0.1120 55.0000 X 372.0000

TCGXL

HEAT # 60515 NAFTA Y BUNDLE # 004035352B

CHEMICAL ANALYSIS

HEAT #	C ✓	MN ✓	P ✓	S ✓	SI ✓	AL	CB	V ✓
1. 60515 ✓	.050	0.800	.012	.002	.020	.020	.001	.056
	CR ✓	CU ✓	MO ✓	NI ✓	NIT	TI	B	
	0.040	0.070	.010	0.030	.0140	.001	.0000	

MECHANICAL PROPERTIES

BUNDLE # NAF	YIELD ✓	TENSILE ✓	ELONGATION % IN 2 IN. ✓	D	MISC
1. 004035352B Y	67500 psi	76150 psi	30	L	
				T	

S/N TCGXL
P.O. 54275

Meets The Requirements Of

ASTM A 572-90 Type 2, 04A
BK 9/20/04

THIS MATERIAL IS IN ACCORDANCE WITH AND CONFORMS TO

A572 -00 GR50 ✓

BOUGHT TO STOCK

We hereby certify that the foregoing data is a true copy of
the data furnished us by our supplier or resulting from tests
performed in a recognized laboratory or our laboratory.

By Authorized Agent



United States Steel Corporation

Gary Works
Gary, IN 46402

Metallurgical Test Report

ORDER: UE51304-01
LOAD: T02438
PO NBR: 051170-00
SOLD TO:

PART:
INVOICE: 154-198163 SHIP DATE: 01/30/02
00 OH
SHIP TO:

THE AMERICAN TANK&FABRICATING CO
12314 ELMWOOD AVE
CLEVELAND OH 44111-5991

THE AMERICAN TANK&FABRICATING CO
12314 ELMWOOD AVE NW
DOOR #5
CLEVELAND OH 44111-5991

SERIAL (HEAT: M27525 I/C: 53W2) STEEL TYPE = CAST REDUCTION RATIO = 11.9 TO 1
84071B00 1.0" X 75.0" X 257.0" S466LBS 1PC

SPEC: PLATE HIGH STRENGTH LOW ALLOY USS SIXTY-N ASTM A633 REV A 01-JAN-2000 GR E APPROVED
STRUCTURAL QUALITY NORMALIZED PLATE

INSP: 01 MILL INSPECTION PRELIMINARY T/R TO ACCOMPANY SHIPPING PAPERS ALSO T/R TO INDICATE NO
MERCURY CONTENT UPON SHIPMENT FAX T/R TO ATTN: GREG MAZUR AT 216-252-4871 RA/SN ALSO RA/LT
CERTIFY THAT ALL MELTING AND MANUFACTURING TOOK PLACE IN THE USA.

HEAT M27525 MELTED AND MANUFACTURED IN THE USA. FINE GRAIN
C=.20 MN=1.37 P=.016 S=.008 SI=.21 CU=.30 NI=.15 CR=.13 MO=.05 AL=.027 N=.01 V=.09 CB=.001

TRANSVERSE YIELD: 63.0 KSI TENSILE: 84.0 KSI 2" % ELONGATION: 50.0
63000 PSI 84000 PSI 8" % ELONGATION: 25.0

PRODUCT AND TEST SPECIMENS WERE NORMALIZED AT 1660 DEG F. FOR 00 HR 56 MIN. COOLING COMPLETED
IN STILL AIR.

** END OF TEST RESULT DATA **

TEST RESULTS WERE CONDUCTED AND RECORDED IN ACCORDANCE WITH TEST METHODS ACCREDITED BY A2LA.
THIS REPORT SHALL NOT BE REPRODUCED OR ALTERED WITHOUT THE PRIOR WRITTEN APPROVAL OF UNITED
STATES STEEL.
THIS PRODUCT WAS MANUFACTURED IN ACCORDANCE WITH THE QUALITY MANAGEMENT SYSTEM WHICH COMPLIES
WITH ISO 9002:1994.

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MANUFACTURED, TESTED AND/OR INSPECTED
IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECT.
PREP. BY THE OFFICE OF D.M. BORMET, MANAGER, Q.A. BY: *Ruben Amador* DATE: 2-1-02

*0900 C F 3 0 0 0277450007A BKM

3 1 0

PAGE 1 OF 1



** LOAD TALLY **

PLATES

R O M S O L D T O	PICKUP(S) 32694,	Purchase Order Date 11/19/01	Purchase Order No. 051170-00	
	U. S. STEEL CORP.	Invoice No. 198163	U.S. Steel Order No. UE51304	Page 01
	GARY WORKS GARY, INDIANA 46402	Subject to Section 7 of conditions of Bill of Lading in N.M.F.C. and U.F.C. No recourse clause is exercised. USS Corp. - Consignor		Shipper's No. 154T02438-01
	CHARGE 0277450 SHIP TO 007			
	THE AMERICAN TANK&FABRICATING CO 12314 ELMWOOD AVE CLEVELAND OH 44111-5991	THE AMERICAN TANK&FABRICATING CO 12314 ELMWOOD AVE NW DOOR #5 CLEVELAND OH 44111-5991		

Date Shipped 01/30/02	From GARY, INDIANA	Route / Carrier CAR CAP. 000 CAR TYPE CUSTOMER TRUCK FOR HIRE		9999998
Ship Mode CTH	Minimum Weight 404	00	OH	PPD / COL COL

IF YOU USE A SHIPPER REFERENCE NBR FOR PYMT, USE 154T02438-01

ORDER ITEM	HEAT	ING CUT	PC	PLATE#	GAUGE	WIDTH	LENGTH	WEIGHT
ORDERED SIZE	1.0000	75.0000		257.0000				

SPEC: USS SIXTY-N ASTM A633 REV A 01-JAN-2000 GR E APPROVED STRUCTURAL

ST: PT#A633E-1.0000-W--

PT#: A633E-1.0000-W-✓

MARK: STAMP USS HT# SLAB# MT IN 1 PLACE

STEN CUST ORD# & USS EA PLT

STENCIL SIXTY-N STEEL A633 GR E

PACK: OR 1 PC - KEEP SIZES SEP

LOAD: FLATBED TRK - SHEET LIFTER UNLDG - BLOCK - COVER W/TARP

20000 LB ABSOLUTE MAX

B/L COVER WITH TARP

BDHBD

				METRIC	25.40MM	1905.00MM	6527.80MM	2479KG
UE51304	01	M27525 53 W2	1	084071A00	1.000	75.00	257.00	5466#

BDHBY

				METRIC	25.40MM	1905.00MM	6527.80MM	2479KG
UE51304	01	M27525 53 W2	1	084071B00	1.000	75.00	257.00	5466#

Per Controller - Gary Works USS Corp. - Shipper

Agent

Permanent Post Office Address of Shipper:
600 Grant Street, Pittsburgh, PA 15219-4776

Per

LMOB

SUPV. QUALITY AND PRACTICE DEVELOPMENT D. A. FLEWELL PER WNE



Gary Works
Gary, IN 46402

PRELIMINARY TEST REPORT

CONFIRMING TEST REPORT WILL BE MAILED

ORDER: UE55784-06

PART:

LOAD: T13642

INVOICE: 154 241121

SHIP DATE: 12/05/02

NBR: 52060

VEH ID: 130A

OH 38097

SOLD TO:

SHIP TO:

THE AMERICAN TANK & FABRICATING CO
12314 ELMWOOD AVE
CLEVELAND OH 44111-5991

THE AMERICAN TANK & FABRICATING CO
12314 ELMWOOD AVE
DOOR #11
CLEVELAND OH 44111-5991

SERIAL HEAT: Y49461 I/C: 54W2 STEEL TYPE = CAST REDUCTION RATIO = 4.0 TO 1
X9108A00 3.0" X 93.0" X 330.0" 1 PC 26111.00 LBS

SPEC: PLATE HIGH STRENGTH LOW ALLOY USS SIXTY-N ASTM A633 01-JAN-2001 CR E APPROVED STRUCTURAL
QUALITY NORMALIZED PLATE LCVN IMPACT TEST HEAT LOT FREQ. H LCVN 20 FT-LBS AVG @ +0 F LCVN 15
FT-LBS MIN @ +0 F

INSP: 01 MILL INSPECTION TEST REPORT TO INDICATE NO MERCURY CONTENT AND REPORT CB RA/SN ALSO
RA/LT CERTIFY THAT ALL MELTING AND MANUFACTURING TOOK PLACE IN THE USA.

HEAT Y49461 MELTED AND MANUFACTURED IN THE USA. FINE GRAIN
C=.18 MN=1.33 P=.015 S=.007 SI=.22 CU=.28 NI=.13 CR=.12 MO=.05 AL=.027 N=.010 V=.11 CB=.001

TRANSVERSE	YIELD:	61.0	KSI	TENSILE:	85.0	KSI	2" % ELONGATION:	23.0
		61000	PSI		85000	PSI		
TRANSVERSE	YIELD:	63.0	KSI	TENSILE:	87.0	KSI	2" % ELONGATION:	32.0
		63000	PSI		87000	PSI		

LONGITUDINAL FL SIZE CHARPY IMPACT V-NOTCH +000 DEG F FT LBS/ 067-074-074
-18 DEG C AVG IMPACT STRENGTH +72 FT LBS
LONGITUDINAL FL SIZE CHARPY IMPACT V-NOTCH +000 DEG F FT LBS/ 098-074-088
-18 DEG C AVG IMPACT STRENGTH +87 FT LBS

PRODUCT AND TEST SPECIMENS WERE NORMALIZED AT 1660 DEG F. FOR 02 HR 48 MIN. COOLING COMPLETED
IN STILL AIR.

MERCURY OR MERCURY BEARING COMPOUNDS ARE NOT USED IN THE MANUFACTURE OF THIS MATERIAL.
** END OF TEST RESULT DATA **

TEST RESULTS WERE CONDUCTED AND RECORDED IN ACCORDANCE WITH TEST METHODS ACCREDITED BY A2LA.
THIS REPORT SHALL NOT BE REPRODUCED OR ALTERED WITHOUT THE PRIOR WRITTEN APPROVAL OF UNITED
STATES STEEL.

THIS PRODUCT WAS MANUFACTURED IN ACCORDANCE WITH THE QUALITY MANAGEMENT SYSTEM WHICH COMPLIES
WITH ISO 9002:1994.

BDSUB

The American Tank & Fabricating Co.

MEETS THE REQUIREMENTS OF

ASTM A633 Grade E 67301

ASTM A633 Grade E 67301

REVIEWED BY: JPL DATE 12-12-02

THIS IS TO CERTIFY THAT THE PRODUCT DESCRIBED HEREIN WAS MANUFACTURED, TESTED AND/OR INSPECTED
IN ACCORDANCE WITH THE SPECIFICATION AND FULFILLS REQUIREMENTS IN SUCH RESPECT.

PREP. BY THE OFFICE OF D.M. BORMET, MGR, PLATE TECH BY:

DATE:

Primary isotopes of concern consist of Cs-137 (Ba-137m) and Sr-90 (Y-90) contributing greater than 99.8% of the total activity associated to the Melter. Other nuclides of concern include actinides, fission products, activation products and all associated daughter products with a total contribution to total activity to be less than 0.2%. APPENDIX 1 gives a breakdown of the total activity by source term, quantity of fissile material by source term and activity of primary isotopes by source terms. Section 4 contains identifies the characterization methodology, activity calculations and decay correction (RadCalc calculation) sheets for each of the individual source terms.

In characterizing the Melter, a conservative approach was taken to ensure that the isotopic distribution and associated activity was bounded. Decay correction was incorporated in the final activity reports.

4.0 WASTE CHARACTERIZATION

The Melter was characterized utilizing analytical data associated to the waste materials that were processed through it, swipe samples within the vitrification cell and swipe samples of the Melter. Representative samples are used to determine Cs-137 and Sr-90 based scaling factors for calculating the hard to detect nuclides.

The radioactivity associated with the Melter is contained in four separate source terms. The first source term is contained within the Melter cavity, consisting of a heel that was produced during the processing of the decontamination solutions used for flushing the remaining residual waste from the Melter Feed Hold Tank (MFHT) and Concentrator Feed Make-Up Tank (CFMT). Once the flushing of the two tanks was complete, the rinseate was sent to the Melter for vitrification. Based on recorded data, approximately 2,200 kg of molten residual glass was removed from the Melter using two evacuated canister assemblies, leaving 300 kg of residual glass to comprise the heel.

The second source term is comprised of all the residual glass contained within the cracks, crevices and interstitial spacing between all of the refractory brick within the Melter cavity. The activity associated with this source term was derived by evaluating all of the different Batches of material that was processed through the Melter and applying it to a very conservative volume of material based on the actual volume of refractory brick. Total calculated mass of residual glass associated to the refractory brick material is 68.2 kg.

The third source term is comprised of the material that is contained within the plugged discharge port (Spout) and associated structures. During the processing of Batch 75, the discharge port became plugged. The volume of material associated to the plugged discharge port consists of material contained within the spout and pour chamber. The spout and pour chamber consists of 2,325 cubic inches of vitrified glass weighing 99.0 kg.

The fourth source term is comprised of activity associated to the surface contamination of the exterior Melter body and components. Based on measurements associated with the Melter

Refractory Assembly drawings, the exterior Melter body and components consist of a total surface area of 522,261.6 cm². By using the maximum result from swipe samples taken from the exterior of the Melter body and applying a conservative wiping efficiency, a bounding total removable activity associated to the exterior of the Melter was determined to be 14.36 Ci.

4.1 Melter Heel Characterization

The Melter heel consists of 300 kg of residual glass contained within the lower body of the Melter cavity. The heel was produced during the processing of the decontamination solutions used for flushing the remaining residual waste from the Melter Feed Hold Tank (MFHT) and Concentrator Feed Make-Up Tank (CFMT). Once the flushing of the two tanks was complete, the rinseate was sent to the Melter for vitrification. Based on recorded data, approximately 2,200 kg of molten residual glass was removed from the Melter using two evacuated canister assemblies, leaving 300 kg of residual glass to comprise the heel.

For determining the isotopic distribution and associated activities related to the Melter heel, analytical data from glass shard samples taken from the Evacuated Canisters was utilized (containers MV-997 and MV-998). For analysis, each of the glass shard samples were split into three separate samples and analyzed (See APPENDIX 2 for Shard Sample Analysis – Sample 04-0073 (#1, #2, #3) and Sample 04-0074 (#1, #2, #3)). In calculating the total activity for the heel, for each isotope, an average of all six sample results (uCi/g) was used and multiplied by the 300 kg of vitrified glass that comprised the heel (see APPENDIX 3 for Melter Heel Activity Calculations). In order to derive a more accurate activity, the isotopic activity was decayed from 7/18/2002 to 9/02/2014 (original expected shipment date).

The total activity associated to the Melter heel (decayed corrected) is 1.117E+03 Ci (including all daughter products) with 29.23 grams of fissile material. Melter heel contains 63.15 A2's with a Thermal Decay Heat of 2.834 W.

4.2 Residual Glass Contained within Refractory Brick Characterization

During the course of six years of vitrification, molten glass would seep into cracks, crevices and interstitial spacing between and within the pieces of refractory brick. Based on the Melter Refractory Assembly Drawings PNL-011-01 through -018 (DRAWING 1), the volume of refractory brick contained within the Melter cavity is 92.7 ft³, being comprised of two types: Monofrax Refractory (61.88 ft³) and Zirmul Refractory (30.82 ft³). For the purposes of determining the total volume of residual glass contained within the cracks, crevices and interstitial spacing, a conservative estimate of 1% of the total volume of refractory brick was applied. This estimate was based on the cross sectioning samples (APPENDIX 4) that were taken of similar refractory material and video taken of inside of the Melter cavity.

For determining the isotopic distribution and associated activities, the average geometric mean for all of the samples taken from Batches 6 through 77 were used. Analytical results from Batches 6 through 69 were analyzed for Cs-137 and Sr-90 (predominant isotopes in waste

matrix). Analytical results for Batches 70 through 77 included actinides, fission products and activation products. For Batches 6 through 69, the actinides and activation products were scaled in based on the Sr-90 contribution in relation to the geometric mean for Batches 70-77.

As previously stated, the total volume of refractory contained within the Melter is 92.7 ft³. The total volume of residual glass, based on the conservative estimate of 1% of the total volume of refractory, is 0.927 ft³. With the glass matrix having a specific gravity of 2.6 g/cc, the total mass of residual glass contained within the cracks, crevices and interstitial spacing is 68.2 kg. By applying the geometric mean of the batched material that was processed through the Melter, the total activity associated to this source term (decay corrected) is 630 Ci (including all daughter products). The refractory contains 67.13 A2's with a Thermal Decay Heat of 1.768 W. The residual glass contained within the refractory contains 32.68 g of fissile material. APPENDIX 5 identifies the original activity calculations and RADCALC decay corrected calculations, glass volume and mass calculations, and volume and mass calculations for the refractory brick.

4.3 Plugged Discharge Port (Spout) Characterization

During the processing of Batch 75, Canister 266, the west discharge port of the melter became clogged (plugged) and unusable. For the purposes of characterization of this source term, the plugged discharge port and associated area is presumed to be completely full. Based on the Melter Refractory Assembly drawings (Drawing 1) the plugged discharge port and associated area consists of a volume of 2,325 cubic inches containing 99 kg of vitrified glass. The plugged discharge port and associated area consist of the pour spout and pour chamber.

For the purposes of determining the isotopic distribution and associated activity, sample data from Batch 75 Canister 266 was used (APPENDIX 6). The Cs-137 and Sr-90 values came directly from the Canister 266 glass shard analytical results. The actinides, remaining fission and activation products were scaled using Radman Waste Stream from the Heel material (APPENDIX 7). By applying analytical results of Batch 75, Canister 266 material that was processed through the Melter and applying the scaling factors identified in Heel material, the total activity associated to this source term (decay corrected) is 1,793 Ci (including all daughter products) with 18.99 g of fissile material. The plugged discharge port contains 82.44 A2's and generates 4.551 W of thermal Decay Heat. APPENDIX 8 contains the activity and RADCALC calculations identifying the decay corrected activity of this material from 9/02/2014.

4.4 Melter Exterior Surface Contamination Characterization

The final source term associated to the Melter is the exterior shell and associated components (i.e. electrodes, passive feed nozzle, airlift, etc.). The external Melter surface contamination was determined by calculating the total activity bases on swipe samples taken on the exterior surface of the Melter and multiplying it by the total surface area of the Melter. A conservative isotopic distribution consisting of the airborne sample analysis from the contaminated vitrification cell (see APPENDIX 9) and the isotopic distribution associated with the refractory was utilized to bound the isotopic activity.

Based on the Melter Refractory Assembly drawing (DRAWING 1), the surface area of the Melter was calculated to be 80,950.7 in² (522,261.6 cm²) with the body of the Melter having a surface area of 79,537.02 in² (513,141.01 cm²) and the associated components having a surface area of 1,413.7 in² (9,120.6 cm²).

The isotopic distribution for the Melter surface contamination was derived by utilizing the distribution associated with the Vitrification Airborne sample results in combination with the isotopic distribution associated with the refractory brick contained within the Melter. A comparison of both isotopic distributions and percent abundance was completed. All of the isotopes associated with each distribution were included in the final distribution. The most conservative percent abundance was used when both distributions contained the same isotope. When only one of the distributions contained an isotope, that isotope was included to the final distribution with its corresponding percent abundance.

In April of 2004, three smear samples were taken on the Melter body (see APPENDIX 10 – Rad Survey Report 124255). Contact dose rate readings of these smear samples were reported as 2R/hr, 2R/hr and 6R/hr. Each smear sample was taken over a 100 cm² surface area. Due to the small sample population the most conservative results (6R/hr) was applied to the entire surface area of the container. In accordance with Radiological Engineering Calculation CALC-2007-48 (APPENDIX 11), 1 mR/hr is equal to approximately 67,000 dpm B⁻ / Y. To ensure that the total removable activity associated to the exterior of the Melter has been accounted for, a smear wiping efficiency factor of 10% was included. Based on this information, the total removable activity associated to the exterior surface of the Melter is (decay corrected) 14.36 Ci (including all daughter products) with 0.66 g of fissile material (see APPENDIX 12) with a concentration of 27.50 μ Ci/cm². The Melter exterior surface activity contains 2.136 A2's and produces a thermal Decay Heat of 0.041 W.

5.0 RESULTS

Based on the results of this characterization analysis, the Melter contains a total activity of 3,554 Ci (including all daughter products) with Cs-137 (Ba-137m) contributing 3,143 Ci (88.425%) and Sr-90 (Y-90) contributing 407.1 Ci (11.453%). 99.6% of the total activity associated with the Melter is contained within the Melter cavity in the form of residual glass contained within the refractory brick, heel and plugged discharge consisting of 3,540 Ci. The total surface contamination activity associated to the Melter is 14.36 Ci. The activity from surface contamination represents approximately 0.404% of the total activity at a concentration of 27.50 μ Ci/cm². The Melter contains 2.149E+02 A2's and generates 9.194 watts (decay heat).

APPENDIX 1

Activity Summary

APPENDIX 1 - Activity Summary

Activity Breakdown by Source Term					
Source Term	Total Act (Ci)	Fissile Mass (g)	AZ's	Decay Heat (W)	% of Total Activity
Exterior Contamination (decay corrected)	1.436E+01	6.569E-01	2.136E+00	4.054E-02	0.404%
Melter Spout (decay corrected)	1.793E+03	1.899E+01	8.244E+01	4.551E+00	50.445%
Refractory (decay corrected)	6.300E+02	3.268E+01	6.713E+01	1.768E+00	17.725%
Melter Heel (decay corrected)	1.117E+03	2.923E+01	6.315E+01	2.834E+00	31.426%
Totals	1.554E+03	8.156E+01	2.149E+02	9.194E+00	100.000%

Activity Associated to Primary Isotopes						
	Exterior Surface	Spout	Refractory	Heel	Totals	
	Act (Ci)	Act (Ci)	Act (Ci)	Act (Ci)	Act (Ci)	% of Total Act
Cs-137	5.062E+00	8.566E+02	2.132E+02	5.419E+02	1.617E+03	45.487%
Ba-137m	4.778E+00	8.086E+02	2.012E+02	5.116E+02	1.526E+03	42.938%
Sr-90	2.213E+00	6.332E+01	1.068E+02	3.120E+01	2.035E+02	5.726%
Y-90	2.213E+00	6.333E+01	1.068E+02	3.121E+01	2.036E+02	5.727%
Total Activity of Primary Isotopes						99.878%
Remaining Activity						0.122%

APPENDIX 2

Glass Shard Sample Report (04-0073 & 04-0074)

APPENDIX 2

Sample Report

Report Date : 5/22/2014

Revision Date : 03/10/2004

User Sample ID: 04-0073#1

Description: SHD-WV-997-02,03

Activity Units: uCi/gm

Sample Date: 09/16/2002

Nuclide	Activity	LLD	%Abundance	Scaling Nuclide	Scaling Factor
Cm-243	8.340E-03	False	0.000 %	Cs-137	3.808E-06
Cm-244	2.180E-01	False	0.009 %	Cs-137	9.954E-05
Mn-54	8.120E-02	False	0.003 %	Cs-137	3.708E-05
Co-60	4.040E-02	False	0.002 %	Cs-137	1.845E-05
Ni-63	4.840E-01	False	0.021 %	Cs-137	2.210E-04
Sr-90	1.270E+02	False	5.469 %	Cs-137	5.799E-02
Tc-99	9.670E-03	False	0.000 %	Cs-137	4.416E-06
Cs-137	2.190E+03	False	94.307 %	N/A	N/A
Eu-154	6.560E-01	False	0.028 %	Cs-137	2.995E-04
Th-228	2.940E-02	False	0.001 %	Cs-137	1.342E-05
Th-230	2.100E-04	False	0.000 %	Cs-137	9.589E-08
Th-232	2.450E-04	False	0.000 %	Cs-137	1.119E-07
U-232	2.660E-02	False	0.001 %	Cs-137	1.215E-05
U-233	1.080E-02	False	0.000 %	Cs-137	4.932E-06
U-234	5.170E-03	False	0.000 %	Cs-137	2.361E-06
U-235	2.120E-04	False	0.000 %	Cs-137	9.680E-08
U-236	6.350E-04	False	0.000 %	Cs-137	2.900E-07
U-238	1.150E-03	False	0.000 %	Cs-137	5.251E-07
Np-237	3.850E-03	False	0.000 %	Cs-137	1.758E-06
Pu-238	3.340E-01	False	0.014 %	Cs-137	1.525E-04
Pu-239	7.650E-02	False	0.003 %	Cs-137	3.493E-05
Pu-240	5.850E-02	False	0.003 %	Cs-137	2.671E-05
Pu-241	1.540E+00	False	0.066 %	Cs-137	7.032E-04
Am-241	1.490E+00	False	0.064 %	Cs-137	6.804E-04
Am-243	1.470E-02	False	0.001 %	Cs-137	6.712E-06
Cm-242	1.020E-01	False	0.004 %	Cs-137	4.658E-05

Sample Report

Report Date : 5/22/2014

Revision Date : 03/10/2004

User Sample ID: 04-0073#2

Description: SHD-WV-997-02,03

Activity Units: uCi/gm

Sample Date: 09/16/2002

Nuclide	Activity	LLD	%Abundance	Scaling Nuclide	Scaling Factor
K-40	4.440E-02	False	0.002 %	Cs-137	1.965E-05
Ni-63	5.480E-01	False	0.023 %	Cs-137	2.425E-04
Sr-90	1.300E+02	False	5.396 %	Cs-137	5.752E-02
Zr-95	1.370E+01	False	0.569 %	Cs-137	6.062E-03
Tc-99	9.420E-03	False	0.000 %	Cs-137	4.168E-06
Cs-137	2.260E+03	False	93.816 %	N/A	N/A
Eu-154	5.940E-01	False	0.025 %	Cs-137	2.628E-04
Th-228	2.720E-02	False	0.001 %	Cs-137	1.204E-05
Th-230	1.940E-04	False	0.000 %	Cs-137	8.584E-08
Th-232	1.880E-04	False	0.000 %	Cs-137	8.319E-08
U-232	2.620E-02	False	0.001 %	Cs-137	1.159E-05
U-233	1.060E-02	False	0.000 %	Cs-137	4.690E-06
U-234	5.070E-03	False	0.000 %	Cs-137	2.243E-06
U-235	1.840E-04	False	0.000 %	Cs-137	8.142E-08
U-236	5.510E-04	False	0.000 %	Cs-137	2.438E-07
U-238	1.200E-03	False	0.000 %	Cs-137	5.310E-07
Np-237	2.680E-03	False	0.000 %	Cs-137	1.186E-06
Pu-238	3.520E-01	False	0.015 %	Cs-137	1.558E-04
Pu-239	8.050E-02	False	0.003 %	Cs-137	3.562E-05
Pu-240	6.150E-02	False	0.003 %	Cs-137	2.721E-05
Pu-241	1.650E+00	False	0.068 %	Cs-137	7.301E-04
Am-241	1.510E+00	False	0.063 %	Cs-137	6.681E-04
Am-243	1.490E-02	False	0.001 %	Cs-137	6.593E-06
Cm-242	1.050E-01	False	0.004 %	Cs-137	4.646E-05
Cm-243	8.450E-03	False	0.000 %	Cs-137	3.739E-06
Cm-244	2.210E-01	False	0.009 %	Cs-137	9.779E-05

Sample Report

Report Date : 5/22/2014

Revision Date : 03/10/2004

User Sample ID: 04-0073#3

Description: SHD-WV-997-02,03

Activity Units: uCi/gm

Sample Date: 09/16/2002

Nuclide	Activity	LLD	%Abundance	Scaling Nuclide	Scaling Factor
Ni-63	5.140E-01	False	0.020 %	Cs-137	2.089E-04
Sr-90	1.250E+02	False	4.826 %	Cs-137	5.081E-02
Tc-99	9.860E-03	False	0.000 %	Cs-137	4.008E-06
Cs-137	2.460E+03	False	94.976 %	N/A	N/A
Eu-154	5.510E-01	False	0.021 %	Cs-137	2.240E-04
Th-228	3.120E-02	False	0.001 %	Cs-137	1.268E-05
Th-230	2.230E-04	False	0.000 %	Cs-137	9.065E-08
Th-232	1.610E-04	False	0.000 %	Cs-137	6.545E-08
U-232	2.830E-02	False	0.001 %	Cs-137	1.150E-05
U-233	1.150E-02	False	0.000 %	Cs-137	4.675E-06
U-234	5.490E-03	False	0.000 %	Cs-137	2.232E-06
U-235	1.980E-04	False	0.000 %	Cs-137	8.049E-08
U-236	5.950E-04	False	0.000 %	Cs-137	2.419E-07
U-238	8.780E-04	False	0.000 %	Cs-137	3.569E-07
Pu-238	3.540E-01	False	0.014 %	Cs-137	1.439E-04
Pu-239	8.160E-02	False	0.003 %	Cs-137	3.317E-05
Pu-240	6.240E-02	False	0.002 %	Cs-137	2.537E-05
Pu-241	1.660E+00	False	0.064 %	Cs-137	6.748E-04
Am-241	1.480E+00	False	0.057 %	Cs-137	6.016E-04
Am-243	1.460E-02	False	0.001 %	Cs-137	5.935E-06
Cm-242	1.020E-01	False	0.004 %	Cs-137	4.146E-05
Cm-243	8.270E-03	False	0.000 %	Cs-137	3.362E-06
Cm-244	2.160E-01	False	0.008 %	Cs-137	8.780E-05

Sample Report

Report Date : 5/22/2014

Revision Date : 03/04/2004

User Sample ID: 04-0074#1

Description: SHD-VV-998-01,02

Activity Units: uCi/gm

Sample Date: 09/20/2002

Nuclide	Activity	LLD	%Abundance	Scaling Nuclide	Scaling Factor
Ni-63	6.140E-01	False	0.023 %	Cs-137	2.486E-04
Sr-90	1.790E+02	False	6.738 %	Cs-137	7.247E-02
Tc-99	3.690E-03	False	0.000 %	Cs-137	1.494E-06
Cs-137	2.470E+03	False	92.982 %	N/A	N/A
Eu-154	9.570E-01	False	0.036 %	Cs-137	3.874E-04
Th-228	3.570E-02	False	0.001 %	Cs-137	1.445E-05
Th-230	2.410E-04	False	0.000 %	Cs-137	9.757E-08
Th-232	3.230E-04	False	0.000 %	Cs-137	1.308E-07
U-232	2.980E-02	False	0.001 %	Cs-137	1.206E-05
U-233	1.220E-02	False	0.000 %	Cs-137	4.939E-06
U-234	5.810E-03	False	0.000 %	Cs-137	2.352E-06
U-235	2.260E-04	False	0.000 %	Cs-137	9.150E-08
U-236	6.790E-04	False	0.000 %	Cs-137	2.749E-07
U-238	1.470E-03	False	0.000 %	Cs-137	5.951E-07
Pu-238	4.900E-01	False	0.018 %	Cs-137	1.984E-04
Pu-239	1.120E-01	False	0.004 %	Cs-137	4.534E-05
Pu-240	8.570E-02	False	0.003 %	Cs-137	3.470E-05
Pu-241	2.290E+00	False	0.086 %	Cs-137	9.271E-04
Am-241	2.220E+00	False	0.084 %	Cs-137	8.988E-04
Am-243	3.070E-02	False	0.001 %	Cs-137	1.243E-05
Cm-242	1.780E-01	False	0.007 %	Cs-137	7.206E-05
Cm-243	1.320E-02	False	0.000 %	Cs-137	5.344E-06
Cm-244	3.450E-01	False	0.013 %	Cs-137	1.397E-04

Sample Report

Report Date : 5/22/2014

Revision Date : 03/04/2004

User Sample ID: 04-0074#2

Description: SHD-VW-998-01,02

Activity Units: uCi/gm

Sample Date: 09/20/2002

Nuclide	Activity	LLD	%Abundance	Scaling Nuclide	Scaling Factor
Co-60	6.060E-02	False	0.002 %	Cs-137	2.424E-05
Ni-63	5.750E-01	False	0.022 %	Cs-137	2.300E-04
Sr-90	1.650E+02	False	6.176 %	Cs-137	6.600E-02
Tc-99	3.920E-03	False	0.000 %	Cs-137	1.568E-06
Cs-137	2.500E+03	False	93.570 %	N/A	N/A
Eu-154	9.400E-01	False	0.035 %	Cs-137	3.760E-04
Th-228	3.010E-02	False	0.001 %	Cs-137	1.204E-05
Th-230	2.040E-04	False	0.000 %	Cs-137	8.160E-08
Th-232	2.620E-04	False	0.000 %	Cs-137	1.048E-07
U-232	2.920E-02	False	0.001 %	Cs-137	1.168E-05
U-233	1.190E-02	False	0.000 %	Cs-137	4.760E-06
U-234	5.680E-03	False	0.000 %	Cs-137	2.272E-06
U-235	2.220E-04	False	0.000 %	Cs-137	8.880E-08
U-236	6.650E-04	False	0.000 %	Cs-137	2.660E-07
U-238	1.700E-03	False	0.000 %	Cs-137	6.800E-07
Np-237	4.420E-03	False	0.000 %	Cs-137	1.768E-06
Pu-238	4.390E-01	False	0.016 %	Cs-137	1.756E-04
Pu-239	1.010E-01	False	0.004 %	Cs-137	4.040E-05
Pu-240	7.750E-02	False	0.003 %	Cs-137	3.100E-05
Pu-241	2.080E+00	False	0.078 %	Cs-137	8.320E-04
Am-241	1.970E+00	False	0.074 %	Cs-137	7.880E-04
Am-243	2.720E-02	False	0.001 %	Cs-137	1.088E-05
Cm-242	1.380E-01	False	0.005 %	Cs-137	5.520E-05
Cm-243	1.140E-02	False	0.000 %	Cs-137	4.560E-06
Cm-244	2.980E-01	False	0.011 %	Cs-137	1.192E-04

Sample Report

Report Date : 5/22/2014

Revision Date : 03/10/2004

User Sample ID: 04-0074#3

Description: SHD-VW-998-01,02

Activity Units: uCi/gm

Sample Date: 09/20/2002

Nuclide	Activity	LLD	%Abundance	Scaling Nuclide	Scaling Factor
C-14	1.150E-02	False	0.000 %	Cs-137	4.792E-06
Ni-63	5.740E-01	False	0.023 %	Cs-137	2.392E-04
Sr-90	1.050E+02	False	4.184 %	Cs-137	4.375E-02
Tc-99	3.590E-03	False	0.000 %	Cs-137	1.496E-06
Cs-137	2.400E+03	False	95.631 %	N/A	N/A
Eu-154	5.660E-01	False	0.023 %	Cs-137	2.358E-04
Th-228	1.980E-02	False	0.001 %	Cs-137	8.250E-06
Th-230	1.340E-04	False	0.000 %	Cs-137	5.583E-08
Th-232	1.690E-04	False	0.000 %	Cs-137	7.042E-08
U-232	2.450E-02	False	0.001 %	Cs-137	1.021E-05
U-233	1.000E-02	False	0.000 %	Cs-137	4.167E-06
U-234	4.780E-03	False	0.000 %	Cs-137	1.992E-06
U-235	1.860E-04	False	0.000 %	Cs-137	7.750E-08
U-236	5.580E-04	False	0.000 %	Cs-137	2.325E-07
U-238	1.090E-03	False	0.000 %	Cs-137	4.542E-07
Np-237	2.800E-03	False	0.000 %	Cs-137	1.167E-06
Pu-238	3.010E-01	False	0.012 %	Cs-137	1.254E-04
Pu-239	7.090E-02	False	0.003 %	Cs-137	2.954E-05
Pu-240	5.410E-02	False	0.002 %	Cs-137	2.254E-05
Pu-241	1.430E+00	False	0.057 %	Cs-137	5.958E-04
Am-241	1.270E+00	False	0.051 %	Cs-137	5.292E-04
Am-243	1.750E-03	False	0.000 %	Cs-137	7.292E-07
Cm-242	9.120E-02	False	0.004 %	Cs-137	3.800E-05
Cm-243	7.270E-03	False	0.000 %	Cs-137	3.029E-06
Cm-244	1.900E-01	False	0.008 %	Cs-137	7.917E-05

APPENDIX 3

Melter Heel Activity and Decay Correction Calculations (RADCALC)

APPENDIX 3 - MELTER Heel Activity Calculations

	04-0074#3	04-0073#1	04-0073#2	04-0073#3	04-0074#1	04-0074#2		Average	300000	grams
Nuclide	Activity (uCi/g)	Activity (uCi/g)	Activity (uCi/g)	Activity (uCi/g)	Activity (uCi/g)	Activity (uCi/g)		Activity (uCi/g)	Total Act (uCi)	Total Act (Ci)
Am-241	1.27E+00	1.49E+00	1.51E+00	1.48E+00	2.22E+00	1.97E+00		1.66E+00	4.97E+05	4.97E-01
Am-243	1.75E-02	1.47E-02	1.49E-02	1.46E-02	3.07E-02	2.72E-02		1.99E-02	5.98E+03	5.98E-03
C-14	1.15E-02	1.06E-02	1.10E-02	1.19E-02	1.22E-02	1.22E-02		1.16E-02	3.47E+03	3.47E-03
Cm-242	9.12E-02	1.02E-01	1.05E-01	1.02E-01	1.78E-01	1.38E-01		1.19E-01	3.58E+04	3.58E-02
Cm-243	7.27E-03	8.34E-03	8.45E-03	8.27E-03	1.32E-02	1.14E-02		9.49E-03	2.85E+03	2.85E-03
Cm-244	1.90E-01	2.18E-01	2.21E-01	2.16E-01	3.45E-01	2.98E-01		2.48E-01	7.44E+04	7.44E-02
Co-60	5.02E-02	4.04E-02	4.82E-02	5.18E-02	5.32E-02	6.06E-02		5.07E-02	1.52E+04	1.52E-02
Cs-137	2.40E+03	2.19E+03	2.26E+03	2.46E+03	2.47E+03	2.50E+03		2.38E+03	7.14E+08	7.14E+02
Eu-154	5.66E-01	6.56E-01	5.94E-01	5.51E-01	9.57E-01	9.40E-01		7.11E-01	2.13E+05	2.13E-01
K-40	5.02E-02	4.64E-02	4.44E-02	5.18E-02	5.32E-02	5.34E-02		4.99E-02	1.50E+04	1.50E-02
Mn-54	7.53E-02	8.12E-02	7.23E-02	7.77E-02	7.98E-02	8.01E-02		7.77E-02	2.33E+04	2.33E-02
Ni-63	5.74E-01	4.84E-01	5.48E-01	5.14E-01	6.14E-01	5.75E-01		5.52E-01	1.65E+05	1.65E-01
Np-237	2.80E-03	3.85E-03	2.68E-03	3.60E-03	3.70E-03	4.42E-03		3.51E-03	1.05E+03	1.05E-03
Pu-238	3.01E-01	3.34E-01	3.52E-01	3.54E-01	4.90E-01	4.39E-01		3.78E-01	1.14E+05	1.14E-01
Pu-239	7.09E-02	7.65E-02	8.05E-02	8.16E-02	1.12E-01	1.01E-01		8.71E-02	2.61E+04	2.61E-02
Pu-240	5.41E-02	5.85E-02	6.15E-02	6.24E-02	8.57E-02	7.75E-02		6.66E-02	2.00E+04	2.00E-02
Pu-241	1.43E+00	1.54E+00	1.65E+00	1.66E+00	2.29E+00	2.08E+00		1.78E+00	5.33E+05	5.33E-01
Sr-90	1.05E+02	1.27E+02	1.30E+02	1.25E+02	1.79E+02	1.65E+02		1.39E+02	4.16E+07	4.16E+01
Tc-99	3.59E-03	9.67E-03	9.42E-03	9.86E-03	3.69E-03	3.92E-03		6.69E-03	2.01E+03	2.01E-03
Th-228	1.98E-02	2.94E-02	2.72E-02	3.12E-02	3.57E-02	3.01E-02		2.89E-02	8.67E+03	8.67E-03
Th-230	1.34E-04	2.10E-04	1.94E-04	2.23E-04	2.41E-04	2.04E-04		2.01E-04	6.03E+01	6.03E-05
Th-232	1.69E-04	2.45E-04	1.88E-04	1.61E-04	3.23E-04	2.62E-04		2.25E-04	6.74E+01	6.74E-05
U-232	2.45E-02	2.66E-02	2.62E-02	2.83E-02	2.98E-02	2.92E-02		2.74E-02	8.23E+03	8.23E-03
U-233	1.00E-02	1.08E-02	1.06E-02	1.15E-02	1.22E-02	1.19E-02		1.12E-02	3.35E+03	3.35E-03
U-234	4.78E-03	5.17E-03	5.07E-03	5.49E-03	5.81E-03	5.68E-03		5.33E-03	1.60E+03	1.60E-03
U-235	1.86E-04	2.12E-04	1.84E-04	1.98E-04	2.26E-04	2.22E-04		2.05E-04	6.14E+01	6.14E-05
U-236	5.58E-04	6.35E-04	5.51E-04	5.95E-04	6.79E-04	6.65E-04		6.14E-04	1.84E+02	1.84E-04
U-238	1.09E-03	1.15E-03	1.20E-03	8.78E-04	1.47E-03	1.70E-03		1.25E-03	3.74E+02	3.74E-04
Zr-95	1.43E+01	1.32E+01	1.37E+01	1.47E+01	1.51E+01	1.52E+01		1.44E+01	4.31E+06	4.31E+00

Note - This table does not depict the decay corrected activity. Decay correction and final total activity will be identified on Radcalc decay calculation.

Radcalc 4.1

6/27/2014 9:02 AM

File Name: Melter Heal with Shard Data_062714.rad

This report was generated using an unvalidated installation of Radcalc version 4.1.

Radcalc 4.1: C:\WVDP - Melter\Recharacterization Information\Melter Heal Data\Melter Heal with Shard Data_062714.rad

Performed By: Chris Brandjes
Checked By:

===== Input Information =====

Comments:

Activity calculation for melter heel based on the average of six Shard Sample results of the Evacuated Canister material.

Initial Source Data:

Isotope	Ci	Gm	TBq
C-14	3.470E-03	7.747E-04	1.284E-04
K-40	1.500E-02	2.121E+03	5.550E-04
Mn-54	2.330E-02	3.004E-06	8.621E-04
Co-60	1.520E-02	1.343E-05	5.624E-04
Ni-63	1.650E-01	2.922E-03	6.105E-03
Sr-90	4.160E+01	3.012E-01	1.539E+00
Zr-95	4.310E+00	2.006E-04	1.595E-01
Tc-99	2.010E-03	1.190E-01	7.437E-05
Cs-137	7.140E+02	8.214E+00	2.642E+01
Eu-154	2.130E-01	7.880E-04	7.881E-03
Th-228	8.670E-03	1.058E-05	3.208E-04
Th-230	6.030E-05	2.926E-03	2.231E-06
Th-232	6.740E-05	6.146E+02	2.494E-06
U-232	8.230E-03	3.729E-04	3.045E-04
U-233	3.350E-03	3.478E-01	1.240E-04
U-234	1.600E-03	2.574E-01	5.920E-05
U-235	6.150E-05	2.846E+01	2.276E-06
U-236	1.840E-04	2.879E+00	6.808E-06
U-238	3.740E-04	1.113E+03	1.384E-05
Np-237	1.050E-03	1.490E+00	3.885E-05
Pu-238	1.140E-01	6.657E-03	4.218E-03
Pu-239	2.610E-02	4.208E-01	9.657E-04
Pu-240	2.000E-02	8.814E-02	7.400E-04
Pu-241	5.330E-01	5.150E-03	1.972E-02
Am-241	4.970E-01	1.450E-01	1.839E-02
Am-243	5.980E-03	2.994E-02	2.213E-04
Cm-242	3.580E-02	1.081E-05	1.325E-03
Cm-243	2.850E-03	5.813E-05	1.055E-04
Cm-244	7.440E-02	9.143E-04	2.753E-03

Total Activity: 7.617E+02 2.818E+01

* Radionuclides with an A1/A2 fraction of less than 0.001 will not be shown in the output.

Container Data:

Container Void Volume:	0	m^3
Container Mass:	1	kg
Mass of solid beryllium, lead, graphite, and hydrogenous material enriched with deuterium:	0	kg
Gross Mass:	301	kg

Waste Data:

Waste Form:	Normal	
Waste State:	Solid	
Waste Volume:	43.08	ft^3
Waste Mass:	300	kg

Radcalc 4.1
File Name: Melter Heal with Shard Data_062714.rad

6/27/2014 9:02 AM

Mass of solid lead:	0	kg
Mass of solid beryllium, graphite, and hydrogenous material enriched with deuterium:	0	kg
Waste Void Volume:	0	m ³

Decay Time Data:
Date to begin source decay: 9/20/2002
Date container sealed: 9/2/2014

===== Radioactive Decay Results =====

Decayed Source:

Isotope	Ci	Gm	TBq
C-14	3.465E-03	7.736E-04	1.282E-04
K-40	1.500E-02	2.121E+03	5.550E-04
Mn-54	1.437E-06	1.853E-10	5.318E-08
Co-60	3.157E-03	2.790E-06	1.168E-04
Ni-63	1.520E-01	2.691E-03	5.622E-03
Sr-90	3.120E+01	2.259E-01	1.154E+00
Y-90	3.121E+01	5.739E-05	1.155E+00
Zr-95	1.299E-20	6.045E-25	4.805E-22
Nb-95	2.864E-20	7.283E-25	1.060E-21
Nb-95m	1.487E-22	3.900E-28	5.502E-24
Tc-99	2.010E-03	1.190E-01	7.437E-05
Cs-137	5.419E+02	6.234E+00	2.005E+01
Ba-137m	5.116E+02	9.506E-07	1.893E+01
Eu-154	8.123E-02	3.005E-04	3.005E-03
Hg-206	9.794E-16	8.744E-24	3.624E-17
Tl-206	6.881E-14	3.167E-22	2.546E-15
Tl-207	2.559E-09	1.344E-17	9.468E-11
Tl-208	2.717E-03	9.176E-12	1.005E-04
Tl-209	8.094E-08	1.979E-16	2.995E-09
Tl-210	6.540E-11	9.495E-20	2.420E-12
Pb-209	3.747E-06	8.129E-13	1.386E-07
Pb-210	5.155E-08	6.709E-10	1.907E-09
Pb-211	2.566E-09	1.039E-16	9.494E-11
Pb-212	7.563E-03	5.443E-09	2.798E-04
Pb-214	3.114E-07	9.497E-15	1.152E-08
Bi-209	8.103E-25	9.000E-09	2.998E-26
Bi-210	5.139E-08	4.142E-13	1.901E-09
Bi-211	2.566E-09	6.248E-18	9.494E-11
Bi-212	7.563E-03	5.162E-10	2.798E-04
Bi-213	3.747E-06	1.935E-13	1.386E-07
Bi-214	3.114E-07	7.053E-15	1.152E-08
Bi-215	2.100E-15	1.777E-23	7.768E-17
Po-210	4.712E-08	1.049E-11	1.743E-09
Po-211	7.005E-12	6.760E-23	2.592E-13
Po-212	4.844E-03	2.713E-20	1.792E-04
Po-213	3.667E-06	2.907E-22	1.357E-07
Po-214	3.114E-07	9.668E-22	1.152E-08
Po-215	2.566E-09	8.704E-23	9.494E-11
Po-216	7.563E-03	2.172E-14	2.798E-04
Po-218	3.114E-07	1.119E-15	1.152E-08
At-215	1.026E-14	1.956E-29	3.798E-16
At-217	3.748E-06	2.328E-18	1.387E-07
At-218	5.917E-11	1.715E-21	2.189E-12
At-219	2.165E-15	2.269E-24	8.009E-17
Rn-217	4.497E-10	4.671E-24	1.664E-11
Rn-218	5.917E-14	4.002E-26	2.189E-15
Rn-219	2.566E-09	1.973E-19	9.494E-11
Rn-220	7.563E-03	8.230E-12	2.798E-04
Rn-222	3.114E-07	2.024E-12	1.152E-08

Radcalc 4.1

6/27/2014 9:02 AM

File Name: Melter Heal with Shard Data_062714.rad

Fr-221	3.748E-06	2.158E-14	1.387E-07
Fr-223	3.608E-11	9.328E-19	1.335E-12
Ra-223	2.566E-09	5.009E-14	9.494E-11
Ra-224	7.563E-03	4.723E-08	2.798E-04
Ra-225	3.760E-06	9.590E-11	1.391E-07
Ra-226	3.118E-07	3.154E-07	1.154E-08
Ra-228	5.144E-05	1.887E-07	1.903E-06
Ac-225	3.748E-06	6.458E-11	1.387E-07
Ac-227	2.614E-09	3.615E-11	9.672E-11
Ac-228	5.144E-05	2.302E-11	1.903E-06
Th-227	2.548E-09	8.293E-14	9.429E-11
Th-228	7.562E-03	9.225E-06	2.798E-04
Th-229	3.778E-06	1.777E-05	1.398E-07
Th-230	6.047E-05	2.934E-03	2.237E-06
Th-231	6.150E-05	1.157E-10	2.276E-06
Th-232	6.740E-05	6.146E+02	2.494E-06
Th-234	3.740E-04	1.615E-08	1.384E-05
Pa-231	1.554E-08	3.291E-07	5.751E-10
Pa-233	1.052E-03	5.069E-08	3.892E-05
Pa-234	5.610E-07	2.840E-13	2.076E-08
Pa-234m	3.740E-04	5.446E-13	1.384E-05
U-232	7.309E-03	3.311E-04	2.704E-04
U-233	3.350E-03	3.478E-01	1.239E-04
U-234	1.604E-03	2.579E-01	5.933E-05
U-235	6.150E-05	2.846E+01	2.276E-06
U-235m	2.608E-02	8.476E-10	9.649E-04
U-236	1.840E-04	2.879E+00	6.808E-06
U-237	7.365E-06	9.025E-11	2.725E-07
U-238	3.740E-04	1.113E+03	1.384E-05
Np-237	1.052E-03	1.493E+00	3.892E-05
Np-239	5.973E-03	2.575E-08	2.210E-04
Pu-238	1.039E-01	6.067E-03	3.844E-03
Pu-239	2.609E-02	4.207E-01	9.655E-04
Pu-240	2.005E-02	8.836E-02	7.418E-04
Pu-241	2.990E-01	2.889E-03	1.106E-02
Am-241	4.952E-01	1.445E-01	1.832E-02
Am-243	5.973E-03	2.991E-02	2.210E-04
Cm-242	3.084E-10	9.315E-14	1.141E-11
Cm-243	2.162E-03	4.411E-05	8.001E-05
Cm-244	4.696E-02	5.771E-04	1.737E-03

Total Activity:	1.117E+03	4.134E+01
w/o Daughters:	5.744E+02	2.125E+01

Decay Heat:

Heat Generated on Start Date:	0.889	W
Heat Generated on Seal Date:	2.834	W

===== Regulatory Requirements Warning =====

Radcalc utilizes numerically based criteria to classify packages against the regulations. Many regulations also include subjective criteria that Radcalc does not consider. The user must check to ensure that all requirements in the regulations are met.

===== DOT Classification Results =====

* DOT classification calculations are made at the end of the user-specified decay time.

Radioactive Determination:

Radioactive:	Yes	(ACEMs and ALECs > 1.0)
ACEM Limit Fraction:	6806000	ACEMs (Number of ACEMs)
ALEC Limit Fraction:	2.125E+09	ALECs (Number of ALECs)

Radcalc 4.1
File Name: Melter Heal with Shard Data_062714.rad

6/27/2014 9:02 AM

* This package is not exempt from 49 CFR Subchapter C.

Effective A2s for Mixture:	3.365E+11	Bq	
Type Determination:			
Type:	B		(A2s > 1.0)
A2 Limit Fraction:	63.15	A2s	(Number of A2s)
Limited Quantity Determination:			
Limited Quantity:	No		(Solid, activity > 0.001 A2)
Activity:	63.15	A2	
	1117	Ci	
	41.34	TBq	
Fissile:	Yes		
Fissile Excepted:	Yes (c)		
LSA Determination:			
LSA-I:	No		(Fissile excepted, ACEMs > 30 x rad limits)
LSA-II:	No		(A2s/gm > 0.0001)
LSA-III:	Yes		(A2s/gm <= 0.002)
Specific Activity:	0.0002105	A2/gm	
	0.003724	Ci/gm	
HRCQ Determination:			
HRCQ:	No		(A2s <= 3000, Activity <= 1000 TBq)
A2 Limit Fraction:	63.15	A2s	
Activity:	1117	Ci	
	41.34	TBq	
Fissile Determination:			
Fissile:	Yes		(Contains fissile isotopes per 49 CFR 173.403)
Fissile Excepted Determination:			
Fissile Excepted:	Yes (c)		(Fissile <= 180 grams, non-fissile >= 2000 * fissile)
Fissile Mass:	29.23	gm	
Container beryllium, lead, graphite, and hydrogenous material enriched with deuterium:	0	gm	
Container Mass:	1000	gm	
Waste lead:	0	gm	
Waste beryllium, graphite, and hydrogenous material enriched with deuterium:	0	gm	
Waste Mass:	300000	gm	
Solid Non-Fissile Mass:	300000	gm	
Total Uranium Mass:	1145	gm	
U-233 Mass:	0.3478	gm	
U-235 Mass:	28.46	gm	
Uranium Enrichment:	2.486	%	
Total Plutonium Mass:	0.5181	gm	
Pu-239 Mass:	0.4207	gm	
Pu-241 Mass:	0.002889	gm	
Reportable Quantity Determination:			
Reportable Quantity:	Yes		(RQs >= 1.0)
RQ Limit Fraction:	1441	RQs	(Number of RQs)
Shipping Papers and Labels:			
Isotope	Number of A2s	Fraction of A2s	Cumulative A2s
+ Cs-137	33.42	0.5292	33.42
+ Am-241	18.32	0.2901	51.74
+ Sr-90	3.848	0.06093	55.59
			Cumulative Fraction of A2s
			0.5292
			0.8193
			0.8802

Radcalc 4.1

6/27/2014 9:02 AM

File Name: Melter Heal with Shard Data_062714.rad

+ Pu-238	3.844	0.06087	59.43	0.9411
+ Pu-239	0.9655	0.01529	60.4	0.9564
Cm-244	0.8687	0.01376	61.27	0.9701
Pu-240	0.7418	0.01175	62.01	0.9819
Th-228	0.2798	0.00443	62.29	0.9863
U-232	0.2704	0.004282	62.56	0.9906
Am-243	0.221	0.0035	62.78	0.9941
Pu-241	0.1844	0.00292	62.97	0.997
Cm-243	0.08001	0.001267	63.05	0.9983

+ Contains 95% of the total A2s and must be included per 49 CFR 173.433.

* Radionuclides comprising less than 0.1% of the total A2s are not shown in the list.

===== DOE Classification Results =====

* DOE classification calculations are made at the end of the user-specified decay time.

DOE-STD-1027 Category Determination:

Category:	Cat 3	(Cat3s > 1.0, Cat2s <= 1.0)
Cat 2 Limit Fraction:	0.02215	
Cat 3 Limit Fraction:	12.31	

* The DOE-STD-1027 category determination is based on dose-related limits.
The user must apply any criticality-related limits separately.

Dose-Equivalent Curies:

ICRP-72 DE-Ci:	0.6769
FGR-11 DE-Ci:	0.85

TRU Waste Determination:

TRU Waste:	Yes	(TRU activity > 100 nCi/gm)
TRU Activity:	2182	nCi/g

WIPP Quantities:

FGE Value:	19.07
PE-Ci Value:	0.686

===== NRC Classification Results =====

* NRC classification calculations are made at the end of the user-specified decay time.

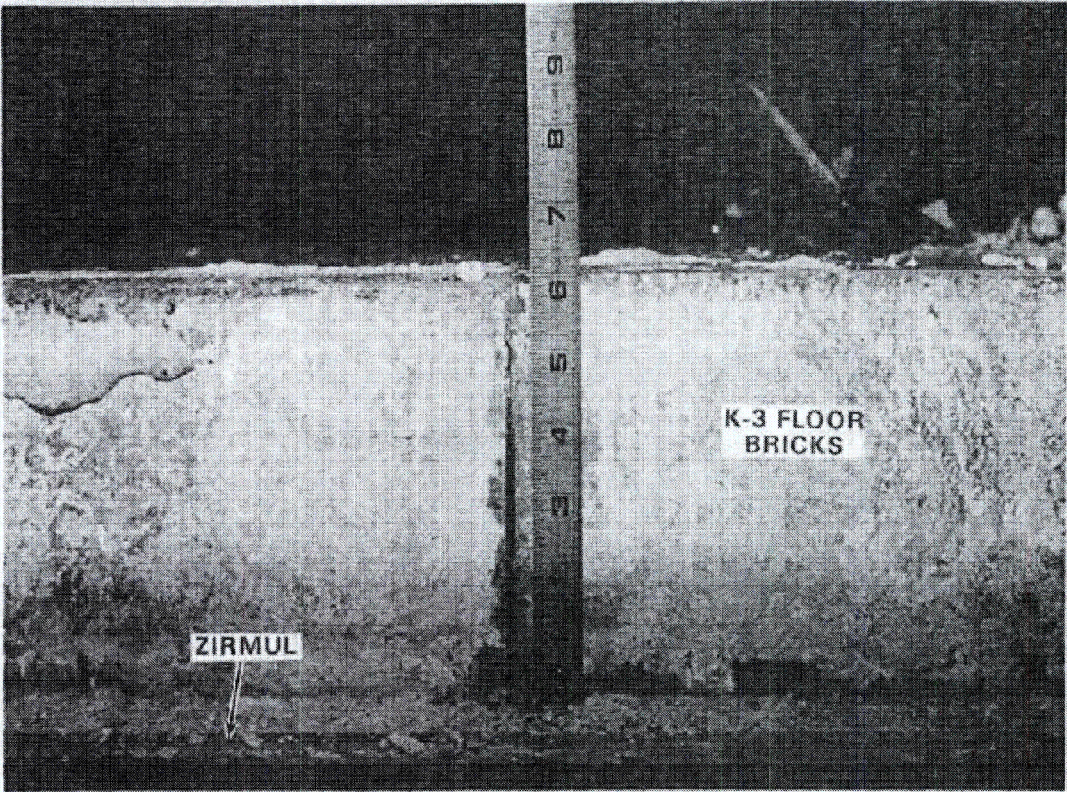
NRC Container Category:

Container Category:	III	
LSA-I:	No	
LSA-II:	No	
LSA-III:	Yes	
Total Activity:	1117	Ci
A2 Limit Fraction:	63.15	A2s

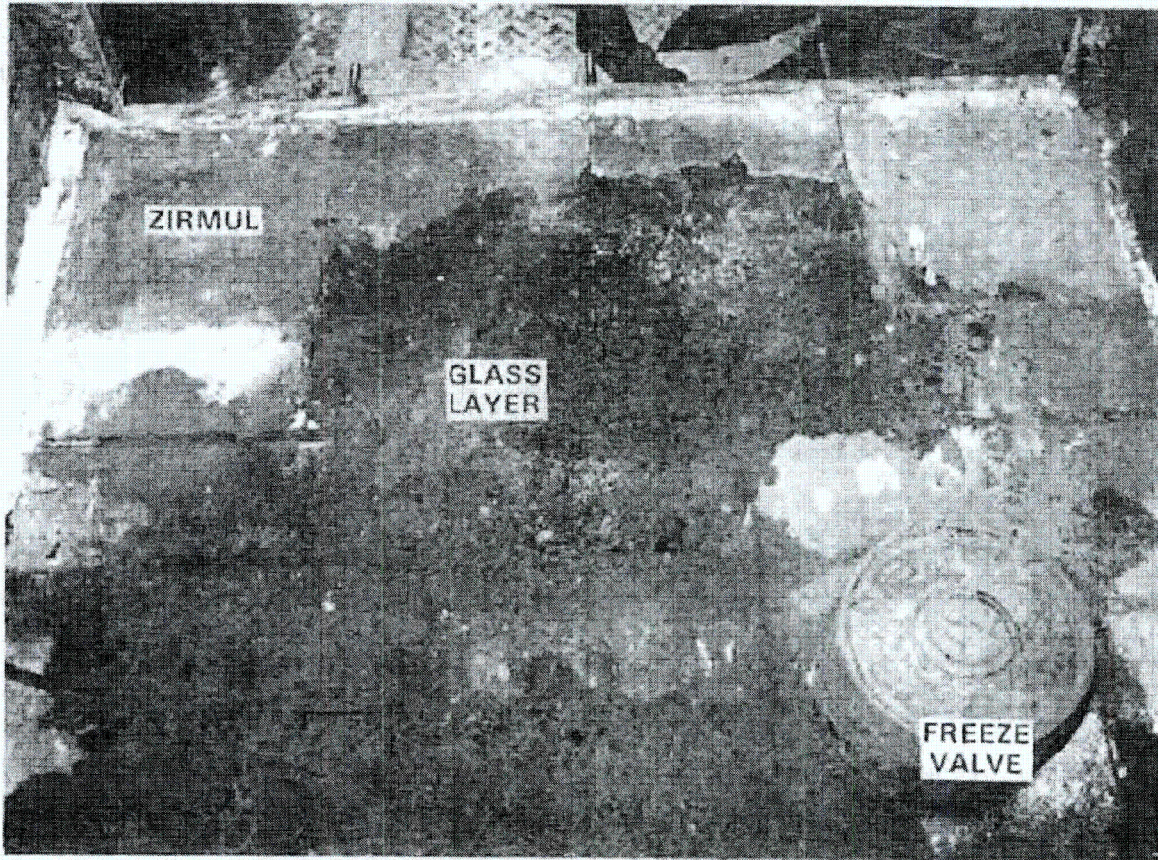
APPENDIX 4

Miscellaneous Pictures of Vitrified Glass Contained within Refractory

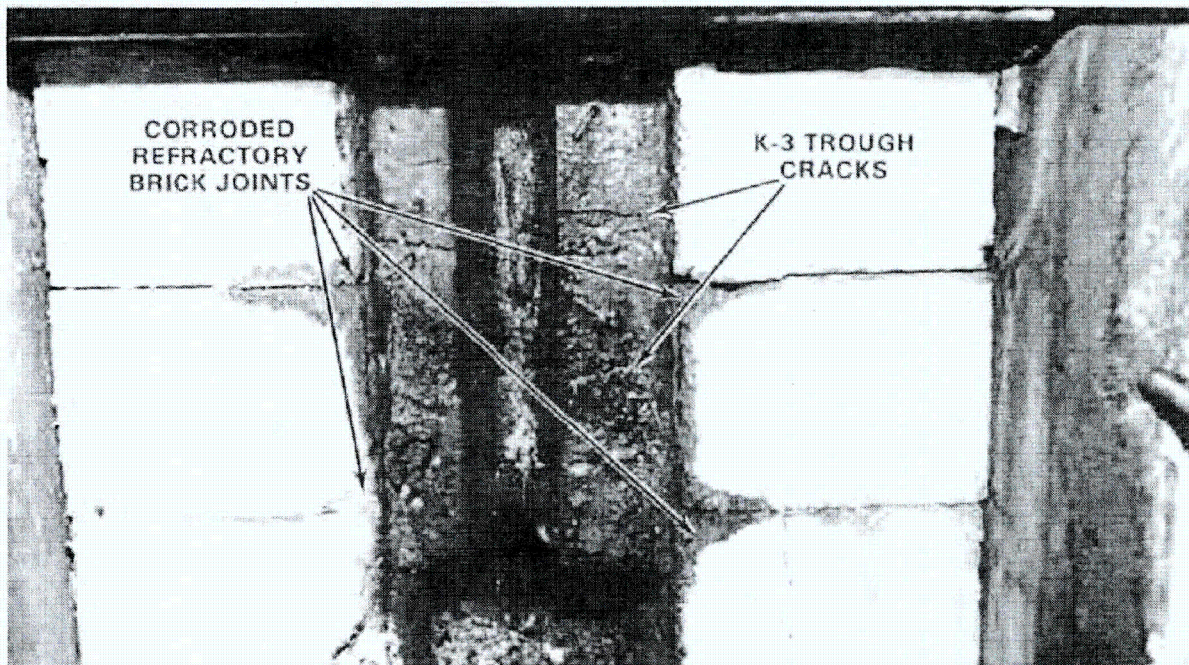
(PNL-3959, Materials and Design Experience
in a Slurry-Fed Electric Glass Melter)

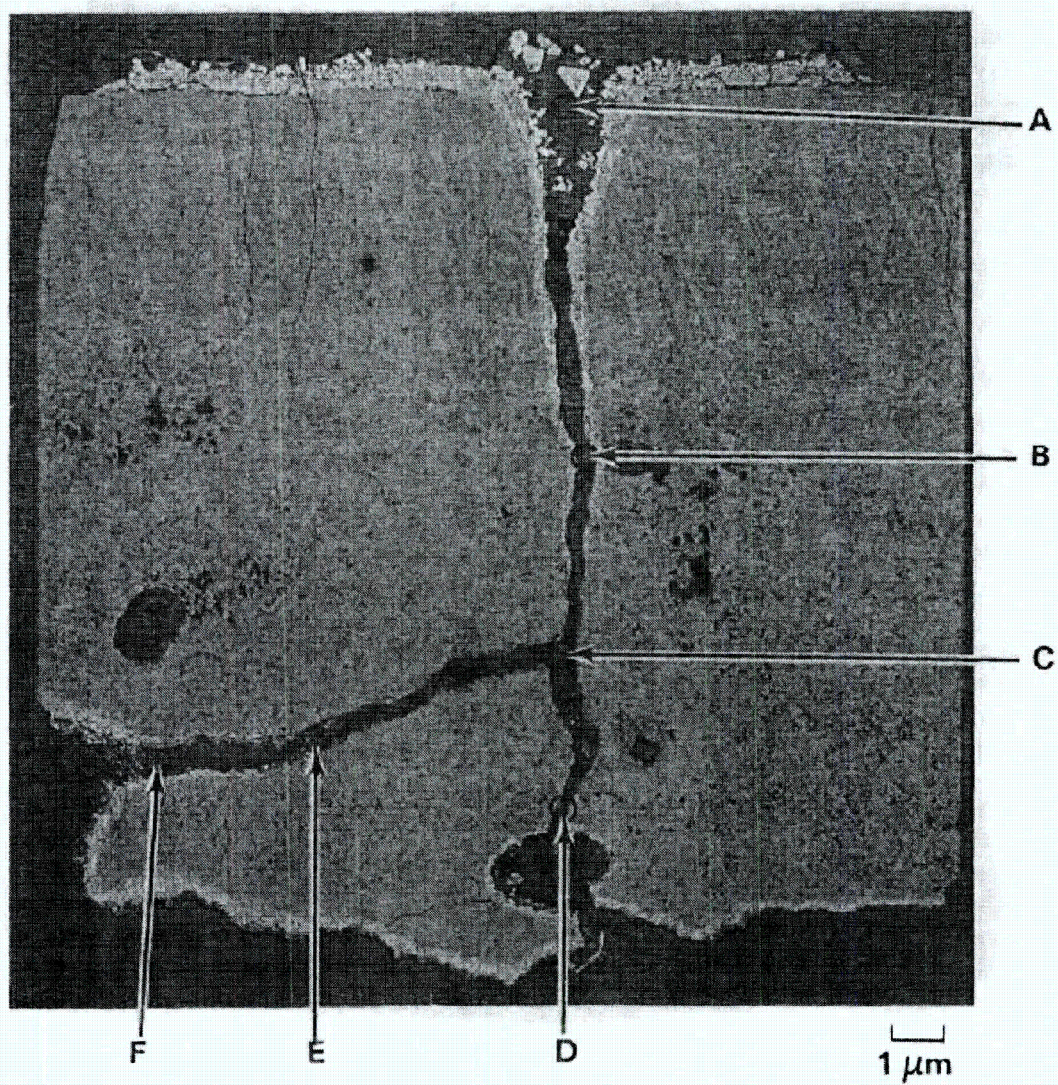


Miscellaneous Melter Photos
Continued

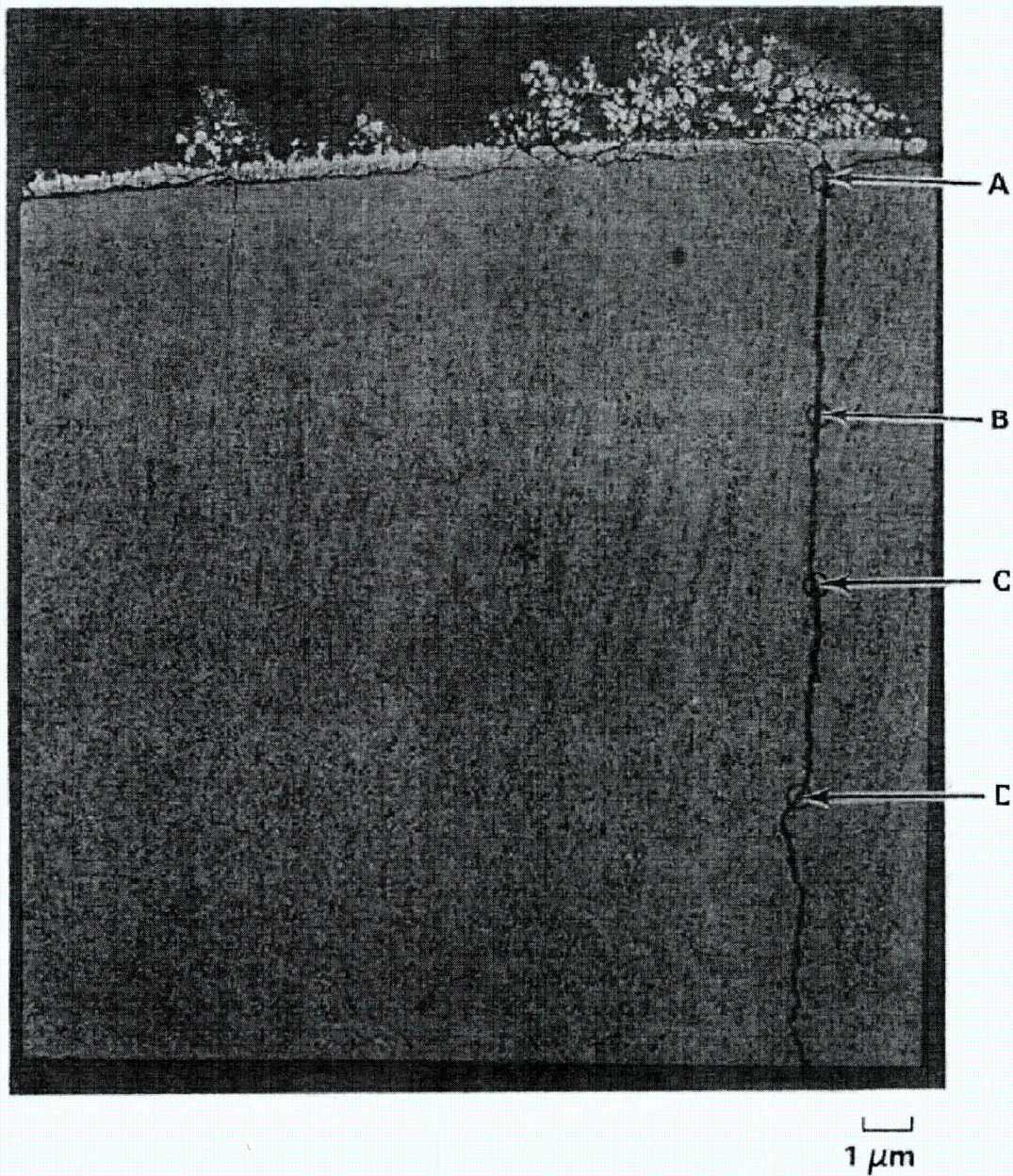


Glass Layer on the Zirmul Floor Blocks

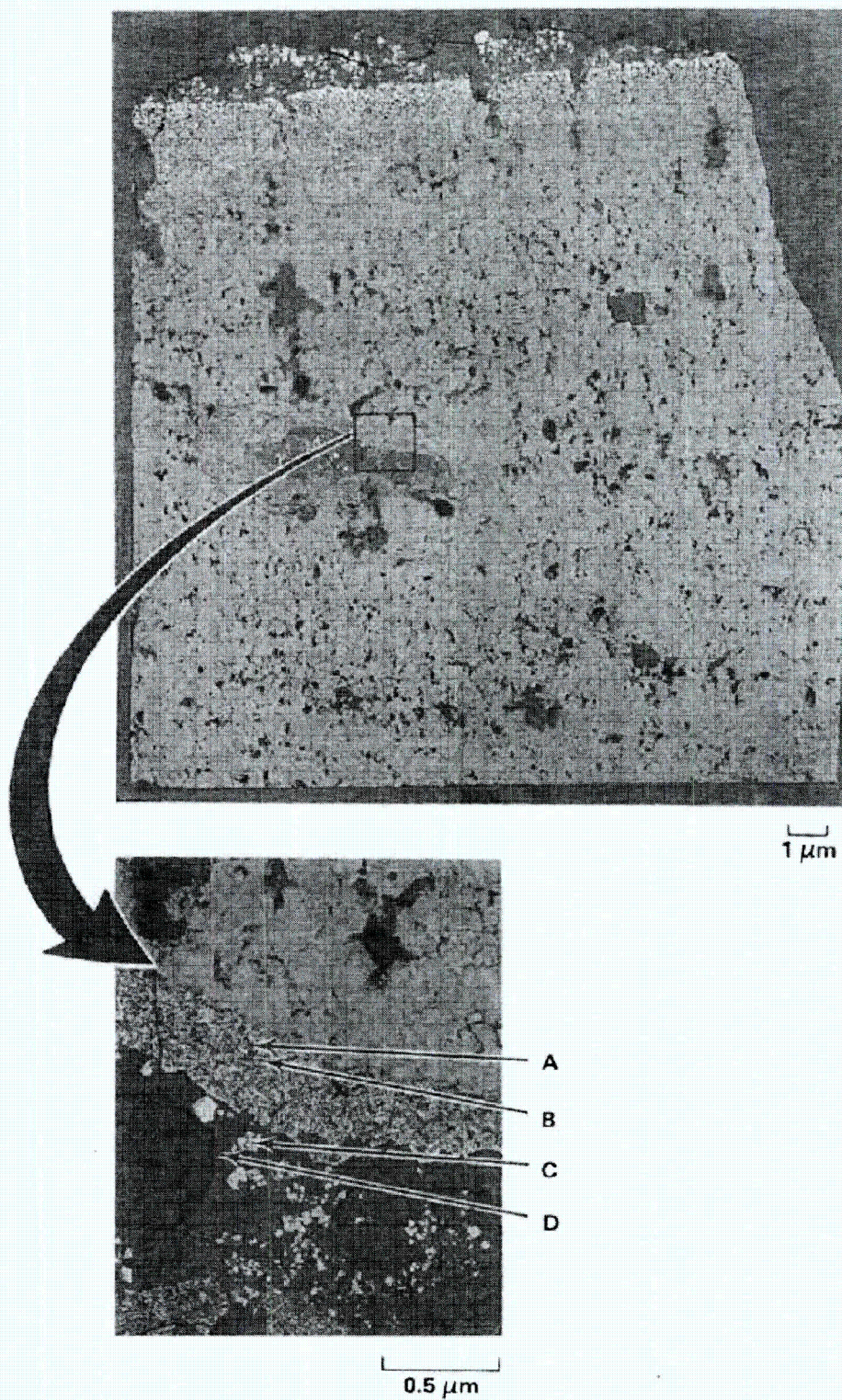




Miscellaneous Melter Photos
Continued



Glass-Filled Crack in Monofrax K-3



APPENDIX 5

Melter Refractory Activity and Decay Correction Calculations (RADCALC)

APPENDIX 5 - Refractory Activity Calculations

Monofrax Refractory

Description

Volume (ft3)	61.88
Density (lbs/ft3)	243.5
Total Weight (lbs)	15067.78

Zirmul Refractory

Description

Volume (ft3)	30.82
Density (lbs/ft3)	196
Total Weight (lbs)	6040.72

1% of the total Volume	Volume (ft3)	Mass (lbs)	Mass (g)
Monofrax Refractory	0.6188	150.6778	68407.72
Zirmul Refractory	0.3082	60.4072	27424.87

Glass Calc (Based on 1% of

total volume of refractory	Volume (ft3)	Volume (cc)	Mass (g)
Monofrax Refractory	0.6188	17522.47	45558.41
Zirmul Refractory	0.3082	8727.25	22690.86

Totals			68249.27
---------------	--	--	----------

	Geomean (6-69)	Geomean (70-77)	Ave (Conc.) Geomean for 6-77	Ave (Act) Geomean for 6-77
Isotope	Conc. (uCi/g)	Conc. (uCi/g)	Conc. (uCi/g)	Act (Ci)
Cs-137	4.83E+03	3.43E+03	4.13E+03	2.82E+02
Sr-90	4.00E+03	1.89E+02	2.10E+03	1.43E+02
Am-241	2.35E+01	1.57E+00	1.25E+01	8.56E-01
Am-243	1.85E-01	1.23E-02	9.85E-02	6.73E-03
Cm-242	1.88E-01	1.25E-02	1.00E-01	6.84E-03
Cm-243	1.10E-01	7.35E-03	5.89E-02	4.02E-03
Cm-244	2.95E+00	1.97E-01	1.58E+00	1.08E-01
Co-60	1.80E+00	1.20E-01	9.61E-01	6.56E-02
Eu-154	4.03E+01	2.69E+00	2.15E+01	1.47E+00
Np-237	2.32E-02	1.55E-03	1.24E-02	8.46E-04
Pu-238	4.26E+00	2.84E-01	2.27E+00	1.55E-01
Pu-239	1.02E+00	6.80E-02	5.45E-01	3.72E-02
Pu-240	7.80E-01	5.19E-02	4.16E-01	2.84E-02
Pu-241	1.02E+01	6.79E-01	5.44E+00	3.71E-01
Tc-99	1.43E+00	9.54E-02	7.65E-01	5.22E-02
Th-228	6.26E-02	4.17E-03	3.34E-02	2.28E-03
Th-230	4.18E-04	2.78E-05	2.23E-04	1.52E-05
Th-232	1.15E-03	7.64E-05	6.12E-04	4.18E-05
U-232	1.37E-02	9.10E-04	7.29E-03	4.97E-04
U-233	1.61E-02	1.07E-03	8.57E-03	5.85E-04
U-234	7.67E-03	5.10E-04	4.09E-03	2.79E-04
U-235	1.90E-03	1.27E-04	1.01E-03	6.92E-05
U-236	5.70E-03	3.80E-04	3.04E-03	2.08E-04
U-238	3.19E-03	2.13E-04	1.70E-03	1.16E-04
			Total	4.28E+02

Note - This table does not reflect decay corrected activity. Decay corrected activity is addressed in Radcalc decay calculation.

Radcalc 4.1
File Name: Refractory with Ave. Geomean 6-77 Act.rad

6/26/2014 3:57 PM

This report was generated using an unvalidated installation of Radcalc version 4.1.

Radcalc 4.1: C:\WVDP - Melter\Recharacterization Information\Refractory with Ave. Geomean 6-77 Act.rad

Performed By: Chris Brandjes
Checked By:

===== Input Information =====

Comments:
Activity associated to refractory using average Geomean for all samples.

Mass of glass is based on 1% of total volume of Refractory with a glass density of 2.6 g/cc.

Decayed from 7/18/2002 to 09/02/2014. Representing last Sample Date.

Initial Source Data:

Isotope	Ci	Gm	TBq
Co-60	6.560E-02	5.797E-05	2.427E-03
Sr-90	1.430E+02	1.035E+00	5.291E+00
Tc-99	5.220E-02	3.090E+00	1.931E-03
Cs-137	2.820E+02	3.244E+00	1.043E+01
Eu-154	1.470E+00	5.439E-03	5.439E-02
Th-228	2.280E-03	2.782E-06	8.436E-05
Th-230	1.520E-05	7.375E-04	5.624E-07
Th-232	4.180E-05	3.812E+02	1.547E-06
U-232	4.970E-04	2.252E-05	1.839E-05
U-233	5.850E-04	6.073E-02	2.165E-05
U-234	2.790E-04	4.488E-02	1.032E-05
U-235	6.920E-05	3.202E+01	2.560E-06
U-236	2.080E-04	3.255E+00	7.696E-06
U-238	1.160E-04	3.451E+02	4.292E-06
Np-237	8.460E-04	1.200E+00	3.130E-05
Pu-238	1.550E-01	9.051E-03	5.735E-03
Pu-239	3.720E-02	5.998E-01	1.376E-03
Pu-240	2.840E-02	1.252E-01	1.051E-03
Pu-241	3.710E-01	3.585E-03	1.373E-02
Am-241	8.560E-01	2.498E-01	3.167E-02
Am-243	6.730E-03	3.370E-02	2.490E-04
Cm-242	6.840E-03	2.066E-06	2.531E-04
Cm-243	4.020E-03	8.200E-05	1.487E-04
Cm-244	1.080E-01	1.327E-03	3.996E-03

Total Activity: 4.282E+02 1.584E+01

* Radionuclides with an A1/A2 fraction of less than 0.001 will not be shown in the output.

Container Data:

Container Void Volume:	0	m^3
Container Mass:	1	kg
Mass of solid beryllium, lead, graphite, and hydrogenous material enriched with deuterium:	0	kg
Gross Mass:	69.19	kg

Waste Data:

Waste Form:	Normal	
Waste State:	Solid	
Waste Volume:	0.927	ft^3
Waste Mass:	150.3	lb
Mass of solid lead:	0	kg
Mass of solid beryllium, graphite, and hydrogenous material enriched with deuterium:	0	kg

Radcalc 4.1

6/26/2014 3:57 PM

File Name: Refractory with Ave. Geomean 6-77 Act.rad

Waste Void Volume: 0 m³

Decay Time Data:

Date to begin source decay: 7/18/2002
Date container sealed: 9/2/2014

===== Radioactive Decay Results =====

Decayed Source:

Isotope	Ci	Gm	TBq
Co-60	1.332E-02	1.177E-05	4.927E-04
Sr-90	1.068E+02	7.732E-01	3.951E+00
Y-90	1.068E+02	1.964E-04	3.952E+00
Tc-99	5.220E-02	3.090E+00	1.931E-03
Cs-137	2.132E+02	2.452E+00	7.887E+00
Ba-137m	2.012E+02	3.739E-07	7.446E+00
Eu-154	5.527E-01	2.045E-03	2.045E-02
Hg-206	2.537E-16	2.265E-24	9.385E-18
Tl-206	1.782E-14	8.204E-23	6.594E-16
Tl-207	2.960E-09	1.554E-17	1.095E-10
Tl-208	1.806E-04	6.098E-13	6.681E-06
Tl-209	1.434E-08	3.507E-17	5.307E-10
Tl-210	1.672E-11	2.427E-20	6.186E-13
Pb-209	6.641E-07	1.441E-13	2.457E-08
Pb-210	1.335E-08	1.738E-10	4.940E-10
Pb-211	2.968E-09	1.202E-16	1.098E-10
Pb-212	5.026E-04	3.617E-10	1.860E-05
Pb-214	7.960E-08	2.428E-15	2.945E-09
Bi-209	1.457E-25	1.618E-09	5.392E-27
Bi-210	1.331E-08	1.073E-13	4.925E-10
Bi-211	2.968E-09	7.227E-18	1.098E-10
Bi-212	5.026E-04	3.430E-11	1.860E-05
Bi-213	6.640E-07	3.429E-14	2.457E-08
Bi-214	7.962E-08	1.803E-15	2.946E-09
Bi-215	2.428E-15	2.054E-23	8.984E-17
Po-210	1.222E-08	2.720E-12	4.522E-10
Po-211	8.103E-12	7.819E-23	2.998E-13
Po-212	3.219E-04	1.803E-21	1.191E-05
Po-213	6.498E-07	5.152E-23	2.404E-08
Po-214	7.960E-08	2.472E-22	2.945E-09
Po-215	2.968E-09	1.007E-22	1.098E-10
Po-216	5.026E-04	1.443E-15	1.859E-05
Po-218	7.962E-08	2.860E-16	2.946E-09
At-215	1.187E-14	2.263E-29	4.393E-16
At-217	6.641E-07	4.126E-19	2.457E-08
At-218	1.513E-11	4.385E-22	5.597E-13
At-219	2.503E-15	2.624E-24	9.262E-17
Rn-217	7.969E-11	8.278E-25	2.949E-12
Rn-218	1.513E-14	1.023E-26	5.597E-16
Rn-219	2.968E-09	2.282E-19	1.098E-10
Rn-220	5.026E-04	5.469E-13	1.859E-05
Rn-222	7.962E-08	5.176E-13	2.946E-09
Fr-221	6.641E-07	3.825E-15	2.457E-08
Fr-223	4.172E-11	1.079E-18	1.544E-12
Ra-223	2.968E-09	5.794E-14	1.098E-10
Ra-224	5.026E-04	3.138E-09	1.859E-05
Ra-225	6.663E-07	1.699E-11	2.465E-08
Ra-226	7.972E-08	8.064E-08	2.950E-09
Ra-228	3.211E-05	1.178E-07	1.188E-06
Ac-225	6.641E-07	1.144E-11	2.457E-08
Ac-227	3.023E-09	4.180E-11	1.119E-10
Ac-228	3.211E-05	1.437E-11	1.188E-06

Radcalc 4.1

6/26/2014 3:57 PM

File Name: Refractory with Ave. Geomean 6-77 Act.rad

Th-227	2.947E-09	9.592E-14	1.091E-10
Th-228	5.024E-04	6.129E-07	1.859E-05
Th-229	6.695E-07	3.148E-06	2.477E-08
Th-230	1.523E-05	7.389E-04	5.635E-07
Th-231	6.920E-05	1.302E-10	2.560E-06
Th-232	4.180E-05	3.812E+02	1.547E-06
Th-234	1.160E-04	5.008E-09	4.292E-06
Pa-231	1.775E-08	3.757E-07	6.566E-10
Pa-233	8.493E-04	4.093E-08	3.142E-05
Pa-234	1.740E-07	8.810E-14	6.438E-09
Pa-234m	1.160E-04	1.689E-13	4.292E-06
U-232	4.406E-04	1.996E-05	1.630E-05
U-233	5.850E-04	6.073E-02	2.165E-05
U-234	2.841E-04	4.569E-02	1.051E-05
U-235	6.920E-05	3.202E+01	2.560E-06
U-235m	3.717E-02	1.208E-09	1.375E-03
U-236	2.080E-04	3.255E+00	7.696E-06
U-237	5.083E-06	6.229E-11	1.881E-07
U-238	1.160E-04	3.451E+02	4.292E-06
Np-237	8.493E-04	1.205E+00	3.143E-05
Np-239	6.722E-03	2.898E-08	2.487E-04
Pu-238	1.409E-01	8.226E-03	5.212E-03
Pu-239	3.719E-02	5.997E-01	1.376E-03
Pu-240	2.847E-02	1.255E-01	1.054E-03
Pu-241	2.064E-01	1.994E-03	7.636E-03
Am-241	8.449E-01	2.466E-01	3.126E-02
Am-243	6.722E-03	3.366E-02	2.487E-04
Cm-242	4.488E-11	1.356E-14	1.661E-12
Cm-243	3.038E-03	6.196E-05	1.124E-04
Cm-244	6.771E-02	8.320E-04	2.505E-03

Total Activity:	6.300E+02	2.331E+01
w/o Daughters:	3.220E+02	1.191E+01

Decay Heat:		
Heat Generated on Start Date:	0.5161	W
Heat Generated on Seal Date:	1.768	W

===== Regulatory Requirements Warning =====

Radcalc utilizes numerically based criteria to classify packages against the regulations. Many regulations also include subjective criteria that Radcalc does not consider. The user must check to ensure that all requirements in the regulations are met.

===== DOT Classification Results =====

* DOT classification calculations are made at the end of the user-specified decay time.

Radioactive Determination:			
Radioactive:	Yes		(ACEMs and ALECs > 1.0)
ACEM Limit Fraction:	12760000	ACEMs	(Number of ACEMs)
ALEC Limit Fraction:	1.190E+09	ALECs	(Number of ALECs)
* This package is not exempt from 49 CFR Subchapter C.			

Effective A2s for Mixture:	1.775E+11	Bq
----------------------------	-----------	----

Type Determination:			
Type:	B		(A2s > 1.0)
A2 Limit Fraction:	67.13	A2s	(Number of A2s)

Limited Quantity Determination:			
Limited Quantity:	No		(Solid, activity > 0.001 A2)

Radcalc 4.1

6/26/2014 3:57 PM

File Name: Refractory with Ave. Geomean 6-77 Act.rad

Activity:	67.13	A2		
	630	Ci		
	23.31	TBq		
Fissile:	Yes			
Fissile Excepted:	Yes (c)			
LSA Determination:				
LSA-I:	No		(Fissile excepted, ACEMs > 30 x rad limits)	
LSA-II:	No		(A2s/gm > 0.0001)	
LSA-III:	Yes		(A2s/gm <= 0.002)	
Specific Activity:	0.0009844	A2/gm		
	0.00924	Ci/gm		
HRCQ Determination:				
HRCQ:	No		(A2s <= 3000, Activity <= 1000 TBq)	
A2 Limit Fraction:	67.13	A2s		
Activity:	630	Ci		
	23.31	TBq		
Fissile Determination:				
Fissile:	Yes		(Contains fissile isotopes per 49 CFR 173.403)	
Fissile Excepted Determination:				
Fissile Excepted:	Yes (c)		(Fissile <= 180 grams, non-fissile >= 2000 * fissile)	
Fissile Mass:	32.68	gm		
Container beryllium, lead, graphite, and hydrogenous material enriched with deuterium:	0	gm		
Container Mass:	1000	gm		
Waste lead:	0	gm		
Waste beryllium, graphite, and hydrogenous material enriched with deuterium:	0	gm		
Waste Mass:	68190	gm		
Solid Non-Fissile Mass:	68160	gm		
Total Uranium Mass:	380.5	gm		
U-233 Mass:	0.06073	gm		
U-235 Mass:	32.02	gm		
Uranium Enrichment:	8.415	%		
Total Plutonium Mass:	0.7354	gm		
Pu-239 Mass:	0.5997	gm		
Pu-241 Mass:	0.001994	gm		
Reportable Quantity Determination:				
Reportable Quantity:	Yes		(RQs >= 1.0)	
RQ Limit Fraction:	1606	RQs	(Number of RQs)	
Shipping Papers and Labels:				
Isotope	Number of A2s	Fraction of A2s	Cumulative A2s	Cumulative Fraction of A2s
+ Am-241	31.26	0.4657	31.26	0.4657
+ Sr-90	13.17	0.1962	44.43	0.6619
+ Cs-137	13.15	0.1958	57.58	0.8578
+ Pu-238	5.212	0.07765	62.79	0.9354
+ Pu-239	1.376	0.0205	64.17	0.9559
Cm-244	1.253	0.01866	65.42	0.9746
Pu-240	1.054	0.01569	66.47	0.9903
Am-243	0.2487	0.003705	66.72	0.994
Pu-241	0.1273	0.001896	66.85	0.9959
Cm-243	0.1124	0.001674	66.96	0.9976
U-235m	0.06876	0.001024	67.03	0.9986
+ Contains 95% of the total A2s and must be included per 49 CFR 173.433.				
* Radionuclides comprising less than 0.1% of the total A2s are not shown in the list.				

Radcalc 4.1
File Name: Refractory with Ave. Geomean 6-77 Act.rad

6/26/2014 3:57 PM

===== DOE Classification Results =====

* DOE classification calculations are made at the end of the user-specified decay time.

DOE-STD-1027 Category Determination:

Category:	Cat 3	(Cat3s > 1.0, Cat2s <= 1.0)
Cat 2 Limit Fraction:	0.02833	
Cat 3 Limit Fraction:	12.38	

* The DOE-STD-1027 category determination is based on dose-related limits.
The user must apply any criticality-related limits separately.

Dose-Equivalent Curies:

ICRP-72 DE-Ci:	1.054
FGR-11 DE-Ci:	1.465

TRU Waste Determination:

TRU Waste:	Yes	(TRU activity > 100 nCi/gm)
TRU Activity:	15580	nCi/g

WIPP Quantities:

FGE Value:	21.28
PE-Ci Value:	1.105

===== NRC Classification Results =====

* NRC classification calculations are made at the end of the user-specified decay time.

NRC Container Category:

Container Category:	III	
LSA-I:	No	
LSA-II:	No	
LSA-III:	Yes	
Total Activity:	630	Ci
A2 Limit Fraction:	67.13	A2s

APPENDIX 6

Analytical Data for Batch 75

Appendix 6 - Analytical Data for Batch 75

PRIM_SAM_KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP IDC	SAMPOIN T	SAMTYPE	MTBATCH	RES_TYP1	UNCERTAINTYV ALUE	RESULT_ VALUE	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) VM	Scaling factors
01-2326	11/2/2001		108-112	9/25/2001	B75WH-108,109,111 & 112	CFMT	WH	75WH	Am241	8.28E-02	1.37E+00		2 uCi/g	Rep2 (B75)	Cs-137	1.16E+04	1.00E+00
01-2326	11/2/2001		108-112	9/25/2001	B75WH-108,109,111 & 112	CFMT	WH	75WH	Am241	1.01E-01	1.68E+00		4 uCi/g	Rep4 (B75)	Sr-90	8.70E+02	7.47E-02
01-2326	11/2/2001		108-112	9/25/2001	B75WH-108,109,111 & 112	CFMT	WH	75WH	Am241	1.05E-01	1.75E+00		3 uCi/g	Rep3 (B75)	Am-241	3.86E+00	3.32E-04
01-2326	11/2/2001		108-112	9/25/2001	B75WH-108,109,111 & 112	CFMT	WH	75WH	Am241	9.16E-02	1.52E+00		1 uCi/g	Rep1 (B75)	Am-241	4.60E-02	3.95E-06
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WI (ACT #11)	075	Am241	2.24E-01	3.72E+00		3 uCi/g	Rep3 (03db)	Cm-242	4.37E-02	3.75E-06
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WI (ACT #11)	075	Am241	2.33E-01	3.87E+00		7 uCi/g	Rep7 (07db)	Cm-243	2.51E-02	2.16E-06
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WI (ACT #11)	075	Am241	2.26E-01	3.75E+00		8 uCi/g	Rep8 (08db)	Cm-244	6.72E-01	5.77E-05
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WI (ACT #11)	075	Am241	2.43E-01	4.04E+00		6 uCi/g	Rep6 (06db)	Co-60	2.96E-01	2.54E-05
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WI (ACT #11)	075	Am241	2.33E-01	3.88E+00		1 uCi/g	Rep1 (01db)	Eu-154	2.95E+00	2.53E-04
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WI (ACT #11)	075	Am241	2.21E-01	3.66E+00		5 uCi/g	Rep5 (18 db)	Np-237	7.14E-03	6.13E-07
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WI (ACT #11)	075	Am241	2.51E-01	4.17E+00		4 uCi/g	Rep4 (04db)	Pu-238	1.27E+00	1.09E-04
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WI (ACT #11)	075	Am241	2.34E-01	3.87E+00		2 uCi/g	Rep2 (02db)	IPu-239	3.04E-01	2.61E-05
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WI (ACT #11)	075	Am241	2.29E-01	3.80E+00		9 uCi/g	Rep9 (09db)	IPu-240	2.32E-01	1.99E-05
01-1392	7/11/2001		75WH-17	7/11/2001	B75WH	CFMT	WH	75	Am-241	4.61E-02	1.33E-01		1 uCi/g	Rep1	Tc-99	1.59E-01	1.36E-05
01-1392	7/11/2001		75WH-17	7/11/2001	B75WH	CFMT	WH	75	Am-241	5.58E-02	1.32E-01		2 uCi/g	Rep2			
01-1392	7/11/2001		75WH-17	7/11/2001	B75WH	CFMT	WH	75	Am-241	3.48E-02	8.98E-02		7 uCi/g	Rep7			
01-1392	7/11/2001		75WH-17	7/11/2001	B75WH	CFMT	WH	75	Am-241	3.43E-02	1.06E-01		9 uCi/g	Rep9			
01-1392	7/11/2001		75WH-17	7/11/2001	B75WH	CFMT	WH	75	Am-241	5.52E-02	1.42E-01		5 uCi/g	Rep5			
01-1392	7/11/2001		75WH-17	7/11/2001	B75WH	CFMT	WH	75	Am-241	7.47E-02	1.25E-01		4 uCi/g	Rep4			
01-1392	7/11/2001		75WH-17	7/11/2001	B75WH	CFMT	WH	75	Am-241	4.09E-02	1.13E-01		6 uCi/g	Rep6			
01-1392	7/11/2001		75WH-17	7/11/2001	B75WH	CFMT	WH	75	Am-241	5.79E-02	1.59E-01		3 uCi/g	Rep3			
01-1392	7/11/2001		75WH-17	7/11/2001	B75WH	CFMT	WH	75	Am-241	3.53E-02	1.36E-01		8 uCi/g	Rep8			
01-1440	7/17/2001		21-23	7/17/2001	B75WH-21-75WH-23	CFMT	WH	75	Am-241	7.97E-02	2.49E-01		3 uCi/g	Rep3 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	B75WH-21-75WH-23	CFMT	WH	75	Am-241	1.08E-01	3.64E-01		2 uCi/g	Rep2 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	B75WH-21-75WH-23	CFMT	WH	75	Am-241	9.89E-02	2.96E-01		1 uCi/g	Rep1 (B75)			
01-1501	7/24/2001		24-29	7/23/2001	B75WH-24-B75WH-26	CFMT	WH	75	Am-241	8.69E-02	3.42E-01		3 uCi/g	Rep3			
01-1501	7/24/2001		24-29	7/23/2001	B75WH-24-B75WH-26	CFMT	WH	75	Am-241	1.26E-01	4.78E-01		1 uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH-24-B75WH-26	CFMT	WH	75	Am-241	1.21E-01	4.65E-01		2 uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	B75WH-32-75WH-34	CFMT	WH	75	Am-241	6.88E-02	5.35E-01		1 uCi/g	Rep1			
01-1557	7/30/2001		32,33,34	7/30/2001	B75WH-32-75WH-34	CFMT	WH	75	Am-241	8.36E-02	5.55E-01		2 uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	B75WH-32-75WH-34	CFMT	WH	75	Am-241	8.33E-02	5.25E-01		3 uCi/g	Rep3			
01-1621	8/7/2001		38-40	8/7/2001	B75WH-38-75WH-40	CFMT	WH	075	Am-241	2.39E-01	7.67E-01		1 uCi/g	Rep1 (38)			
01-1621	8/7/2001		38-40	8/7/2001	B75WH-38-75WH-40	CFMT	WH	075	Am-241	2.67E-01	7.18E-01		2 uCi/g	Rep2 (39)			
01-1621	8/7/2001		38-40	8/7/2001	B75WH-38-75WH-40	CFMT	WH	075	Am-241	4.17E-01	7.09E-01		3 uCi/g	Rep3 (40)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Am-241	5.57E-01	1.07E+00		3 uCi/g	Rep3			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Am-241	4.07E-01	8.47E-01		2 uCi/g	Rep2			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Am-241	3.27E-01	1.00E+00		1 uCi/g	Rep1			
01-1722	8/21/2001		46-48,52-5	8/20/2001	B75WH-46,47,48,52,53	CFMT	WH	75	Am-241	2.65E-01	8.74E-01		1 uCi/g	Rep1			
01-1722	8/21/2001		46-48,52-5	8/20/2001	B75WH-46,47,48,52,53	CFMT	WH	75	Am-241	2.68E-01	8.92E-01		2 uCi/g	Rep2			
01-1722	8/21/2001		46-48,52-5	8/20/2001	B75WH-46,47,48,52,53	CFMT	WH	75	Am-241	2.74E-01	9.02E-01		3 uCi/g	Rep3			
01-1778	8/27/2001		62-64	8/25/2001	B75WH-62-64	CFMT	WH	75	Am-241	6.10E-01	1.50E+00		3 uCi/g	Rep3 (64DB)			
01-1778	8/27/2001		62-64	8/25/2001	B75WH-62-64	CFMT	WH	75	Am-241	3.43E-01	7.48E-01		1 uCi/g	Rep1 (62DB)			
01-1778	8/27/2001		62-64	8/25/2001	B75WH-62-64	CFMT	WH	75	Am-241	5.18E-01	9.70E-01		2 uCi/g	Rep2 (63DB)			
01-1892	9/10/2001		80-84	9/4/2001	B75WH-80- 75WH-84	CFMT	WH	75	Am-241	4.38E-01	1.31E+00		1 uCi/g	Rep1			
01-1892	9/10/2001		80-84	9/4/2001	B75WH-80- 75WH-84	CFMT	WH	75	Am-241	5.18E-01	1.24E+00		2 uCi/g	Rep2			
01-1892	9/10/2001		80-84	9/4/2001	B75WH-80- 75WH-84	CFMT	WH	75	Am-241	5.63E-01	1.12E+00		3 uCi/g	Rep3			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Am-241	7.91E-01	1.31E+00		3 uCi/g	Rep3 (B75)			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Am-241	1.10E+00	1.58E+00		2 uCi/g	Rep2 (B75)			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Am-241	7.99E-01	1.57E+00		1 uCi/g	Rep1 (B75)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH-108-112	CFMT	WH	75	Am-241	1.18E+00	2.25E+00		4 uCi/g	Rep4			
01-2026	9/26/2001		108-112	9/25/2001	B75WH-108-112	CFMT	WH	75	Am-241	6.62E-01	1.79E+00		3 uCi/g	Rep3			
01-2026	9/26/2001		108-112	9/25/2001	B75WH-108-112	CFMT	WH	75	Am-241	8.90E-01	1.69E+00		2 uCi/g	Rep2			
01-2026	9/26/2001		108-112	9/25/2001	B75WH-108-112	CFMT	WH	75	Am-241	5.63E-01	1.79E+00		1 uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WI (ACT #11)	075	Am-241	1.98E+00	4.64E+00		5 uCi/g	Rep5			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WI (ACT #11)	075	Am-241	8.64E-01	3.08E+00		3 uCi/g	Rep3			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WI (ACT #11)	075	Am-241	9.52E-01	3.87E+00		6 uCi/g	Rep6			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WI (ACT #11)	075	Am-241	9.96E-01	4.03E+00		7 uCi/g	Rep7			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WI (ACT #11)	075	Am-241	2.31E+00	2.92E+00		1 uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WI (ACT #11)	075	Am-241		<2.73E+0		8 uCi/g	Rep8			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WI (ACT #11)	075	Am-241	6.94E-01	3.95E+00		4 uCi/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WI (ACT #11)	075	Am-241	1.25E+00	4.27E+00		2 uCi/g	Rep2			
01-2498	11/26/2001		01 - 09	11/24/2001	B75W01 - 09	CFMT	WI (ACT #11)	075	Am-241	1.01E+00	3.37E+00		9 uCi/g	Rep9			
01-2326	11/2/2001		108-112	9/25/2001	B75WH-108,109,111 & 112	CFMT	WH	75WH	Am243	1.35E-03	2.10E-02		1 uCi/g	Rep1 (B75)			

PRIM_SAM_ KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPOIN T	SAMTYPE	VITBATCH	RES_TYP1	UNCERTAINTY ALUE	RESULT VALUE	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) VM	Scaling factors
01-2326	11/2/2001		108-112	9/25/2001	B75WH-108,109,111 & 112	CFMT	WH	75WH	Am243	1.49E-03	2.32E-02	4	uCi/g	Rep4 (B75)			
01-2326	11/2/2001		108-112	9/25/2001	B75WH-108,109,111 & 112	CFMT	WH	75WH	Am243	1.55E-03	2.41E-02	3	uCi/g	Rep3 (B75)			
01-2326	11/2/2001		108-112	9/25/2001	B75WH-108,109,111 & 112	CFMT	WH	75WH	Am243	1.22E-03	1.89E-02	2	uCi/g	Rep2 (B75)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Am243	2.92E-03	4.52E-02	9	uCi/g	Rep9 (09db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Am243	2.88E-03	4.47E-02	8	uCi/g	Rep8 (08db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Am243	2.82E-03	4.36E-02	5	uCi/g	Rep5 (18 db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Am243	2.86E-03	4.44E-02	3	uCi/g	Rep3 (03db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Am243	2.97E-03	4.61E-02	7	uCi/g	Rep7 (07db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Am243	2.99E-03	4.61E-02	2	uCi/g	Rep2 (02db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Am243	3.10E-03	4.82E-02	6	uCi/g	Rep6 (06db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Am243	2.98E-03	4.63E-02	1	uCi/g	Rep1 (01db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Am243	3.20E-03	4.97E-02	4	uCi/g	Rep4 (04db)			
01-2326	11/2/2001		108-112	9/25/2001	B75WH-108,109,111 & 112	CFMT	WH	75WH	Cm242	1.77E-03	2.22E-02	3	uCi/g	Rep3 (B75)			
01-2326	11/2/2001		108-112	9/25/2001	B75WH-108,109,111 & 112	CFMT	WH	75WH	Cm242	1.34E-03	1.61E-02	1	uCi/g	Rep1 (B75)			
01-2326	11/2/2001		108-112	9/25/2001	B75WH-108,109,111 & 112	CFMT	WH	75WH	Cm242	1.28E-03	1.52E-02	2	uCi/g	Rep2 (B75)			
01-2326	11/2/2001		108-112	9/25/2001	B75WH-108,109,111 & 112	CFMT	WH	75WH	Cm242	1.40E-03	1.76E-02	4	uCi/g	Rep4 (B75)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Cm242	3.95E-03	4.45E-02	2	uCi/g	Rep2 (02db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Cm242	3.54E-03	4.40E-02	6	uCi/g	Rep6 (06db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Cm242	3.51E-03	4.52E-02	9	uCi/g	Rep9 (09db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Cm242	3.20E-03	4.27E-02	8	uCi/g	Rep8 (08db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Cm242	3.48E-03	4.45E-02	1	uCi/g	Rep1 (01db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Cm242	3.47E-03	4.46E-02	7	uCi/g	Rep7 (07db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Cm242	3.74E-03	4.16E-02	5	uCi/g	Rep5 (18 db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Cm242	3.25E-03	4.14E-02	3	uCi/g	Rep3 (03db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Cm242	3.65E-03	4.49E-02	4	uCi/g	Rep4 (04db)			
01-2326	11/2/2001		108-112	9/25/2001	B75WH-108,109,111 & 112	CFMT	WH	75WH	Cm243/244	1.71E-02	2.80E-01	1	uCi/g	Rep1 (B75)			
01-2326	11/2/2001		108-112	9/25/2001	B75WH-108,109,111 & 112	CFMT	WH	75WH	Cm243/244	1.54E-02	2.50E-01	2	uCi/g	Rep2 (B75)			
01-2326	11/2/2001		108-112	9/25/2001	B75WH-108,109,111 & 112	CFMT	WH	75WH	Cm243/244	1.87E-02	3.04E-01	3	uCi/g	Rep3 (B75)			
01-2326	11/2/2001		108-112	9/25/2001	B75WH-108,109,111 & 112	CFMT	WH	75WH	Cm243/244	1.86E-02	3.05E-01	4	uCi/g	Rep4 (B75)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Cm243/244	4.35E-02	7.03E-01	2	uCi/g	Rep2 (02db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Cm243/244	4.15E-02	6.82E-01	8	uCi/g	Rep8 (08db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Cm243/244	4.03E-02	6.51E-01	5	uCi/g	Rep5 (18 db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Cm243/244	4.20E-02	6.88E-01	9	uCi/g	Rep9 (09db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Cm243/244	4.53E-02	7.41E-01	6	uCi/g	Rep6 (06db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Cm243/244	4.28E-02	7.02E-01	7	uCi/g	Rep7 (07db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Cm243/244	4.52E-02	7.38E-01	4	uCi/g	Rep4 (04db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Cm243/244	4.10E-02	6.71E-01	3	uCi/g	Rep3 (03db)			
01-2498	11/26/2001		01-09	11/24/2001	B75WM01-09	CFMT	WM (ACT #11)	075	Cm243/244	4.28E-02	7.01E-01	1	uCi/g	Rep1 (01db)			
01-1392	7/11/2001		75WH-1-17	7/11/2001	B75WH	CFMT	WH	75	Co-60	3.02E-03	5.59E-03	8	uCi/g	Rep8			
01-1392	7/11/2001		75WH-1-17	7/11/2001	B75WH	CFMT	WH	75	Co-60		<3.95E-3	6	uCi/g	Rep6			
01-1392	7/11/2001		75WH-1-17	7/11/2001	B75WH	CFMT	WH	75	Co-60		<6.27E-3	1	uCi/g	Rep1			
01-1392	7/11/2001		75WH-1-17	7/11/2001	B75WH	CFMT	WH	75	Co-60	1.74E-03	4.23E-03	9	uCi/g	Rep9			
01-1392	7/11/2001		75WH-1-17	7/11/2001	B75WH	CFMT	WH	75	Co-60	2.32E-03	5.82E-03	7	uCi/g	Rep7			
01-1392	7/11/2001		75WH-1-17	7/11/2001	B75WH	CFMT	WH	75	Co-60	1.02E-02	1.78E-02	2	uCi/g	Rep2			
01-1392	7/11/2001		75WH-1-17	7/11/2001	B75WH	CFMT	WH	75	Co-60		<5.79E-3	5	uCi/g	Rep5			
01-1392	7/11/2001		75WH-1-17	7/11/2001	B75WH	CFMT	WH	75	Co-60	5.97E-03	9.66E-03	4	uCi/g	Rep4			
01-1392	7/11/2001		75WH-1-17	7/11/2001	B75WH	CFMT	WH	75	Co-60	7.08E-03	9.71E-03	3	uCi/g	Rep3			
01-1440	7/17/2001		21-23	7/17/2001	75WH-21-75WH-23	CFMT	WH	75	Co-60	5.22E-03	1.22E-02	3	uCi/g	Rep3 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	75WH-21-75WH-23	CFMT	WH	75	Co-60		<1.10E-2	2	uCi/g	Rep2 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	75WH-21-75WH-23	CFMT	WH	75	Co-60	7.07E-03	2.01E-02	1	uCi/g	Rep1 (B75)			
01-1501	7/24/2001		24-29	7/23/2001	B75WH-24-B75WH-26	CFMT	WH	75	Co-60	2.40E-02	2.99E-02	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH-24-B75WH-26	CFMT	WH	75	Co-60		<1.43E-2	3	uCi/g	Rep3			
01-1501	7/24/2001		24-29	7/23/2001	B75WH-24-B75WH-26	CFMT	WH	75	Co-60		<1.19E-2	2	uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH-32-75WH-34	CFMT	WH	75	Co-60		<1.44E-2	1	uCi/g	Rep1			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH-32-75WH-34	CFMT	WH	75	Co-60		<1.55E-2	2	uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH-32-75WH-34	CFMT	WH	75	Co-60		<1.33E-2	3	uCi/g	Rep3			
01-1621	8/7/2001		38-40	8/7/2001	75WH-38-75WH-40	CFMT	WH	075	Co-60		<3.28E-2	3	uCi/g	Rep3 (40)			
01-1621	8/7/2001		38-40	8/7/2001	75WH-38-75WH-40	CFMT	WH	075	Co-60	1.87E-02	4.10E-02	1	uCi/g	Rep1 (38)			
01-1621	8/7/2001		38-40	8/7/2001	75WH-38-75WH-40	CFMT	WH	075	Co-60		<1.90E-2	2	uCi/g	Rep2 (39)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Co-60		<3.51E-2	2	uCi/g	Rep2			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Co-60		<2.80E-2	1	uCi/g	Rep1			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Co-60		<2.75E-2	3	uCi/g	Rep3			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH-46,47,48,52,53	CFMT	WH	75	Co-60		<3.34E-2	2	uCi/g	Rep2			

PRIM_SAM KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPOIN T	SAMTYPE	VITBATCH	RES_TYP1	UNCERTAINTY ALUE	RESULT VALUE	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) VM	Scaling factors
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VMH46,47,48,52,53	CFMT	WH	75	Co-60		<2.94E-2	1	uCi/g	Rep1			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VMH46,47,48,52,53	CFMT	WH	75	Co-60	1.39E-02	3.42E-02	3	uCi/g	Rep3			
01-1778	8/27/2001		62-64	8/25/2001	75VMH62-64	CFMT	WH	75	Co-60	8.22E-02	1.03E-01	3	uCi/g	Rep3 (64DB)			
01-1778	8/27/2001		62-64	8/25/2001	75VMH62-64	CFMT	WH	75	Co-60	4.10E-02	1.00E-01	2	uCi/g	Rep2 (63DB)			
01-1778	8/27/2001		62-64	8/25/2001	75VMH62-64	CFMT	WH	75	Co-60		<3.14E-2	1	uCi/g	Rep1 (62DB)			
01-1918	9/16/2001		03	9/15/2001	B75VMH	CFMT	WH	75	Co-60		<6.39E-2	3	uCi/g	Rep3 (B75)			
01-1918	9/16/2001		03	9/15/2001	B75VMH	CFMT	WH	75	Co-60	8.81E-02	9.87E-02	2	uCi/g	Rep2 (B75)			
01-1918	9/16/2001		03	9/15/2001	B75VMH	CFMT	WH	75	Co-60		<5.01E-2	1	uCi/g	Rep1 (B75)			
01-2026	9/26/2001		108-112	9/25/2001	B75VMH108-112	CFMT	WH	75	Co-60	4.37E-02	7.48E-02	1	uCi/g	Rep1			
01-2026	9/26/2001		108-112	9/25/2001	B75VMH108-112	CFMT	WH	75	Co-60	4.42E-02	8.65E-02	3	uCi/g	Rep3			
01-2026	9/26/2001		108-112	9/25/2001	B75VMH108-112	CFMT	WH	75	Co-60	1.25E-01	1.59E-01	4	uCi/g	Rep4			
01-2026	9/26/2001		108-112	9/25/2001	B75VMH108-112	CFMT	WH	75	Co-60		<5.06E-2	2	uCi/g	Rep2			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Co-60	9.23E-02	2.81E-01	9	uCi/g	Rep9			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Co-60	2.05E-01	3.53E-01	7	uCi/g	Rep7			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Co-60		<2.04E-1	1	uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Co-60	9.86E-02	2.89E-01	5	uCi/g	Rep5			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Co-60	1.03E-01	2.07E-01	3	uCi/g	Rep3			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Co-60	1.61E-01	2.52E-01	4	uCi/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Co-60		<1.69E-1	6	uCi/g	Rep6			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Co-60	3.21E-01	3.93E-01	2	uCi/g	Rep2			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Co-60		<2.50E-1	8	uCi/g	Rep8			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	Cs-137	7.74E+00	3.17E+02	2	uCi/g	Rep2			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	Cs-137	7.52E+00	2.88E+02	6	uCi/g	Rep6			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	Cs-137	8.54E+00	3.28E+02	3	uCi/g	Rep3			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	Cs-137	7.63E+00	3.13E+02	8	uCi/g	Rep8			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	Cs-137	6.84E+00	2.89E+02	7	uCi/g	Rep7			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	Cs-137	7.47E+00	3.15E+02	1	uCi/g	Rep1			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	Cs-137	7.85E+00	3.22E+02	5	uCi/g	Rep5			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	Cs-137	7.87E+00	3.32E+02	4	uCi/g	Rep4			
01-1392	7/11/2001		75VMH1-17	7/11/2001	B75VMH	CFMT	WH	75	Cs-137	6.60E+00	2.53E+02	9	uCi/g	Rep9			
01-1440	7/17/2001		21-23	7/17/2001	75VMH21-75VMH23	CFMT	WH	75	Cs-137	2.15E+01	7.98E+02	2	uCi/g	Rep2 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	75VMH21-75VMH23	CFMT	WH	75	Cs-137	1.58E+01	5.93E+02	3	uCi/g	Rep3 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	75VMH21-75VMH23	CFMT	WH	75	Cs-137	1.68E+01	6.36E+02	1	uCi/g	Rep1 (B75)			
01-1501	7/24/2001		24-29	7/23/2001	B75VMH24-B75VMH26	CFMT	WH	75	Cs-137	3.00E+01	1.14E+03	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75VMH24-B75VMH26	CFMT	WH	75	Cs-137	2.80E+01	1.05E+03	3	uCi/g	Rep3			
01-1501	7/24/2001		24-29	7/23/2001	B75VMH24-B75VMH26	CFMT	WH	75	Cs-137	3.03E+01	1.13E+03	2	uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75VMH32-75VMH34	CFMT	WH	75	Cs-137	3.86E+01	1.43E+03	2	uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75VMH32-75VMH34	CFMT	WH	75	Cs-137	3.96E+01	1.50E+03	1	uCi/g	Rep1			
01-1557	7/30/2001		32,33,34	7/30/2001	75VMH32-75VMH34	CFMT	WH	75	Cs-137	3.48E+01	1.30E+03	3	uCi/g	Rep3			
01-1621	8/7/2001		38-40	8/7/2001	75VMH38-75VMH40	CFMT	WH	075	Cs-137	4.40E+01	1.85E+03	3	uCi/g	Rep3 (40)			
01-1621	8/7/2001		38-40	8/7/2001	75VMH38-75VMH40	CFMT	WH	075	Cs-137	4.49E+01	1.72E+03	2	uCi/g	Rep2 (39)			
01-1621	8/7/2001		38-40	8/7/2001	75VMH38-75VMH40	CFMT	WH	075	Cs-137	4.41E+01	1.81E+03	1	uCi/g	Rep1 (38)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75VMH # 43 - 45	CFMT	WH	75	Cs-137	5.41E+01	2.22E+03	2	uCi/g	Rep2			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75VMH # 43 - 45	CFMT	WH	75	Cs-137	5.24E+01	2.15E+03	3	uCi/g	Rep3			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75VMH # 43 - 45	CFMT	WH	75	Cs-137	5.95E+01	2.28E+03	1	uCi/g	Rep1			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VMH46,47,48,52,53	CFMT	WH	75	Cs-137	6.29E+01	2.62E+03	6	uCi/g	Rep6			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VMH46,47,48,52,53	CFMT	WH	75	Cs-137	6.40E+01	2.66E+03	4	uCi/g	Rep4			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VMH46,47,48,52,53	CFMT	WH	75	Cs-137	6.29E+01	2.66E+03	1	uCi/g	Rep1			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VMH46,47,48,52,53	CFMT	WH	75	Cs-137	6.87E+01	2.64E+03	3	uCi/g	Rep3			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VMH46,47,48,52,53	CFMT	WH	75	Cs-137	6.84E+01	2.61E+03	5	uCi/g	Rep5			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75VMH46,47,48,52,53	CFMT	WH	75	Cs-137	6.48E+01	2.66E+03	2	uCi/g	Rep2			
01-1778	8/27/2001		62-64	8/25/2001	75VMH62-64	CFMT	WH	75	Cs-137	7.48E+01	3.07E+03	3	uCi/g	Rep3 (64DB)			
01-1778	8/27/2001		62-64	8/25/2001	75VMH62-64	CFMT	WH	75	Cs-137	8.13E+01	3.12E+03	1	uCi/g	Rep1 (62DB)			
01-1778	8/27/2001		62-64	8/25/2001	75VMH62-64	CFMT	WH	75	Cs-137	7.53E+01	3.18E+03	2	uCi/g	Rep2 (63DB)			
01-1892	9/10/2001		80-84	9/4/2001	75VMH80-75VMH84	CFMT	WH	75	Cs-137	9.21E+01	3.78E+03	2	uCi/g	Rep2			
01-1892	9/10/2001		80-84	9/4/2001	75VMH80-75VMH84	CFMT	WH	75	Cs-137	1.05E+02	4.02E+03	3	uCi/g	Rep3			
01-1892	9/10/2001		80-84	9/4/2001	75VMH80-75VMH84	CFMT	WH	75	Cs-137	8.88E+01	3.75E+03	1	uCi/g	Rep1			
01-1918	9/16/2001		03	9/15/2001	B75VMH	CFMT	WH	75	Cs-137	1.13E+02	4.52E+03	1	uCi/g	Rep1 (B75)			
01-1918	9/16/2001		03	9/15/2001	B75VMH	CFMT	WH	75	Cs-137	1.03E+02	4.30E+03	2	uCi/g	Rep2 (B75)			
01-1918	9/16/2001		03	9/15/2001	B75VMH	CFMT	WH	75	Cs-137	1.01E+02	4.11E+03	3	uCi/g	Rep3 (B75)			
01-2026	9/26/2001		108-112	9/25/2001	B75VMH108-112	CFMT	WH	75	Cs-137	1.25E+02	5.08E+03	3	uCi/g	Rep3			
01-2026	9/26/2001		108-112	9/25/2001	B75VMH108-112	CFMT	WH	75	Cs-137	1.16E+02	4.89E+03	1	uCi/g	Rep1			
01-2026	9/26/2001		108-112	9/25/2001	B75VMH108-112	CFMT	WH	75	Cs-137	1.17E+02	4.91E+03	2	uCi/g	Rep2			

PRIM_SAM_ KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPOIN T	SAMTYPE	VITBATCH	RES_TYP1	UNCERTAINTY ALUE	RESULT_ VALUE	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) W	Scaling factors
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Cs-137	1.13E+02	4.72E+03		4 uCi/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cs-137	2.88E+02	1.11E+04		5 uCi/g	Rep5			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cs-137	3.14E+02	1.17E+04		6 uCi/g	Rep6			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cs-137	3.08E+02	1.14E+04		3 uCi/g	Rep3			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cs-137	3.36E+02	1.22E+04		9 uCi/g	Rep9			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cs-137	3.18E+02	1.18E+04		4 uCi/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cs-137	3.20E+02	1.19E+04		7 uCi/g	Rep7			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cs-137	2.87E+02	1.10E+04		1 uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cs-137	3.03E+02	1.20E+04		8 uCi/g	Rep8			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Cs-137	3.16E+02	1.17E+04		2 uCi/g	Rep2			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Density		1.02 (29.9)		1 g/mL	Rep1 (B74)			
01-2499	11/26/2001		10 - 13	11/24/2001	B75WH10 - 13	CFMT	WM (ACT #11)	075	Density		1.32 (25.8)		1 g/mL	Rep1			
01-2574	12/6/2001		10 thru 13	12/6/2001	B75 WGF 10-13	CFMT	WGF (ACT #18)	075	Density		1.40 (30.9)		1 g/mL	Rep1			
01-2624	12/11/2001		10 THRU 1	12/11/2001	B75SF10 - B75SF13	CFMT	SF (ACT #25C)	75	Density		1.44 (31.2)		1 g/mL	Rep1			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-154	3.05E-02	1.01E-01		4 uCi/g	Rep4			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-154	1.35E-02	6.50E-02		9 uCi/g	Rep9			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-154	1.81E-02	6.82E-02		7 uCi/g	Rep7			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-154	2.79E-02	8.81E-02		5 uCi/g	Rep5			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-154	2.60E-02	8.84E-02		6 uCi/g	Rep6			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-154	2.72E-02	8.54E-02		1 uCi/g	Rep1			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-154	2.50E-02	9.10E-02		2 uCi/g	Rep2			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-154	1.59E-02	7.44E-02		8 uCi/g	Rep8			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-154	2.50E-02	1.06E-01		3 uCi/g	Rep3			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Eu-154	4.12E-02	1.74E-01		3 uCi/g	Rep3 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Eu-154	5.32E-02	2.18E-01		2 uCi/g	Rep2 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Eu-154	5.19E-02	2.05E-01		1 uCi/g	Rep1 (B75)			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Eu-154	5.94E-02	2.39E-01		3 uCi/g	Rep3			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Eu-154	8.41E-02	2.68E-01		1 uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Eu-154	1.43E-01	2.46E-01		2 uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Eu-154	5.11E-02	2.69E-01		1 uCi/g	Rep1			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Eu-154	7.66E-02	2.55E-01		2 uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Eu-154	4.91E-02	2.80E-01		3 uCi/g	Rep3			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Eu-154	1.46E-01	5.44E-01		3 uCi/g	Rep3 (40)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Eu-154	1.40E-01	4.48E-01		1 uCi/g	Rep1 (38)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Eu-154	1.14E-01	4.70E-01		2 uCi/g	Rep2 (39)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Eu-154	1.86E-01	7.23E-01		3 uCi/g	Rep3			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Eu-154	1.52E-01	6.62E-01		2 uCi/g	Rep2			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Eu-154	1.50E-01	6.83E-01		1 uCi/g	Rep1			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Eu-154	1.45E-01	6.77E-01		1 uCi/g	Rep1			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Eu-154	1.04E-01	5.83E-01		3 uCi/g	Rep3			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Eu-154	1.27E-01	5.93E-01		2 uCi/g	Rep2			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Eu-154		<5.39E-1		2 uCi/g	Rep2 (63DB)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Eu-154	3.05E-01	1.15E+00		3 uCi/g	Rep3 (64DB)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Eu-154	2.06E-01	6.39E-01		1 uCi/g	Rep1 (62DB)			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Eu-154	3.33E-01	1.11E+00		3 uCi/g	Rep3 (B75)			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Eu-154		<9.13E-1		1 uCi/g	Rep1 (B75)			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Eu-154		<8.13E-1		2 uCi/g	Rep2 (B75)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Eu-154	3.33E-01	1.08E+00		2 uCi/g	Rep2			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Eu-154	3.44E-01	1.43E+00		3 uCi/g	Rep3			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Eu-154	4.09E-01	1.53E+00		4 uCi/g	Rep4			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Eu-154	3.17E-01	1.06E+00		1 uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Eu-154	8.40E-01	2.80E+00		3 uCi/g	Rep3			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Eu-154	1.19E+00	4.15E+00		8 uCi/g	Rep8			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Eu-154	1.07E+00	3.62E+00		2 uCi/g	Rep2			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Eu-154	5.63E-01	1.74E+00		4 uCi/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Eu-154	8.07E-01	2.69E+00		7 uCi/g	Rep7			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Eu-154		<2.57E+0		1 uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Eu-154		<8.76E-1		9 uCi/g	Rep9			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Eu-154	7.04E-01	2.88E+00		5 uCi/g	Rep5			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WM (ACT #11)	075	Eu-154	9.45E-01	2.78E+00		6 uCi/g	Rep6			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-155		<3.25E-2		9 uCi/g	Rep9			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-155		<7.29E-2		5 uCi/g	Rep5			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-155		<4.77E-2		7 uCi/g	Rep7			

PRIM_SAM_KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPPOINT	SAMTYPE	MTBATCH	RES_TYP1	UNCERTAINTY	RESULT_VALUE	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) VM	Scaling factors
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-155		<4.34E-2	8	uCi/g	Rep8			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-155		<6.59E-2	6	uCi/g	Rep6			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-155		<7.27E-2	3	uCi/g	Rep3			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-155		<5.42E-2	2	uCi/g	Rep2			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-155		<6.37E-2	1	uCi/g	Rep1			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Eu-155		<8.75E-2	4	uCi/g	Rep4			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Eu-155		<1.29E-1	2	uCi/g	Rep2 (B75			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Eu-155		<1.29E-1	1	uCi/g	Rep1 (B75			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Eu-155		<1.09E-1	3	uCi/g	Rep3 (B75			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Eu-155		<8.89E-2	3	uCi/g	Rep3			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Eu-155		<1.70E-1	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Eu-155		<1.08E-1	2	uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Eu-155		<1.06E-1	3	uCi/g	Rep3			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Eu-155		<1.12E-1	2	uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Eu-155		<6.33E-2	1	uCi/g	Rep1			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Eu-155		<4.18E-1	3	uCi/g	Rep3 (40			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Eu-155		<2.49E-1	2	uCi/g	Rep2 (39			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Eu-155		<2.14E-1	1	uCi/g	Rep1 (38			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Eu-155		<6.73E-1	3	uCi/g	Rep3			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Eu-155		<3.23E-1	1	uCi/g	Rep1			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Eu-155		<4.23E-1	2	uCi/g	Rep2			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Eu-155		<2.94E-1	3	uCi/g	Rep3			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Eu-155		<4.17E-1	1	uCi/g	Rep1			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Eu-155		<3.13E-1	2	uCi/g	Rep2			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Eu-155		<5.94E-1	1	uCi/g	Rep1 (62DB			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Eu-155		<6.42E-1	3	uCi/g	Rep3 (64DB			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Eu-155		<9.28E-1	2	uCi/g	Rep2 (63DB			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Eu-155		<7.74E-1	3	uCi/g	Rep3 (B75			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Eu-155		<1.30E+0	2	uCi/g	Rep2 (B75			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Eu-155		<1.10E+0	1	uCi/g	Rep1 (B75			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Eu-155		<1.35E+0	4	uCi/g	Rep4			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Eu-155		<7.14E-1	1	uCi/g	Rep1			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Eu-155		<8.66E-1	3	uCi/g	Rep3			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Eu-155		<6.08E-1	2	uCi/g	Rep2			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossAlpha	1.96E-01	2.31E-01	3	uCi/g	Rep3			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossAlpha	1.77E-01	2.25E-01	2	uCi/g	Rep2			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossAlpha	2.25E-01	3.25E-01	6	uCi/g	Rep6			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossAlpha	1.36E-01	1.86E-01	1	uCi/g	Rep1			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossAlpha	7.31E-02	1.83E-01	10	uCi/g	Rep10			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossAlpha	5.82E-02	1.31E-01	12	uCi/g	Rep12			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossAlpha	6.45E-02	1.49E-01	13	uCi/g	Rep13			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossAlpha	7.14E-02	2.03E-01	11	uCi/g	Rep11			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossAlpha	1.90E-01	2.24E-01	5	uCi/g	Rep5			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	GrossAlpha	1.14E-01	4.63E-01	2	uCi/g	Rep2			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	GrossAlpha	1.07E-01	4.35E-01	3	uCi/g	Rep3			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	GrossAlpha	1.07E-01	4.42E-01	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	GrossAlpha	1.35E-01	6.39E-01	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	GrossAlpha	1.43E-01	7.20E-01	2	uCi/g	Rep2			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	GrossAlpha	1.18E-01	4.74E-01	3	uCi/g	Rep3			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	GrossAlpha	3.69E-01	8.81E-01	2	uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	GrossAlpha	3.66E-01	8.73E-01	3	uCi/g	Rep3			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	GrossAlpha	3.14E-01	6.80E-01	1	uCi/g	Rep1			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	GrossAlpha		Not Measu	4	uCi/g	Rep4: U2			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	GrossAlpha	2.86E-01	6.49E-01	2	uCi/g	Rep2 (39			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	GrossAlpha	3.34E-01	9.98E-01	3	uCi/g	Rep3			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	GrossAlpha	3.95E-01	1.26E+00	1	uCi/g	Rep1 (38			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	GrossAlpha	4.56E-01	1.49E+00	1	uCi/g	Rep1			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	GrossAlpha	4.51E-01	1.23E+00	3	uCi/g	Rep3			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	GrossAlpha	4.55E-01	1.40E+00	2	uCi/g	Rep2			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	GrossAlpha	7.63E-01	2.01E+00	3	uCi/g	Rep3 (B 75			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	GrossAlpha	6.04E-01	1.16E+00	2	uCi/g	Rep2 (B 75			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	GrossAlpha	5.43E-01	7.98E-01	1	uCi/g	Rep1 (B 75			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	GrossAlpha		<2.65E+0	4	uCi/g	Rep4 (B75			

PRIM_SAM_KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPPOINT	SAMTYPE	VITBATCH	RES_TYP1	UNCERTAINTYV	RESULT_VALUE	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) W	Scaling factors
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	GrossAlpha		<2.63E+0	5	uCi/g	Rep5 (B75			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	GrossAlpha		<3.06E+0	6	uCi/g	Rep6 (B75			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	GrossAlpha	1.94E+00	2.96E+00	3	uCi/g	Rep3 (#82			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	GrossAlpha	1.78E+00	3.39E+00	1	uCi/g	Rep1 (#80			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	GrossAlpha	1.57E+00	2.52E+00	2	uCi/g	Rep2 (#81			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossBeta	7.13E+00	3.83E+02	1	uCi/g	Rep1			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossBeta	8.25E+00	4.20E+02	5	uCi/g	Rep5			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossBeta	6.69E+00	4.06E+02	10	uCi/g	Rep10			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossBeta	6.62E+00	4.05E+02	12	uCi/g	Rep12			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossBeta	5.77E+00	3.49E+02	11	uCi/g	Rep11			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossBeta	9.47E+00	4.93E+02	3	uCi/g	Rep3			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossBeta	8.15E+00	4.08E+02	6	uCi/g	Rep6			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossBeta	8.02E+00	4.15E+02	2	uCi/g	Rep2			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	GrossBeta	5.68E+00	3.42E+02	13	uCi/g	Rep13			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	GrossBeta	1.24E+01	7.78E+02	3	uCi/g	Rep3			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	GrossBeta	1.54E+01	9.71E+02	2	uCi/g	Rep2			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	GrossBeta	1.23E+01	7.74E+02	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	GrossBeta	2.13E+01	1.36E+03	3	uCi/g	Rep3			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	GrossBeta	2.30E+01	1.47E+03	2	uCi/g	Rep2			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	GrossBeta	2.16E+01	1.37E+03	1	uCi/g	Rep1			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	GrossBeta	3.05E+01	1.84E+03	2	uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	GrossBeta	3.01E+01	1.82E+03	1	uCi/g	Rep1			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	GrossBeta	2.78E+01	1.66E+03	3	uCi/g	Rep3			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	GrossBeta		Not Measu	4	uCi/g	Rep4: U2			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	GrossBeta	3.57E+01	2.18E+03	2	uCi/g	Rep2 (39			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	GrossBeta	3.66E+01	2.24E+03	1	uCi/g	Rep1 (38			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	GrossBeta	3.90E+01	2.39E+03	3	uCi/g	Rep3			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	GrossBeta	4.75E+01	2.93E+03	2	uCi/g	Rep2			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	GrossBeta	4.71E+01	2.91E+03	1	uCi/g	Rep1			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	GrossBeta	4.65E+01	2.84E+03	3	uCi/g	Rep3			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	GrossBeta	5.67E+01	3.36E+03	2	uCi/g	Rep2 (B 75			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	GrossBeta	5.89E+01	3.48E+03	1	uCi/g	Rep1 (B 75			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	GrossBeta	5.72E+01	3.41E+03	3	uCi/g	Rep3 (B 75			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	GrossBeta	8.59E+01	4.19E+03	6	uCi/g	Rep6 (B75			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	GrossBeta	7.72E+01	3.81E+03	4	uCi/g	Rep4 (B75			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	GrossBeta	8.45E+01	4.28E+03	5	uCi/g	Rep5 (B75			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	GrossBeta	1.03E+02	5.29E+03	3	uCi/g	Rep3 (#82			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	GrossBeta	9.16E+01	4.92E+03	1	uCi/g	Rep1 (#80			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	GrossBeta	8.97E+01	4.76E+03	2	uCi/g	Rep2 (#81			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Na		Not Measu	8	ug/g	Rep8			
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Np237	3.49E-04	4.20E-03	4	uCi/g	Rep4 (B75			
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Np237	2.33E-04	2.47E-03	2	uCi/g	Rep2 (B75			
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Np237	2.60E-04	3.11E-03	3	uCi/g	Rep3 (B75			
01-2326	11/2/2001		108-112	9/25/2001	B75WH108,109,111 & 112	CFMT	WH	75WH	Np237	2.57E-04	2.69E-03	1	uCi/g	Rep1 (B75			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WI (ACT #11)	075	Np237	5.86E-04	7.38E-03	1	uCi/g	Rep1 (01db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WI (ACT #11)	075	Np237	5.11E-04	6.54E-03	4	uCi/g	Rep4 (04db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WI (ACT #11)	075	Np237	6.22E-04	6.87E-03	2	uCi/g	Rep2 (02db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WI (ACT #11)	075	Np237	7.07E-04	8.78E-03	7	uCi/g	Rep7 (07db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WI (ACT #11)	075	Np237	6.77E-04	7.95E-03	6	uCi/g	Rep6 (06db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WI (ACT #11)	075	Np237	5.62E-04	6.95E-03	9	uCi/g	Rep9 (09db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WI (ACT #11)	075	Np237	6.08E-04	6.21E-03	5	uCi/g	Rep5 (18 db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WI (ACT #11)	075	Np237	5.15E-04	6.44E-03	8	uCi/g	Rep8 (08db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WI (ACT #11)	075	Np237	5.79E-04	7.17E-03	3	uCi/g	Rep3 (03db			
01-2500	11/26/2001		14	11/24/2001	B75WM14	CFMT	WI (ACT #11)	075	pH		0.156 (24 °C	1	su	Rep1			
01-2515	11/28/2001		B75PH01.0	11/28/2001	75PH01,75PH02	CFMT	B75 AFTER AC	75	pH		0.121 (27 °C	1	su	Rep1			
01-2575	12/6/2001		14 thru 16	12/6/2001	B75 WGF 14-16	CFMT	WGF (ACT #18)	075	pH		0.144 (27 °C	1	su	Rep1			
01-2575	12/6/2001		14 thru 16	12/6/2001	B75 WGF 14-16	CFMT	WGF (ACT #18)	075	pH		0.145 (27 °C	3	su	Rep3			
01-2575	12/6/2001		14 thru 16	12/6/2001	B75 WGF 14-16	CFMT	WGF (ACT #18)	075	pH		0.145 (27 °C	2	su	Rep2			
01-2622	12/11/2001		04 THRU 0	12/11/2001	B75SF04 - B75SF06	CFMT	SF (ACT #25C)	75	pH		0.141 (27 °C	3	su	Rep3			
01-2622	12/11/2001		04 THRU 0	12/11/2001	B75SF04 - B75SF06	CFMT	SF (ACT #25C)	75	pH		0.142 (27 °C	2	su	Rep2			
01-2622	12/11/2001		04 THRU 0	12/11/2001	B75SF04 - B75SF06	CFMT	SF (ACT #25C)	75	pH		0.141 (27 °C	1	su	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WI (ACT #11)	075	Pu238		<8.77E-5	9	uCi/g	Rep9 (09db			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	WI (ACT #11)	075	Pu238		<8.77E-5	1	uCi/g	Rep1 (01db			

PRIM_SAM_KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPOIN T	SAMTYPE	VITBATCH	RES_TYP1	UNCERTAINTY	RESULT	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) VM	Scaling factors
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu236		<1.04E-4	4	uCi/g	Rep4 (04db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu236		<8.77E-5	2	uCi/g	Rep2 (02db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu236		<8.77E-5	7	uCi/g	Rep7 (07db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu236		<7.74E-5	3	uCi/g	Rep3 (03db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu236		<9.46E-5	6	uCi/g	Rep6 (06db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu236		<8.08E-5	8	uCi/g	Rep8 (08db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu236		<8.08E-5	5	uCi/g	Rep5 (18 db)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-238	1.81E-03	3.08E-02	1	uCi/g	Rep1 (1)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-238	1.67E-03	3.72E-02	8	uCi/g	Rep8 (8DB):			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-238	3.46E-03	6.32E-02	3	uCi/g	Rep3 (3)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-238	1.45E-03	2.94E-02	7	uCi/g	Rep7 (7)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-238	2.51E-03	3.83E-02	6	uCi/g	Rep6 (11)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-238	2.94E-03	3.61E-02	4	uCi/g	Rep4 (4)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-238	1.35E-03	2.60E-02	9	uCi/g	Rep9 (9DB):			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-238	2.32E-03	3.54E-02	5	uCi/g	Rep5 (5)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-238	2.18E-03	3.45E-02	2	uCi/g	Rep2 (2)			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Pu-238	4.89E-03	7.93E-02	3	uCi/g	Rep3			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Pu-238	4.89E-03	7.93E-02	1	uCi/g	Rep1			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Pu-238	5.20E-03	9.13E-02	2	uCi/g	Rep2			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Pu-238	7.22E-03	1.31E-01	2	uCi/g	Rep2			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Pu-238	5.73E-03	1.30E-01	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Pu-238	5.63E-03	1.27E-01	3	uCi/g	Rep3			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Pu-238	5.68E-03	1.43E-01	2	uCi/g	Rep2 (WH-)			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Pu-238	5.87E-03	1.50E-01	1	uCi/g	Rep1 (WH-)			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Pu-238	5.32E-03	1.27E-01	3	uCi/g	Rep3 (WH-)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Pu-238	8.59E-03	2.11E-01	1	uCi/g	Rep1 (38)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Pu-238	7.88E-03	1.95E-01	2	uCi/g	Rep2 (39)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Pu-238	7.79E-03	2.00E-01	3	uCi/g	Rep3 (40)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Pu-238	9.27E-03	2.62E-01	2	uCi/g	Rep2 (44)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Pu-238	9.75E-03	2.64E-01	1	uCi/g	Rep1 (43)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Pu-238	1.11E-02	2.77E-01	3	uCi/g	Rep3			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Pu-238	1.06E-02	3.10E-01	3	uCi/g	Rep3 (01-)			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Pu-238	1.16E-02	3.16E-01	1	uCi/g	Rep1 (01-)			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Pu-238	9.22E-03	2.99E-01	2	uCi/g	Rep2 (01-)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Pu-238	9.59E-03	3.71E-01	2	uCi/g	Rep2 (63)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Pu-238	1.11E-02	3.03E-01	1	uCi/g	Rep1 (62)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Pu-238	1.05E-02	3.93E-01	3	uCi/g	Rep3 (64)			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	Pu-238	1.28E-02	4.21E-01	1	uCi/g	Rep1			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	Pu-238	1.29E-02	4.06E-01	2	uCi/g	Rep2			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	Pu-238	1.61E-02	4.40E-01	3	uCi/g	Rep3			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Pu-238	1.60E-02	4.49E-01	2	uCi/g	Rep2			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Pu-238	1.55E-02	4.57E-01	1	uCi/g	Rep1			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Pu-238	1.53E-02	4.62E-01	3	uCi/g	Rep3			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Pu-238	1.98E-02	4.64E-01	6	uCi/g	Rep6 (#109)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Pu-238	2.30E-02	5.33E-01	7	uCi/g	Rep7 (#111)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Pu-238	2.04E-02	4.70E-01	5	uCi/g	Rep5 (#108)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Pu-238	1.47E-02	4.88E-01	8	uCi/g	Rep8 (#112)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu-238	5.10E-02	1.17E+00	5	uCi/g	Rep5			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu-238	6.00E-02	1.27E+00	7	uCi/g	Rep7			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu-238	6.18E-02	1.28E+00	2	uCi/g	Rep2			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu-238	4.99E-02	1.17E+00	8	uCi/g	Rep8			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu-238	6.11E-02	1.27E+00	9	uCi/g	Rep9			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu-238	6.75E-02	1.51E+00	4	uCi/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu-238	5.81E-02	1.27E+00	1	uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu-238	6.13E-02	1.37E+00	6	uCi/g	Rep6			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Pu-238	5.04E-02	1.12E+00	3	uCi/g	Rep3			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-239+240	1.16E-03	1.50E-02	2	uCi/g	Rep2 (2)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-239+240	7.28E-04	1.14E-02	9	uCi/g	Rep9 (9DB):			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-239+240	1.76E-03	2.62E-02	3	uCi/g	Rep3 (3)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-239+240	9.81E-04	1.38E-02	1	uCi/g	Rep1 (1)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-239+240	7.81E-04	1.29E-02	7	uCi/g	Rep7 (7)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-239+240	8.99E-04	1.63E-02	8	uCi/g	Rep8 (8DB):			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-239+240	1.20E-03	1.46E-02	5	uCi/g	Rep5 (5)			

PRIM_SAM_KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPOIN T	SAMTYPE	VITBATCH	RES_TYP1	UNCERTAINTYV ALUE	RESULT VALUE	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) W	Scaling factors
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-239+240	1.57E-03	1.57E-02	4	uCi/g	Rep4 (4)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Pu-239+240	1.35E-03	1.68E-02	6	uCi/g	Rep6 (11)			
01-1440	7/17/2001		21-23	7/17/2001	75WH121-75WH23	CFMT	WH	75	Pu-239+240	2.61E-03	3.78E-02	2	uCi/g	Rep2			
01-1440	7/17/2001		21-23	7/17/2001	75WH121-75WH23	CFMT	WH	75	Pu-239+240	2.33E-03	3.21E-02	3	uCi/g	Rep3			
01-1440	7/17/2001		21-23	7/17/2001	75WH121-75WH23	CFMT	WH	75	Pu-239+240	2.48E-03	3.33E-02	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Pu-239+240	2.90E-03	5.68E-02	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Pu-239+240	2.81E-03	5.44E-02	3	uCi/g	Rep3			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Pu-239+240	3.78E-03	5.97E-02	2	uCi/g	Rep2			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Pu-239+240	3.12E-03	7.14E-02	1	uCi/g	Rep1 (WH)			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Pu-239+240	2.85E-03	6.10E-02	3	uCi/g	Rep3 (WH)			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Pu-239+240	3.05E-03	6.82E-02	2	uCi/g	Rep2 (WH)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Pu-239+240	4.09E-03	8.98E-02	1	uCi/g	Rep1 (38)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Pu-239+240	4.05E-03	8.90E-02	2	uCi/g	Rep2 (39)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Pu-239+240	3.89E-03	8.99E-02	3	uCi/g	Rep3 (40)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Pu-239+240	5.16E-03	1.15E-01	3	uCi/g	Rep3			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Pu-239+240	4.65E-03	1.14E-01	1	uCi/g	Rep1 (43)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Pu-239+240	4.40E-03	1.12E-01	2	uCi/g	Rep2 (44)			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Pu-239+240	4.15E-03	1.23E-01	2	uCi/g	Rep2 (01-			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Pu-239+240	5.43E-03	1.36E-01	1	uCi/g	Rep1 (01-			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Pu-239+240	4.87E-03	1.32E-01	3	uCi/g	Rep3 (01-			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Pu-239+240	5.87E-03	1.29E-01	1	uCi/g	Rep1 (62)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Pu-239+240	5.46E-03	1.63E-01	3	uCi/g	Rep3 (64)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Pu-239+240	4.99E-03	1.54E-01	2	uCi/g	Rep2 (63)			
01-1892	9/10/2001		80-84	9/4/2001	75WH80- 75WH84	CFMT	WH	75	Pu-239+240	5.81E-03	1.71E-01	2	uCi/g	Rep2			
01-1892	9/10/2001		80-84	9/4/2001	75WH80- 75WH84	CFMT	WH	75	Pu-239+240	7.21E-03	1.84E-01	3	uCi/g	Rep3			
01-1892	9/10/2001		80-84	9/4/2001	75WH80- 75WH84	CFMT	WH	75	Pu-239+240	5.58E-03	1.73E-01	1	uCi/g	Rep1			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Pu-239+240	6.63E-03	1.89E-01	3	uCi/g	Rep3			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Pu-239+240	6.93E-03	1.82E-01	2	uCi/g	Rep2			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Pu-239+240	6.87E-03	1.91E-01	1	uCi/g	Rep1			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Pu-239+240	9.04E-03	1.94E-01	5	uCi/g	Rep5 (#108)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Pu-239+240	9.08E-03	1.99E-01	6	uCi/g	Rep6 (#109)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Pu-239+240	6.53E-03	2.04E-01	8	uCi/g	Rep8 (#112)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Pu-239+240	1.03E-02	2.27E-01	7	uCi/g	Rep7 (#111)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VI (ACT #11)	075	Pu-239+240	5.05E-02	5.36E-01	2	uCi/g	Rep2			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VI (ACT #11)	075	Pu-239+240	2.94E-02	5.10E-01	7	uCi/g	Rep7			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VI (ACT #11)	075	Pu-239+240	3.29E-02	6.42E-01	4	uCi/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VI (ACT #11)	075	Pu-239+240	3.08E-02	5.41E-01	9	uCi/g	Rep9			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VI (ACT #11)	075	Pu-239+240	2.50E-02	5.04E-01	8	uCi/g	Rep8			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VI (ACT #11)	075	Pu-239+240	2.47E-02	4.86E-01	5	uCi/g	Rep5			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VI (ACT #11)	075	Pu-239+240	2.49E-02	4.71E-01	3	uCi/g	Rep3			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VI (ACT #11)	075	Pu-239+240	2.87E-02	5.41E-01	1	uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VI (ACT #11)	075	Pu-239+240	3.04E-02	5.89E-01	6	uCi/g	Rep6			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VI (ACT #11)	075	Pu242	<5.72E-3		8	uCi/g	Rep8 (08db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VI (ACT #11)	075	Pu242	<5.47E-3		3	uCi/g	Rep3 (03db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VI (ACT #11)	075	Pu242	<6.25E-3		2	uCi/g	Rep2 (02db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VI (ACT #11)	075	Pu242	<7.38E-3		4	uCi/g	Rep4 (04db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VI (ACT #11)	075	Pu242	<6.21E-3		9	uCi/g	Rep9 (09db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VI (ACT #11)	075	Pu242	<5.72E-3		5	uCi/g	Rep5 (18 db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VI (ACT #11)	075	Pu242	<6.21E-3		7	uCi/g	Rep7 (07db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VI (ACT #11)	075	Pu242	<6.21E-3		1	uCi/g	Rep1 (01db)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VI (ACT #11)	075	Pu242	<6.69E-3		6	uCi/g	Rep6 (06db)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Sr90	7.19E-01	2.50E+01	3	uCi/g	Rep3 (3DB)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Sr90	5.73E-01	1.87E+01	5	uCi/g	Rep5 (5DB)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Sr90	6.35E-01	2.11E+01	6	uCi/g	Rep6			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Sr90	6.11E-01	2.08E+01	2	uCi/g	Rep2 (2DB)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Sr90	5.11E-01	1.80E+01	1	uCi/g	Rep1 (1DB)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Sr90	6.23E-01	1.93E+01	4	uCi/g	Rep4 (4DB)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Sr90	6.14E-01	2.03E+01	8	uCi/g	Rep8 (8DB)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Sr90	5.31E-01	1.65E+01	7	uCi/g	Rep7 (7DB)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Sr90	5.45E-01	1.63E+01	9	uCi/g	Rep9 (9DB)			
01-1440	7/17/2001		21-23	7/17/2001	75WH121-75WH23	CFMT	WH	75	Sr90	1.23E+00	4.91E+01	1	uCi/g	Rep1 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	75WH121-75WH23	CFMT	WH	75	Sr90	1.49E+00	6.12E+01	2	uCi/g	Rep2 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	75WH121-75WH23	CFMT	WH	75	Sr90	1.20E+00	4.75E+01	3	uCi/g	Rep3 (B75)			

PRIM_SAM_KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPOIN_T	SAMTYPE	VITBATCH	RES_TYP1	UNCERTAINTYV	RESULT_VALUE	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) W	Scaling factors
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Sr90	2.04E+00	8.77E+01		4 uCi/g	Rep4 (B75)			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Sr90	2.12E+00	9.16E+01		5 uCi/g	Rep5 (B75)			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Sr90	1.96E+00	8.42E+01		6 uCi/g	Rep6 (B75)			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Sr90	2.35E+00	1.02E+02		3 uCi/g	Rep3 (B75)			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Sr90	2.47E+00	1.07E+02		2 uCi/g	Rep2 (B75)			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Sr90	2.50E+00	1.09E+02		1 uCi/g	Rep1 (B75)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Sr90	2.99E+00	1.31E+02		1 uCi/g	Rep1 (38)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Sr90	2.86E+00	1.25E+02		2 uCi/g	Rep2 (39)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Sr90	3.22E+00	1.42E+02		3 uCi/g	Rep3 (40)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Sr90	4.07E+00	1.80E+02		1 uCi/g	Rep1 (B75)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Sr90	3.86E+00	1.69E+02		3 uCi/g	Rep3 (B75)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Sr90	3.96E+00	1.75E+02		2 uCi/g	Rep2 (B75)			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Sr90	4.30E+00	1.95E+02		2 uCi/g	Rep2 (47)			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Sr90	4.28E+00	1.95E+02		3 uCi/g	Rep3 (48)			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Sr90	4.29E+00	1.93E+02		1 uCi/g	Rep1 (46)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Sr90	5.31E+00	2.49E+02		5 uCi/g	Rep5 (63)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Sr90	4.00E+00	1.84E+02		4 uCi/g	Rep4 (62)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Sr90	5.58E+00	2.60E+02		6 uCi/g	Rep6 (64)			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	Sr90	5.50E+00	2.57E+02		2 uCi/g	Rep2 (#81)			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	Sr90	5.82E+00	2.72E+02		1 uCi/g	Rep1 (#80)			
01-1892	9/10/2001		80-84	9/4/2001	75WH80-75WH84	CFMT	WH	75	Sr90	6.15E+00	2.87E+02		3 uCi/g	Rep3 (#82)			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Sr90	7.23E+00	3.31E+02		1 uCi/g	Rep1 (85)			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Sr90	6.75E+00	3.09E+02		2 uCi/g	Rep2 (86)			
01-1918	9/16/2001		03	9/15/2001	B75WH	CFMT	WH	75	Sr90	6.74E+00	3.10E+02		3 uCi/g	Rep3 (87)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Sr90	7.26E+00	3.37E+02		4 uCi/g	Rep4 (112)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Sr90	6.75E+00	3.11E+02		2 uCi/g	Rep2 (109)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Sr90	8.17E+00	3.80E+02		3 uCi/g	Rep3 (111)			
01-2026	9/26/2001		108-112	9/25/2001	B75WH108-112	CFMT	WH	75	Sr90	7.09E+00	3.24E+02		1 uCi/g	Rep1 (108)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WH01 - 09	CFMT	WM (ACT #11)	075	Sr90	1.84E+01	9.04E+02		6 uCi/g	Rep6 (6DB)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WH01 - 09	CFMT	WM (ACT #11)	075	Sr90	1.69E+01	8.22E+02		3 uCi/g	Rep3 (3DB)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WH01 - 09	CFMT	WM (ACT #11)	075	Sr90	1.85E+01	8.98E+02		1 uCi/g	Rep1 (1)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WH01 - 09	CFMT	WM (ACT #11)	075	Sr90	1.74E+01	8.55E+02		7 uCi/g	Rep7 (7DB)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WH01 - 09	CFMT	WM (ACT #11)	075	Sr90	1.77E+01	8.70E+02		9 uCi/g	Rep9 (9DB)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WH01 - 09	CFMT	WM (ACT #11)	075	Sr90	1.98E+01	9.65E+02		4 uCi/g	Rep4 (4DB)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WH01 - 09	CFMT	WM (ACT #11)	075	Sr90	1.80E+01	8.69E+02		2 uCi/g	Rep2 (2DB)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WH01 - 09	CFMT	WM (ACT #11)	075	Sr90	1.70E+01	8.33E+02		8 uCi/g	Rep8 (8DB)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WH01 - 09	CFMT	WM (ACT #11)	075	Sr90	1.66E+01	8.11E+02		5 uCi/g	Rep5			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Tc99	1.33E-03	1.03E-02		11 uCi/g	Rep11 (B75)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Tc99	1.29E-03	8.61E-03		6 uCi/g	Rep6 (B75)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Tc99	1.35E-03	7.89E-03		4 uCi/g	Rep4 (B75)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Tc99	1.17E-03	7.32E-03		5 uCi/g	Rep5 (B75)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Tc99	1.29E-03	9.71E-03		10 uCi/g	Rep10 (B75)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Tc99	1.24E-03	8.07E-03		7 uCi/g	Rep7 (B75)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Tc99	1.29E-03	8.53E-03		3 uCi/g	Rep3 (B75)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Tc99	9.48E-04	8.11E-03		1 uCi/g	Rep1 (B75)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	Tc99	1.13E-03	7.77E-03		2 uCi/g	Rep2 (B75)			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Tc99	1.74E-03	1.58E-02		3 uCi/g	Rep3			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Tc99	1.92E-03	1.84E-02		2 uCi/g	Rep2			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	Tc99	1.70E-03	1.54E-02		1 uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Tc99	2.08E-03	2.13E-02		2 uCi/g	Rep2			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Tc99	2.07E-03	2.15E-02		3 uCi/g	Rep3			
01-1501	7/24/2001		24-29	7/23/2001	B75WH24-B75WH26	CFMT	WH	75	Tc99	2.13E-03	2.31E-02		1 uCi/g	Rep1			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Tc99	2.17E-03	2.65E-02		3 uCi/g	Rep3			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Tc99	2.04E-03	2.55E-02		1 uCi/g	Rep1			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	Tc99	2.17E-03	2.61E-02		2 uCi/g	Rep2			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Tc99	2.54E-03	3.54E-02		2 uCi/g	Rep2 (39)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Tc99	2.46E-03	3.39E-02		1 uCi/g	Rep1 (38)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	Tc99	2.54E-03	3.56E-02		3 uCi/g	Rep3 (40)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Tc99	2.65E-03	3.65E-02		1 uCi/g	Rep1			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Tc99	3.07E-03	4.19E-02		3 uCi/g	Rep3			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75WH # 43 - 45	CFMT	WH	75	Tc99	2.95E-03	4.23E-02		2 uCi/g	Rep2			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Tc99	2.84E-03	4.33E-02		1 uCi/g	Rep1			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Tc99	2.69E-03	4.22E-02		2 uCi/g	Rep2			

PRIM_SAM_KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPOIN T	SAMTYPE	MTBATCH	RES_TYP1	UNCERTAINTYV ALUE	RESULT_ VALUE	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) VM	Scaling factors
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	Tc99	2.71E-03	4.42E-02	3	uCi/g	Rep3			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Tc99	2.82E-03	4.76E-02	6	uCi/g	Rep6 (64DB)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Tc99	2.74E-03	5.11E-02	5	uCi/g	Rep5 (63DB)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	Tc99	2.73E-03	5.06E-02	4	uCi/g	Rep4 (62DB)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Tc99	6.86E-03	1.67E-01	4	uCi/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Tc99	5.29E-03	1.34E-01	9	uCi/g	Rep9			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Tc99	6.80E-03	1.65E-01	6	uCi/g	Rep6			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Tc99	6.90E-03	1.70E-01	1	uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Tc99	6.67E-03	1.63E-01	3	uCi/g	Rep3			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Tc99	6.55E-03	1.63E-01	5	uCi/g	Rep5			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Tc99	6.58E-03	1.62E-01	7	uCi/g	Rep7			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Tc99	7.04E-03	1.66E-01	2	uCi/g	Rep2			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	Tc99	5.42E-03	1.39E-01	8	uCi/g	Rep8			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75VMH	CFMT	WH	75	TotAlphaPu	2.23E-03	4.23E-02	7	uCi/g	Rep7 (7)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75VMH	CFMT	WH	75	TotAlphaPu	3.34E-03	4.95E-02	2	uCi/g	Rep2 (2)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75VMH	CFMT	WH	75	TotAlphaPu	2.79E-03	4.46E-02	1	uCi/g	Rep1 (1)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75VMH	CFMT	WH	75	TotAlphaPu	2.57E-03	5.35E-02	8	uCi/g	Rep8 (8DB)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75VMH	CFMT	WH	75	TotAlphaPu	2.08E-03	3.74E-02	9	uCi/g	Rep9 (9DB)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75VMH	CFMT	WH	75	TotAlphaPu	3.85E-03	5.51E-02	6	uCi/g	Rep6 (11)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75VMH	CFMT	WH	75	TotAlphaPu	4.51E-03	5.18E-02	4	uCi/g	Rep4 (4)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75VMH	CFMT	WH	75	TotAlphaPu	3.52E-03	5.00E-02	5	uCi/g	Rep5 (5)			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75VMH	CFMT	WH	75	TotAlphaPu	5.22E-03	8.94E-02	3	uCi/g	Rep3 (3)			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	TotAlphaPu	7.80E-03	1.29E-01	2	uCi/g	Rep2			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	TotAlphaPu	7.02E-03	1.11E-01	3	uCi/g	Rep3			
01-1440	7/17/2001		21-23	7/17/2001	75WH21-75WH23	CFMT	WH	75	TotAlphaPu	7.37E-03	1.13E-01	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	75WH24-B75WH26	CFMT	WH	75	TotAlphaPu	1.10E-02	1.90E-01	2	uCi/g	Rep2			
01-1501	7/24/2001		24-29	7/23/2001	75WH24-B75WH26	CFMT	WH	75	TotAlphaPu	8.64E-03	1.87E-01	1	uCi/g	Rep1			
01-1501	7/24/2001		24-29	7/23/2001	75WH24-B75WH26	CFMT	WH	75	TotAlphaPu	8.44E-03	1.81E-01	3	uCi/g	Rep3			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	TotAlphaPu	8.16E-03	1.88E-01	3	uCi/g	Rep3 (WH)			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	TotAlphaPu	8.73E-03	2.11E-01	2	uCi/g	Rep2 (WH)			
01-1557	7/30/2001		32,33,34	7/30/2001	75WH32-75WH34	CFMT	WH	75	TotAlphaPu	8.99E-03	2.21E-01	1	uCi/g	Rep1 (WH)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	TotAlphaPu	1.17E-02	2.90E-01	3	uCi/g	Rep3 (40)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	TotAlphaPu	1.27E-02	3.01E-01	1	uCi/g	Rep1 (38)			
01-1621	8/7/2001		38-40	8/7/2001	75WH38-75WH40	CFMT	WH	075	TotAlphaPu	1.20E-02	2.84E-01	2	uCi/g	Rep2 (39)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75VMH # 43 - 45	CFMT	WH	75	TotAlphaPu	1.37E-02	3.73E-01	2	uCi/g	Rep2 (44)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75VMH # 43 - 45	CFMT	WH	75	TotAlphaPu	1.44E-02	3.77E-01	1	uCi/g	Rep1 (43)			
01-1656	8/13/2001		43 THRU 4	8/13/2001	B75VMH # 43 - 45	CFMT	WH	75	TotAlphaPu	1.63E-02	3.92E-01	3	uCi/g	Rep3			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	TotAlphaPu	1.34E-02	4.21E-01	2	uCi/g	Rep2 (01-)			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	TotAlphaPu	1.54E-02	4.42E-01	3	uCi/g	Rep3 (01-)			
01-1722	8/21/2001		46-48,52-5	8/20/2001	75WH46,47,48,52,53	CFMT	WH	75	TotAlphaPu	1.70E-02	4.52E-01	1	uCi/g	Rep1 (01-)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	TotAlphaPu	1.46E-02	5.25E-01	2	uCi/g	Rep2 (63)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	TotAlphaPu	1.70E-02	4.32E-01	1	uCi/g	Rep1 (62)			
01-1778	8/27/2001		62-64	8/25/2001	75WH62-64	CFMT	WH	75	TotAlphaPu	1.59E-02	5.56E-01	3	uCi/g	Rep3 (64)			
01-1892	9/10/2001		80-84	9/4/2001	75WH80- 75WH84	CFMT	WH	75	TotAlphaPu	1.87E-02	5.77E-01	2	uCi/g	Rep2			
01-1892	9/10/2001		80-84	9/4/2001	75WH80- 75WH84	CFMT	WH	75	TotAlphaPu	1.84E-02	5.94E-01	1	uCi/g	Rep1			
01-1892	9/10/2001		80-84	9/4/2001	75WH80- 75WH84	CFMT	WH	75	TotAlphaPu	2.33E-02	6.24E-01	3	uCi/g	Rep3			
01-1918	9/16/2001		03	9/15/2001	B75VMH	CFMT	WH	75	TotAlphaPu	2.30E-02	6.30E-01	2	uCi/g	Rep2			
01-1918	9/16/2001		03	9/15/2001	B75VMH	CFMT	WH	75	TotAlphaPu	2.24E-02	6.48E-01	1	uCi/g	Rep1			
01-1918	9/16/2001		03	9/15/2001	B75VMH	CFMT	WH	75	TotAlphaPu	2.19E-02	6.51E-01	3	uCi/g	Rep3			
01-2026	9/26/2001		108-112	9/25/2001	B75VMH108-112	CFMT	WH	75	TotAlphaPu	2.95E-02	6.64E-01	5	uCi/g	Rep5 (#108)			
01-2026	9/26/2001		108-112	9/25/2001	B75VMH108-112	CFMT	WH	75	TotAlphaPu	3.33E-02	7.60E-01	7	uCi/g	Rep7 (#111)			
01-2026	9/26/2001		108-112	9/25/2001	B75VMH108-112	CFMT	WH	75	TotAlphaPu	2.89E-02	6.64E-01	6	uCi/g	Rep6 (#109)			
01-2026	9/26/2001		108-112	9/25/2001	B75VMH108-112	CFMT	WH	75	TotAlphaPu	2.12E-02	6.91E-01	8	uCi/g	Rep8 (#112)			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	TotAlphaPu	9.18E-02	1.96E+00	6	uCi/g	Rep6			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	TotAlphaPu	9.23E-02	1.82E+00	2	uCi/g	Rep2			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	TotAlphaPu	7.57E-02	1.66E+00	5	uCi/g	Rep5			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	TotAlphaPu	1.00E-01	2.16E+00	4	uCi/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	TotAlphaPu	9.19E-02	1.81E+00	9	uCi/g	Rep9			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	TotAlphaPu	7.49E-02	1.68E+00	8	uCi/g	Rep8			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	TotAlphaPu	8.93E-02	1.78E+00	7	uCi/g	Rep7			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	TotAlphaPu	8.68E-02	1.81E+00	1	uCi/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75VM01 - 09	CFMT	VM (ACT #11)	075	TotAlphaPu	7.53E-02	1.59E+00	3	uCi/g	Rep3			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75VMH	CFMT	WH	75	U		<2.28E+2	1	ug/g	Rep1			

PRIM_SAM_KEY	SAM_DATE	COMP_DAT	BOTTLES	COL_DATE	SAMP_IDC	SAMPPOINT	SAMTYPE	VITBATCH	RES_TYP1	UNCERTAINTYV	RESULT_VALUE	REP_NUM	ROAUNITS	ROAFLAGS	NUCLIDE	AVERAGE ACTIVITY (uCi/g) VM	Scaling factors
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	U		<3.16E+2	3	ug/g	Rep3			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	U		<3.13E+2	7	ug/g	Rep7			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	U		<2.66E+2	5	ug/g	Rep5			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	U		<3.30E+2	4	ug/g	Rep4			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	U		<3.34E+2	8	ug/g	Rep8			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	U		<3.16E+2	9	ug/g	Rep9			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	U		<3.13E+2	2	ug/g	Rep2			
01-1392	7/11/2001		75WH1-17	7/11/2001	B75WH	CFMT	WH	75	U		<2.78E+2	6	ug/g	Rep6			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	VM (ACT #11)	075	U		8.32E+02	2	ug/g	Rep2			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	VM (ACT #11)	075	U		8.87E+02	6	ug/g	Rep6			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	VM (ACT #11)	075	U		8.54E+02	4	ug/g	Rep4			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	VM (ACT #11)	075	U		8.21E+02	3	ug/g	Rep3			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	VM (ACT #11)	075	U		8.19E+02	9	ug/g	Rep9			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	VM (ACT #11)	075	U		8.66E+02	7	ug/g	Rep7			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	VM (ACT #11)	075	U		8.40E+02	8	ug/g	Rep8			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	VM (ACT #11)	075	U		8.05E+02	1	ug/g	Rep1			
01-2498	11/26/2001		01 - 09	11/24/2001	B75WM01 - 09	CFMT	VM (ACT #11)	075	U		8.32E+02	5	ug/g	Rep5			
01-2573	12/6/2001	8/26/2002 1 thru 9		12/6/2001	B75 WGF 1-9	CFMT	WGF (ACT #18)	75	U		5.30E+02	2	ug/g	Rep2			
01-2573	12/6/2001	8/26/2002 1 thru 9		12/6/2001	B75 WGF 1-9	CFMT	WGF (ACT #18)	75	U		<5.24E+2	4	ug/g	Rep4			
01-2573	12/6/2001	8/26/2002 1 thru 9		12/6/2001	B75 WGF 1-9	CFMT	WGF (ACT #18)	75	U		<4.55E+2	6	ug/g	Rep6			
01-2573	12/6/2001	8/26/2002 1 thru 9		12/6/2001	B75 WGF 1-9	CFMT	WGF (ACT #18)	75	U		<4.79E+2	8	ug/g	Rep8			
01-2573	12/6/2001	8/26/2002 1 thru 9		12/6/2001	B75 WGF 1-9	CFMT	WGF (ACT #18)	75	U		<4.03E+2	1	ug/g	Rep1			
01-2573	12/6/2001	8/26/2002 1 thru 9		12/6/2001	B75 WGF 1-9	CFMT	WGF (ACT #18)	75	U		<4.03E+2	9	ug/g	Rep9			
01-2573	12/6/2001	8/26/2002 1 thru 9		12/6/2001	B75 WGF 1-9	CFMT	WGF (ACT #18)	75	U		<5.76E+2	5	ug/g	Rep5			
01-2573	12/6/2001	8/26/2002 1 thru 9		12/6/2001	B75 WGF 1-9	CFMT	WGF (ACT #18)	75	U		<4.78E+2	3	ug/g	Rep3			
01-2573	12/6/2001	8/26/2002 1 thru 9		12/6/2001	B75 WGF 1-9	CFMT	WGF (ACT #18)	75	U		<4.42E+2	7	ug/g	Rep7			

APPENDIX 7

RADMAN Waste Stream Report

APPENDIX 7 - RADMAN Waste Stream Report

RADMAN Waste Stream New Waste Stream Data

Report Date : 3/22/2004 during New Waste Stream Revision Date: 03/22/2004

Waste Description :	West Valley Glass	Chemical Form :	Glass
Generating Process :	Vitrification Operations	Activated Metal :	No
State Code :	N/A	Physical Form :	Solid
Solidification Agent :	<none>	Activity Units :	uCi/gm

Nuclide Name	Activity	Nuclide Type	Scaling Factor	Base Nuclide
H-3	1.89E-02	FP	<LLD>	Cs-137
C-14	1.15E-02	AP	4.84E-06	Cs-137
K-40	4.44E-02	NO	1.87E-05	Cs-137
Mn-54	8.12E-02	AP	3.42E-05	Cs-137
Co-60	4.95E-02	AP	2.08E-05	Cs-137
Ni-63	5.50E-01	AP	2.31E-04	Cs-137
Sr-90	1.36E+02	FP	5.73E-02	Cs-137
Zr-95	1.37E+01	FP	5.76E-03	Cs-137
Tc-99	6.00E-03	FP	2.52E-06	Cs-137
I-129	3.06E-03	FP	<LLD>	Cs-137
Cs-137	2.38E+03	FP	1.00E+00	Cs-137
Ce-144	1.40E+00	FP	<LLD>	Cs-137
Eu-154	6.93E-01	AP	2.92E-04	Cs-137
Th-228	2.85E-02	AP	1.20E-05	Cs-137
Th-230	1.98E-04	AP	8.32E-08	Cs-137
Th-232	2.18E-04	NO	9.15E-08	Cs-137
U-232	2.74E-02	AP	1.15E-05	Cs-137
U-233	1.12E-02	AP	4.71E-06	Cs-137
U-234	5.32E-03	NO	2.24E-06	Cs-137
U-235	2.04E-04	NO	8.58E-08	Cs-137
U-236	6.12E-04	AP	2.57E-07	Cs-137
U-238	1.22E-03	NO	5.13E-07	Cs-137
Np-237	3.36E-03	TR	1.41E-06	Cs-137
Pu-238	3.73E-01	TR	1.57E-04	Cs-137
Pu-239	8.58E-02	TR	3.61E-05	Cs-137
Pu-240	6.55E-02	TR	2.76E-05	Cs-137
Pu-241	1.75E+00	TR	7.36E-04	Cs-137

Nuclide Name	Activity	Nuclide Type	Scaling Factor	Base Nuclide
Am-241	1.63E+00	TR	6.84E-04	Cs-137
Am-243	1.90E-02	TR	7.98E-05	Cs-137
Cm-242	1.16E-01	TR	4.88E-05	Cs-137
Cm-243	9.28E-03	TR	3.90E-06	Cs-137
Cm-244	2.42E-01	TR	1.02E-04	Cs-137

APPENDIX 8

Plugged Discharge Port (Spout) Activity and Decay Correction Calculations (RADCALC)

APPENDIX 8 - Clogged Spout Activity Calculations

Total Mass (g)		99000				
	uCi/g	uCi	Ci			
Sr-90	870	86130000	86.13			
Cs-137	11644	1152756000	1152.756			
Scaling						
Isotope	Act (Ci)	Scaling Factor		Scaling Factors from Heel	Scaling Factors from Analytical	Diff. in Scaling Factors
C-14	2.22E-03	1.93E-06		4.83E-06		
K-40	8.60E-03	7.46E-06		1.87E-05		
Mn-54	1.57E-02	1.36E-05		3.41E-05		
Co-60	2.93E-02	2.54E-05		2.12E-05	2.54E-05	8.35E-01
Ni-63	1.07E-01	9.25E-05		2.32E-04		
Sr-90	8.61E+01	Analytical		Analytical		
Zr-95	2.65E+00	2.30E-03		5.76E-03		
Tc-99	1.57E-02	1.36E-05		2.81E-06	1.36E-05	2.07E-01
Cs-137	1.15E+03	1.00E+00		1.00E+00	1.00E+00	
Eu-154	2.92E-01	2.53E-04		2.99E-04	2.53E-04	1.18E+00
Th-228	5.56E-03	4.82E-06		1.21E-05		
Th-230	3.88E-05	3.37E-08		8.45E-08		
Th-232	4.34E-05	3.76E-08		9.44E-08		
U-232	5.29E-03	4.59E-06		1.15E-05		
U-233	2.16E-03	1.87E-06		4.69E-06		
U-234	1.03E-03	8.93E-07		2.24E-06		
U-235	3.95E-05	3.43E-08		8.60E-08		
U-236	1.19E-04	1.03E-07		2.58E-07		
U-238	2.41E-04	2.09E-07		5.24E-07		
Np-237	7.07E-04	6.13E-07		1.44E-06	6.13E-07	2.35E+00
Pu-238	1.26E-01	1.09E-04		1.59E-04	1.09E-04	1.46E+00
Pu-239	3.01E-02	2.61E-05		3.66E-05	2.61E-05	1.40E+00
Pu-240	2.29E-02	1.99E-05		2.80E-05	1.99E-05	1.41E+00
Pu-241	3.43E-01	2.97E-04		7.46E-04		
Am-241	3.83E-01	3.32E-04		6.96E-04	3.32E-04	2.10E+00
Am-243	4.55E-03	3.95E-06		8.38E-06	3.95E-06	2.12E+00
Cm-242	4.32E-03	3.75E-06		5.02E-05	3.75E-06	1.34E+01
Cm-243	2.49E-03	2.16E-06		3.99E-06	2.16E-06	1.85E+00
Cm-244	6.65E-02	5.77E-05		1.04E-04	5.77E-05	1.80E+00
				Ave Difference in Scaling Factor		2.51E+00

Appendix 8 - Decay Calc for Clogged Discharge Port

Radcalc 4.1
File Name: Melter Spout_062614.rad

6/26/2014 3:46 PM

This report was generated using an unvalidated installation of Radcalc version 4.1.

Radcalc 4.1: C:\WVDP - Melter\Radcalcs from ANL Computer\Melter Spout_062614.rad

Performed By: Chris Brandjes
Checked By:

===== Input Information =====

Comments:

Melter Spout - Act. based on 99 kg of glass at 2.6 g/cc density (1.35 ft3).

Decayed from 11/26/2001 to 09/02/2014. 11/26/2001 was the last Sample Date.

Initial Source Data:

Isotope	Ci	Gm	TBq
C-14	2.220E-03	4.957E-04	8.214E-05
K-40	8.600E-03	1.216E+03	3.182E-04
Mn-54	1.570E-02	2.024E-06	5.809E-04
Co-60	2.930E-02	2.589E-05	1.084E-03
Ni-63	1.070E-01	1.895E-03	3.959E-03
Sr-90	8.610E+01	6.234E-01	3.186E+00
Zr-95	2.650E+00	1.233E-04	9.805E-02
Tc-99	1.570E-02	9.295E-01	5.809E-04
Cs-137	1.150E+03	1.323E+01	4.255E+01
Eu-154	2.920E-01	1.080E-03	1.080E-02
Th-228	5.560E-03	6.783E-06	2.057E-04
Th-230	3.880E-05	1.882E-03	1.436E-06
Th-232	4.340E-05	3.958E+02	1.606E-06
U-232	5.290E-03	2.397E-04	1.957E-04
U-233	2.160E-03	2.242E-01	7.992E-05
U-234	1.030E-03	1.657E-01	3.811E-05
U-235	3.950E-05	1.828E+01	1.462E-06
U-236	1.190E-04	1.862E+00	4.403E-06
U-238	2.410E-04	7.170E+02	8.917E-06
Np-237	7.070E-04	1.003E+00	2.616E-05
Pu-238	1.260E-01	7.358E-03	4.662E-03
Pu-239	3.010E-02	4.853E-01	1.114E-03
Pu-240	2.290E-02	1.009E-01	8.473E-04
Pu-241	3.430E-01	3.314E-03	1.269E-02
Am-241	3.830E-01	1.118E-01	1.417E-02
Am-243	4.550E-03	2.278E-02	1.684E-04
Cm-242	4.320E-03	1.305E-06	1.598E-04
Cm-243	2.490E-03	5.079E-05	9.213E-05
Cm-244	6.650E-02	8.172E-04	2.461E-03

Total Activity: 1.240E+03 4.589E+01

* Radionuclides with an A1/A2 fraction of less than 0.001 will not be shown in the output.

Container Data:

Container Void Volume:	0	m^3
Container Mass:	1	kg
Mass of solid beryllium, lead, graphite, and hydrogenous material enriched with deuterium:	0	kg
Gross Mass:	100	kg

Waste Data:

Waste Form:	Normal	
Waste State:	Solid	
Waste Volume:	1.35	ft^3
Waste Mass:	99	kg

Radcalc 4.1

6/26/2014 3:46 PM

File Name: Melter Spout_062614.rad

Mass of solid lead:	0	kg
Mass of solid beryllium, graphite, and hydrogenous material enriched with deuterium:	0	kg
Waste Void Volume:	0	m ³

Decay Time Data:

Date to begin source decay:	11/26/2001
Date container sealed:	9/2/2014

===== Radioactive Decay Results =====

Decayed Source:

Isotope	Ci	Gm	TBq
C-14	2.217E-03	4.949E-04	8.201E-05
K-40	8.600E-03	1.216E+03	3.182E-04
Mn-54	4.997E-07	6.443E-11	1.849E-08
Co-60	5.467E-03	4.831E-06	2.023E-04
Ni-63	9.799E-02	1.735E-03	3.626E-03
Sr-90	6.332E+01	4.584E-01	2.343E+00
Y-90	6.333E+01	1.165E-04	2.343E+00
Zr-95	3.172E-22	1.476E-26	1.174E-23
Nb-95	6.994E-22	1.779E-26	2.588E-23
Nb-95m	3.631E-24	9.524E-30	1.344E-25
Tc-99	1.570E-02	9.295E-01	5.809E-04
Cs-137	8.566E+02	9.854E+00	3.169E+01
Ba-137m	8.086E+02	1.503E-06	2.992E+01
Eu-154	1.043E-01	3.857E-04	3.858E-03
Hg-206	7.135E-16	6.370E-24	2.640E-17
Tl-206	5.014E-14	2.308E-22	1.855E-15
Tl-207	1.863E-09	9.781E-18	6.893E-11
Tl-208	1.733E-03	5.852E-12	6.412E-05
Tl-209	5.578E-08	1.364E-16	2.064E-09
Tl-210	4.495E-11	6.527E-20	1.663E-12
Pb-209	2.582E-06	5.602E-13	9.555E-08
Pb-210	3.755E-08	4.888E-10	1.390E-09
Pb-211	1.868E-09	7.567E-17	6.911E-11
Pb-212	4.823E-03	3.471E-09	1.785E-04
Pb-214	2.140E-07	6.528E-15	7.919E-09
Bi-209	5.969E-25	6.629E-09	2.208E-26
Bi-210	3.745E-08	3.018E-13	1.385E-09
Bi-211	1.868E-09	4.548E-18	6.911E-11
Bi-212	4.823E-03	3.292E-10	1.785E-04
Bi-213	2.582E-06	1.334E-13	9.554E-08
Bi-214	2.141E-07	4.848E-15	7.921E-09
Bi-215	1.527E-15	1.292E-23	5.648E-17
Po-210	3.454E-08	7.686E-12	1.278E-09
Po-211	5.099E-12	4.921E-23	1.887E-13
Po-212	3.089E-03	1.730E-20	1.143E-04
Po-213	2.527E-06	2.004E-22	9.349E-08
Po-214	2.140E-07	6.646E-22	7.919E-09
Po-215	1.868E-09	6.337E-23	6.911E-11
Po-216	4.823E-03	1.385E-14	1.784E-04
Po-218	2.141E-07	7.689E-16	7.921E-09
At-215	7.472E-15	1.424E-29	2.765E-16
At-217	2.583E-06	1.605E-18	9.555E-08
At-218	4.067E-11	1.179E-21	1.505E-12
At-219	1.574E-15	1.650E-24	5.823E-17
Rn-217	3.099E-10	3.219E-24	1.147E-11
Rn-218	4.067E-14	2.751E-26	1.505E-15
Rn-219	1.868E-09	1.436E-19	6.911E-11
Rn-220	4.823E-03	5.248E-12	1.784E-04
Rn-222	2.141E-07	1.392E-12	7.921E-09

Radcalc 4.1
File Name: Melter Spout_062614.rad

6/26/2014 3:46 PM

Fr-221	2.583E-06	1.487E-14	9.555E-08
Fr-223	2.623E-11	6.782E-19	9.705E-13
Ra-223	1.868E-09	3.647E-14	6.911E-11
Ra-224	4.823E-03	3.012E-08	1.784E-04
Ra-225	2.591E-06	6.607E-11	9.585E-08
Ra-226	2.143E-07	2.168E-07	7.930E-09
Ra-228	3.409E-05	1.250E-07	1.261E-06
Ac-225	2.583E-06	4.451E-11	9.555E-08
Ac-227	1.901E-09	2.628E-11	7.033E-11
Ac-228	3.409E-05	1.525E-11	1.261E-06
Th-227	1.854E-09	6.035E-14	6.861E-11
Th-228	4.822E-03	5.883E-06	1.784E-04
Th-229	2.602E-06	1.224E-05	9.629E-08
Th-230	3.892E-05	1.888E-03	1.440E-06
Th-231	3.950E-05	7.432E-11	1.462E-06
Th-232	4.340E-05	3.958E+02	1.606E-06
Th-234	2.410E-04	1.041E-08	8.917E-06
Pa-231	1.066E-08	2.258E-07	3.946E-10
Pa-233	7.086E-04	3.414E-08	2.622E-05
Pa-234	3.615E-07	1.830E-13	1.337E-08
Pa-234m	2.410E-04	3.510E-13	8.917E-06
U-232	4.660E-03	2.111E-04	1.724E-04
U-233	2.160E-03	2.242E-01	7.992E-05
U-234	1.034E-03	1.664E-01	3.827E-05
U-235	3.950E-05	1.828E+01	1.462E-06
U-235m	3.007E-02	9.774E-10	1.113E-03
U-236	1.190E-04	1.862E+00	4.403E-06
U-237	4.556E-06	5.583E-11	1.686E-07
U-238	2.410E-04	7.170E+02	8.917E-06
Np-237	7.086E-04	1.005E+00	2.622E-05
Np-239	4.545E-03	1.959E-08	1.681E-04
Pu-238	1.139E-01	6.653E-03	4.215E-03
Pu-239	3.009E-02	4.852E-01	1.113E-03
Pu-240	2.294E-02	1.011E-01	8.488E-04
Pu-241	1.850E-01	1.787E-03	6.844E-03
Am-241	3.804E-01	1.110E-01	1.408E-02
Am-243	4.545E-03	2.276E-02	1.681E-04
Cm-242	1.047E-11	3.164E-15	3.876E-13
Cm-243	1.854E-03	3.781E-05	6.860E-05
Cm-244	4.067E-02	4.998E-04	1.505E-03
Total Activity:	1.793E+03		6.634E+01
w/o Daughters:	9.209E+02		3.408E+01

Decay Heat:
Heat Generated on Start Date: 1.408 W
Heat Generated on Seal Date: 4.551 W

===== Regulatory Requirements Warning =====

Radcalc utilizes numerically based criteria to classify packages against the regulations. Many regulations also include subjective criteria that Radcalc does not consider. The user must check to ensure that all requirements in the regulations are met.

===== DOT Classification Results =====

* DOT classification calculations are made at the end of the user-specified decay time.

Radioactive Determination:
Radioactive: Yes (ACEMs and ALECs > 1.0)
ACEM Limit Fraction: 32470000 ACEMs (Number of ACEMs)
ALEC Limit Fraction: 3.407E+09 ALECs (Number of ALECs)

Radcalc 4.1
File Name: Melter Spout_062614.rad

6/26/2014 3:46 PM

* This package is not exempt from 49 CFR Subchapter C.

Effective A2s for Mixture:	4.133E+11	Bq	
Type Determination:			
Type:	B		(A2s > 1.0)
A2 Limit Fraction:	82.44	A2s	(Number of A2s)
Limited Quantity Determination:			
Limited Quantity:	No		(Solid, activity > 0.001 A2)
Activity:	82.44	A2	
	1793	Ci	
	66.34	TBq	
Fissile:	Yes		
Fissile Excepted:	Yes (c)		
LSA Determination:			
LSA-I:	No		(Fissile excepted, ACEMs > 30 x rad limits)
LSA-II:	No		(A2s/gm > 0.0001)
LSA-III:	Yes		(A2s/gm <= 0.002)
Specific Activity:	0.0008327	A2/gm	
	0.01811	Ci/gm	
HRCQ Determination:			
HRCQ:	No		(A2s <= 3000, Activity <= 1000 TBq)
A2 Limit Fraction:	82.44	A2s	
Activity:	1793	Ci	
	66.34	TBq	
Fissile Determination:			
Fissile:	Yes		(Contains fissile isotopes per 49 CFR 173.403)
Fissile Excepted Determination:			
Fissile Excepted:	Yes (c)		(Fissile <= 180 grams, non-fissile >= 2000 * fissile)
Fissile Mass:	18.99	gm	
Container beryllium, lead, graphite, and hydrogenous material enriched with deuterium:	0	gm	
Container Mass:	1000	gm	
Waste lead:	0	gm	
Waste beryllium, graphite, and hydrogenous material enriched with deuterium:	0	gm	
Waste Mass:	99000	gm	
Solid Non-Fissile Mass:	98980	gm	
Total Uranium Mass:	737.5	gm	
U-233 Mass:	0.2242	gm	
U-235 Mass:	18.28	gm	
Uranium Enrichment:	2.478	%	
Total Plutonium Mass:	0.5947	gm	
Pu-239 Mass:	0.4852	gm	
Pu-241 Mass:	0.001787	gm	
Reportable Quantity Determination:			
Reportable Quantity:	Yes		(RQs >= 1.0)
RQ Limit Fraction:	2366	RQs	(Number of RQs)
Shipping Papers and Labels:			
Isotope	Number of A2s	Fraction of A2s	Cumulative A2s
+ Cs-137	52.82	0.6408	52.82
+ Am-241	14.08	0.1707	66.9
+ Sr-90	7.809	0.09473	74.71
			Cumulative Fraction of A2s
			0.6408
			0.8115
			0.9062

Radcalc 4.1
File Name: Melter Spout_062614.rad

6/26/2014 3:46 PM

+	Pu-238	4.215	0.05113	78.92	0.9574
	Pu-239	1.113	0.01351	80.04	0.9709
	Pu-240	0.8488	0.0103	80.88	0.9812
	Cm-244	0.7525	0.009128	81.64	0.9903
	Th-228	0.1784	0.002164	81.81	0.9925
	U-232	0.1724	0.002092	81.99	0.9945
	Am-243	0.1681	0.00204	82.16	0.9966
	Pu-241	0.1141	0.001384	82.27	0.998

- + Contains 95% of the total A2s and must be included per 49 CFR 173.433.
- * Radionuclides comprising less than 0.1% of the total A2s are not shown in the list.

===== DOE Classification Results =====

- * DOE classification calculations are made at the end of the user-specified decay time.

DOE-STD-1027 Category Determination:

Category:	Cat 3	(Cat3s > 1.0, Cat2s <= 1.0)
Cat 2 Limit Fraction:	0.02564	
Cat 3 Limit Fraction:	19.37	

- * The DOE-STD-1027 category determination is based on dose-related limits.
The user must apply any criticality-related limits separately.

Dose-Equivalent Curies:

ICRP-72 DE-Ci:	0.6396
FGR-11 DE-Ci:	0.8536

TRU Waste Determination:

TRU Waste:	Yes	(TRU activity > 100 nCi/gm)
TRU Activity:	5601	nCi/g

WIPP Quantities:

FGE Value:	12.46
PE-Ci Value:	0.577

===== NRC Classification Results =====

- * NRC classification calculations are made at the end of the user-specified decay time.

NRC Container Category:

Container Category:	III	
LSA-I:	No	
LSA-II:	No	
LSA-III:	Yes	
Total Activity:	1793	Ci
A2 Limit Fraction:	82.44	A2s

APPENDIX 9

Airborne Sample Analysis from Vitrification Cell

APPENDIX 9 - Airborne Sample Analysis

Analysis of Multiple Sample Data Sets (SCAL)

Sample Data Set Scaling Factor Comparison
(Last Column is Scaling Factor for All Data Set Values)

Session Date : 7/1/2014

Page : 1

Waste :	Airborne c ontaminati on	Airborne C ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Average Data Set Scaling Factor
Date :	11/02/1999	11/02/1999	11/02/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	01/21/2000	01/21/2000	
Sample Id :	99-1961	99-1959	99-1960	99-2062	99-2085	99-2060	99-2061	99-2059	99-2085# 10	99-2061# 6	
Units :	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Sample	uCi/Sample	
Nuclide	Sample Scaling Factors										
Co-60	8.92E-05	2.22E-04	**	1.29E-04	8.41E-05	1.01E-04	9.19E-05	4.91E-05	3.66E-04	1.11E-03	1.81E-04
Sr-90	3.09E-01	5.65E-01	5.00E-01	4.63E-01	3.83E-01	4.19E-01	2.52E-01	1.92E-01	4.93E-01	1.66E-01	3.48E-01
Tc-99	3.63E-05	3.04E-06	4.80E-05	5.52E-07	1.95E-05	4.08E-07	3.58E-07	2.24E-07	9.88E-06	1.18E-05	3.42E-06
Cs-137	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00	1.00E+00
Eu-154	2.48E-03	5.10E-03	4.30E-03	3.05E-03	3.10E-03	3.32E-03	1.79E-03	1.46E-03	4.37E-03	1.17E-03	2.73E-03
Pu-238	5.62E-04	1.04E-03	5.70E-04	1.02E-03	7.36E-04	7.34E-04	4.52E-04	3.09E-04	8.99E-04	2.18E-04	5.89E-04
Pu-239	1.46E-04	2.70E-04	1.52E-04	2.71E-04	1.90E-04	1.94E-04	1.11E-04	8.18E-05	2.32E-04	5.60E-05	1.53E-04
Pu-240	1.02E-04	1.88E-04	1.05E-04	1.88E-04	1.32E-04	1.35E-04	7.72E-05	5.66E-05	1.62E-04	3.89E-05	1.06E-04
Am-241	4.97E-03	9.62E-03	6.80E-03	7.49E-03	4.55E-03	6.37E-03	3.82E-03	2.74E-03	5.42E-03	4.62E-03	5.33E-03
H-3	**	**	**	**	**	**	**	**	**	1.34E-06	1.71E-06
C-14	**	**	**	**	**	**	**	**	**	9.77E-05	9.05E-04
Fe-55	**	**	**	**	**	**	**	**	**	3.72E-04	1.45E-03
Ni-59	**	**	**	**	**	**	**	**	**	2.11E-05	**
Ni-63	**	**	**	**	**	**	**	**	**	1.51E-03	9.93E-04
I-129	**	**	**	**	**	**	**	**	**	1.59E-05	5.78E-05
Pm-147	**	**	**	**	**	**	**	**	**	1.06E-02	2.79E-03
U-232	**	**	**	**	**	**	**	**	**	4.11E-05	1.56E-04
U-233	**	**	**	**	**	**	**	**	**	1.13E-06	3.05E-06
U-234	**	**	**	**	**	**	**	**	**	3.96E-07	1.07E-06
U-235	**	**	**	**	**	**	**	**	**	3.08E-08	1.36E-07
U-236	**	**	**	**	**	**	**	**	**	7.17E-08	3.18E-07
U-238	**	**	**	**	**	**	**	**	**	2.55E-07	**

** - Indicates NO Value for Nuclide

Waste :	Airborne c ontaminati on	Airborne C ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Average
Date :	11/02/1999	11/02/1999	11/02/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	01/21/2000	01/21/2000	Data Set
Sample Id :	99-1961	99-1959	99-1960	99-2062	99-2085	99-2060	99-2061	99-2059	99-2085#	10	99-2061#	6
Units :	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Sample	uCi/Sample	Scaling
Nuclide	Sample Scaling Factors											Factor
Np-237	**	**	**	**	**	**	**	**	**	2.40E-06	7.59E-07	2.67E-06
Pu-241	**	**	**	**	**	**	**	**	**	5.48E-03	1.36E-03	5.39E-03
Pu-242	**	**	**	**	**	**	**	**	**	5.17E-06	3.66E-06	8.60E-06
Am-243	**	**	**	**	**	**	**	**	**	2.96E-04	1.69E-04	4.41E-04
Cm-242	**	**	**	**	**	**	**	**	**	5.32E-05	5.71E-05	1.09E-04
Cm-244	**	**	**	**	**	**	**	**	**	1.06E-03	8.91E-04	1.92E-03
Cm-245	**	**	**	**	**	**	**	**	**	2.38E-03	1.83E-03	4.13E-03
Cm-246	**	**	**	**	**	**	**	**	**	3.88E-04	2.99E-04	6.72E-04

** - Indicates NO Value for Nuclide

Analysis of Multiple Sample Data Sets (SCAL)

Sample Data Set Fractional Abundance Comparison
(Last Column is Average Abundance for All Data Set Values)

Session Date : 7/1/2014

Page : 1

Waste :	Airborne c ontaminati on	Airborne C ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on
Units :	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Sample	uCi/Sample
Sample Id :	99-1961	99-1959	99-1960	99-2062	99-2085	99-2060	99-2061	99-2059	99-2085# 10	99-2061# 6
Date :	11/02/1999 -----	11/02/1999 -----	11/02/1999 -----	11/12/1999 -----	11/12/1999 -----	11/12/1999 -----	11/12/1999 -----	11/12/1999 -----	01/21/2000 -----	01/21/2000 -----

The Topical Criteria for Co-60 (+/- 2) are Exceeded as Follows :

Sample	0.01	0.00	0.09
Average	0.01	0.01	0.01
Variance	2.17	3.19	7.15

The Topical Criteria for Cs-137 (+/- 2) are Exceeded as Follows :

Sample
Average
Variance

The Topical Criteria for Ce-144 (+/- 5) are Exceeded as Follows :

Sample
Average
Variance

Analysis of Multiple Sample Data Sets (SCAL)

Sample Data Set Fractional Abundance Comparison
(Last Column is Average Abundance for All Data Set Values)

Session Date : 7/1/2014

Page : 1

Waste :	Airborne c ontaminati on	Airborne C ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Average Data Set Abundance
Date :	11/02/1999	11/02/1999	11/02/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	01/21/2000	01/21/2000
Sample Id :	99-1961	99-1959	99-1960	99-2062	99-2085	99-2060	99-2061	99-2059	99-2085# 10	99-2061# 6	
Units :	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Sample	uCi/Sample	
Nuclide	Sample Abundances in %										
Co-60	0.00677	0.01402	**	0.00874	0.00604	0.00707	0.00730	0.00410	0.02394	0.09366	0.01310
Sr-90	23.44375	35.72570	33.06920	31.37935	27.49610	29.32729	20.04233	16.03183	32.28174	14.04884	25.09735
Tc-99	0.00275	0.00019	0.00317	0.00004	0.00140	0.00003	0.00003	0.00002	0.00065	0.00100	0.00025
Cs-137	75.91960	63.23449	66.13839	67.79719	71.87101	69.91417	79.45353	83.57577	65.50503	84.41625	72.21240
Eu-154	0.18810	0.32242	0.28461	0.20673	0.22269	0.23200	0.14244	0.12195	0.28650	0.09859	0.19695
Pu-238	0.04266	0.06600	0.03768	0.06928	0.05292	0.05132	0.03593	0.02586	0.05891	0.01836	0.04256
Pu-239	0.01109	0.01706	0.01003	0.01838	0.01367	0.01354	0.00880	0.00683	0.01520	0.00473	0.01105
Pu-240	0.00771	0.01188	0.00697	0.01274	0.00947	0.00943	0.00613	0.00473	0.01059	0.00328	0.00768
Am-241	0.37755	0.60823	0.44996	0.50755	0.32669	0.44515	0.30350	0.22891	0.35510	0.39004	0.38484
H-3	**	**	**	**	**	**	**	**	**	0.00009	0.00014
C-14	**	**	**	**	**	**	**	**	**	0.00640	0.07641
Fe-55	**	**	**	**	**	**	**	**	**	0.02435	0.12200
Ni-59	**	**	**	**	**	**	**	**	**	0.00139	**
Ni-63	**	**	**	**	**	**	**	**	**	0.09859	0.08380
I-129	**	**	**	**	**	**	**	**	**	0.00104	0.00488
Pm-147	**	**	**	**	**	**	**	**	**	0.69406	0.23538
U-232	**	**	**	**	**	**	**	**	**	0.00269	0.01319
U-233	**	**	**	**	**	**	**	**	**	0.00007	0.00026
U-234	**	**	**	**	**	**	**	**	**	0.00003	0.00009
U-235	**	**	**	**	**	**	**	**	**	0.00000	0.00001
U-236	**	**	**	**	**	**	**	**	**	0.00000	0.00003
U-238	**	**	**	**	**	**	**	**	**	0.00002	**

** - Indicates NO Value for Nuclide

Waste :	Airborne c ontaminati on	Airborne C ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	
Date :	11/02/1999	11/02/1999	11/02/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	01/21/2000	01/21/2000	
Sample Id :	99-1961	99-1959	99-1960	99-2062	99-2085	99-2060	99-2061	99-2059	99-2085# 10	99-2061# 6		Average Data Set Abundance
Units :	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Sample	uCi/Sample	
Nuclide	Sample Abundances in %											
Np-237	**	**	**	**	**	**	**	**	**	0.00016	0.00006	0.00019
Pu-241	**	**	**	**	**	**	**	**	**	0.35913	0.11461	0.38917
Pu-242	**	**	**	**	**	**	**	**	**	0.00034	0.00031	0.00062
Am-243	**	**	**	**	**	**	**	**	**	0.01937	0.01423	0.03185
Cm-242	**	**	**	**	**	**	**	**	**	0.00348	0.00482	0.00786
Cm-244	**	**	**	**	**	**	**	**	**	0.06967	0.07517	0.13883
Cm-245	**	**	**	**	**	**	**	**	**	0.15603	0.15466	0.29799
Cm-246	**	**	**	**	**	**	**	**	**	0.02542	0.02520	0.04855

** - Indicates NO Value for Nuclide

Analysis of Multiple Sample Data Sets (SCAL)

Sample Data Set Value Comparison

Session Date : 7/1/2014

(Last Column is Average Value for All Data Sets)

Page : 1

Waste :	Airborne c ontaminati on	Airborne C ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Average Value ALL Data Sets
Date :	11/02/1999	11/02/1999	11/02/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	01/21/2000	01/21/2000	
Sample Id :	99-1961	99-1959	99-1960	99-2062	99-2085	99-2060	99-2061	99-2059	99-2085# 10	99-2061# 6	
Units :	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Sample	uCi/Sample	
Nuclide											
Co-60	4.97E-05	1.57E-04	**	2.36E-04	1.11E-04	2.70E-04	1.02E-04	1.56E-04	1.78E-03	1.52E-03	2.37E-04
Sr-90	1.72E-01	4.00E-01	1.22E-01	8.47E-01	5.05E-01	1.12E+00	2.80E-01	6.10E-01	2.40E+00	2.28E-01	4.54E-01
Tc-99	2.02E-05	2.15E-06	1.17E-05	1.01E-06	2.58E-05	1.09E-06	3.97E-07	7.11E-07	4.81E-05	1.62E-05	4.47E-06
Cs-137	5.57E-01	7.08E-01	2.44E-01	1.83E+00	1.32E+00	2.67E+00	1.11E+00	3.18E+00	4.87E+00	1.37E+00	1.31E+00
Eu-154	1.38E-03	3.61E-03	1.05E-03	5.58E-03	4.09E-03	8.86E-03	1.99E-03	4.64E-03	2.13E-02	1.60E-03	3.57E-03
Pu-238	3.13E-04	7.39E-04	1.39E-04	1.87E-03	9.72E-04	1.96E-03	5.02E-04	9.84E-04	4.38E-03	2.98E-04	7.71E-04
Pu-239	8.14E-05	1.91E-04	3.70E-05	4.96E-04	2.51E-04	5.17E-04	1.23E-04	2.60E-04	1.13E-03	7.67E-05	2.00E-04
Pu-240	5.66E-05	1.33E-04	2.57E-05	3.44E-04	1.74E-04	3.60E-04	8.57E-05	1.80E-04	7.87E-04	5.33E-05	1.39E-04
Am-241	2.77E-03	6.81E-03	1.66E-03	1.37E-02	6.00E-03	1.70E-02	4.24E-03	8.71E-03	2.64E-02	6.33E-03	6.97E-03
H-3	**	**	**	**	**	**	**	**	**	6.52E-06	2.34E-06
C-14	**	**	**	**	**	**	**	**	**	4.76E-04	1.24E-03
Fe-55	**	**	**	**	**	**	**	**	**	1.81E-03	1.98E-03
Ni-59	**	**	**	**	**	**	**	**	**	1.03E-04	**
Ni-63	**	**	**	**	**	**	**	**	**	7.33E-03	1.36E-03
I-129	**	**	**	**	**	**	**	**	**	7.74E-05	7.92E-05
Pm-147	**	**	**	**	**	**	**	**	**	5.16E-02	3.82E-03
U-232	**	**	**	**	**	**	**	**	**	2.00E-04	2.14E-04
Cm-245	**	**	**	**	**	**	**	**	**	1.16E-02	2.51E-03
Cm-246	**	**	**	**	**	**	**	**	**	1.89E-03	4.09E-04
U-233	**	**	**	**	**	**	**	**	**	5.49E-06	4.18E-06
U-234	**	**	**	**	**	**	**	**	**	1.93E-06	1.47E-06
U-235	**	**	**	**	**	**	**	**	**	1.50E-07	1.87E-07
U-236	**	**	**	**	**	**	**	**	**	3.49E-07	4.35E-07

** - Indicates NO Value for Nuclide

Waste :	Airborne c ontaminati on	Airborne C ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	Airborne c ontaminati on	
Date :	11/02/1999	11/02/1999	11/02/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	01/21/2000	01/21/2000	Average
Sample Id :	99-1961	99-1959	99-1960	99-2062	99-2085	99-2060	99-2061	99-2059	99-2085# 10	99-2061# 6	Value ALL Data Sets
Units :	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Swipe	uCi/Sample	uCi/Sample	
Nuclide	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
U-238	**	**	**	**	**	**	**	**	1.24E-06	**	1.24E-06
Np-237	**	**	**	**	**	**	**	**	1.17E-05	1.04E-06	3.49E-06
Pu-241	**	**	**	**	**	**	**	**	2.67E-02	1.86E-03	7.05E-03
Pu-242	**	**	**	**	**	**	**	**	2.52E-05	5.02E-06	1.12E-05
Am-243	**	**	**	**	**	**	**	**	1.44E-03	2.31E-04	5.77E-04
Cm-242	**	**	**	**	**	**	**	**	2.59E-04	7.82E-05	1.42E-04
Cm-244	**	**	**	**	**	**	**	**	5.18E-03	1.22E-03	2.51E-03
Totals :	7.34E-01	1.12E+00	3.69E-01	2.70E+00	1.84E+00	3.82E+00	1.40E+00	3.80E+00	7.43E+00	1.62E+00	1.81E+00
Co-60/ Cs-137 Ratios:	8.92E-05	2.22E-04	**	1.29E-04	8.41E-05	1.01E-04	9.19E-05	4.91E-05	3.66E-04	1.11E-03	

** - Indicates NO Value for Nuclide

Analysis of Multiple Sample Data Sets (SCAL)

NRC Criteria for Scaling Factors (+/- 10) are Exceeded as Follows :

Session Date : 7/1/2014

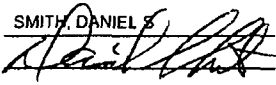
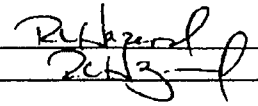
Page : 1

Nuclide	Sample Id	Date	Sample Scaling Factor	Average Scaling Factor	Variance
Tc-99	99-1961	11/02/1999	3.63E-05	3.42E-06	10.61
Tc-99	99-1960	11/02/1999	4.80E-05	3.42E-06	14.03
Tc-99	99-2059	11/12/1999	2.24E-07	3.42E-06	15.28

APPENDIX 10

Melter Smear Survey Report

APPENDIX 10 - Melter Smear Survey Report

124255		Radiation and Contamination Survey Report							
Survey Number		West Valley Nuclear Services Co.							
Location EDR		Instruments Used							
Work Area EDR									
Purpose Of Survey SUPPORT ENTRY		TYPE		SERIAL #		EFF.			
		<input checked="" type="checkbox"/> SCINTILLATION		177		102730			
		<input checked="" type="checkbox"/> GM		177		75562			
		<input checked="" type="checkbox"/> IONIZATION		R20		3841			
		<input checked="" type="checkbox"/> PROPORTIONAL		TEMN		14437			
Additional Information Attached <input type="checkbox"/> YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> ON BACK						α 26.7 β 40.7			
AREA/MATERIALS SURVEYED	SMEARABLE NET (DPM/100 cm ²) COUNT TIME <u>1</u> MIN		DIRECT CHECK NET CPM		RADIATION LEVEL				
	ALPHA	BETA	ALPHA	BETA	WO READING	DISTANCE	Cor. Factor	Cor. Reading	
(3) MASKS	220	2200	—	2100	—	—	—	—	
(3) PAIRS	220	2200	25	2100	—	—	—	—	
RADIO	220	2200	25	2100	—	—	—	—	
R20	220	2200	25	2100	—	—	—	—	
SMears From VIT CELL									
(all smears - 100 cm ²)	MELTER	1	—	—	20/hr	CONTACT	—	—	
		2	—	—	22/hr	CONTACT	—	—	
		3	—	—	62/hr	CONTACT	—	—	
	CFMT	1	—	—	5000/hr	CONTACT	—	—	
		2	—	—	52/hr	CONTACT	—	—	
		3	—	—	52/hr	CONTACT	—	—	
	MFHT	1	—	—	152/hr	CONTACT	—	—	
		2	—	—	152/hr	CONTACT	—	—	
		3	—	—	152/hr	CONTACT	—	—	
CONCLUSIONS - AREA/MATERIALS <input type="checkbox"/> RELEASABLE <input type="checkbox"/> NON-RELEASABLE <input checked="" type="checkbox"/> INFORMATION ONLY									
COMMENTS (IF ANY): PER RP ENGINEER, 1mb/hr = 6,000 dpm/B									
RECOMMENDATIONS: <input checked="" type="checkbox"/> NO FURTHER ACTION REQUIRED <input type="checkbox"/> FURTHER ACTION REQUIRED									
IF FURTHER ACTION REQUIRED, DESCRIBE:									
Technician Name		SMITH, DANIEL S		Date: 20 Apr 2004		Reviewer Name (Print):		Date: 4/20/04	
Signature:				Time: 0830		Signature: 		Time: 1345	

SMEARABLE NET (DPM/100 cm ²)			COMMENTS:
#	Count Time	Min.	
#	ALPHA	BETA	
1	<20	<200	
2			
3			
4			
5			
6			
7	<20	<200	
8	33	792	
9	<20	253	
10	<20	<200	
11			
12			
13	<20	<200	
14	<20	239	
15	<20	<200	
16	37	2609	
17	22	772	
18	56	1977	
19	<20	<200	
20	<20	652	
21	<20	280	
22	26	1483	
23	<20	<200	
24			
25			
26	<20	<200	

EDR

NA

NON-MERCURY
LINER # HG-8

Box #

	CONCENTRATION	1 METER
TOP	3.0	0.5
BOTTOM	2.0	0.3
SIDE 1	13.0	1.0
SIDE 2	0.5	0.2
SIDE 3	0.3	0.1
SIDE 4	2.0	0.4

Survey #: 124255

WV-115B, Rev. 10

APPENDIX 11

Radiological Engineering Calculation (CALC-2007-048)

Radiological Engineering Calculation

Rule of thumb calculation to convert RO-20 Window Open (wo) readings of paper smears in mR/hr to dpm Beta-gamma.

Background

There are times in High Contamination Areas that a paper smear will have too much activity on it to be able to count it with normally used instruments (Tennelec/GMs). This calculation will provide a rule of thumb to convert mR/hr Window Open (wo) readings using and RO-20 to dpm beta-gamma on paper smears.

Given

1. This is for paper smears only; cloth smears typically pick up more activity.
2. The primary beta-gamma isotopes are Cs-137 and Sr-90.
3. Smear is held close to contact to a RO-20 (in a plastic bag) with the wo.
4. The highest and lowest smear from the surveys were eliminated to avoid single smear bias (surveys 142175 and 121948).

Evaluation

See Attached Calculation Sheet.

Conclusions

When counting paper smears with a (wo) RO-20 in a plastic bag, 1mR/hr = approximately 67,000 dpm beta-gamma.

Prepared by: David Biela David Biela 12-26-07
Print Name / Signature / Date

Peer Reviewed by: Richard Black Richard Black 12/26/07
Print Name / Signature / Date

Radiological Engineering Calculation

Rule of thumb calculation to convert RO-20 Window Open (wo) readings of paper smears in mR/hr to dpm Beta-gamma.

SURVEY RESULTS

SURVEY NUMBER	mR/hr RO- 20 (wo)	dpm (based on gm conversion)	dpm / 1 mR/hr RO-20 (wo)
142175	0.8	62,500	78,125
142175	0.3	15,625	52,083
121948	15.0	1,250,000	83,333
121948	9.0	500,000	55,556
AVERAGE			67,274

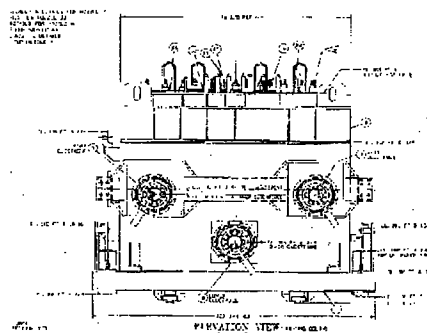
APPENDIX 12

Melter Surface Area Activity and Decay Correction Calculations (RADCALC)

APPENDIX 12 - Melter Act and Decay Calc for Exterior Surface Contamination

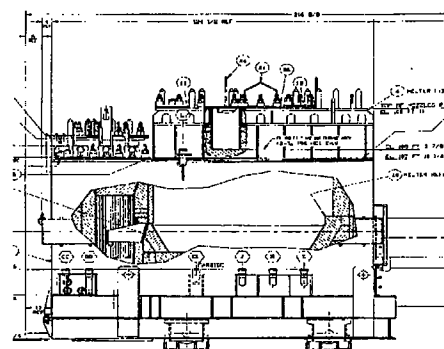
Melter Surface Area

Electrode Face & Opposite side	Length (in)	Height (in)	Surface area (in ²)	Surface area (cm ²)	Surface area (cm ²) Both sides
Melter body	105.5	75.75	7991.625	51550.77	103117.54
Melter lid	105.5	24.5	2584.75	16675.77	33351.546
Melter base	129.75	12	1557	10045.14	20090.282



Sides Adjacent to Electrodes

	Length (in)	Height (in)	Surface area (in ²)	Surface area (cm ²)	Surface area (cm ²) Both sides
Melter body & base	124.5	85.75	10675.88	68876.48	137752.95
Melter lid	85.125	24.5	2085.563	13455.22	26910.43



Top	Length (in)	Width (in)	Surface area (in ²)	Surface area (cm ²)	Surface area (cm ²) Both sections
Discharge Area (times 2)	36.875	47.8125	1763.086	11374.73	22749.45
Lid Assembly area	85.125	105.5	8980.688	57959.8	
Bottom	129.75	132.875	17240.53	111229	

Total surface area of Melter box= 513141.01 cm²

Ancelart Equipment on Lid of MELTER

Number of Items	Ave.Length (in)	Radius (in)	Surface area (in ²)	Surface area (cm ²)
100	4	0.5	3413.7	9120.6
Total surface area of MELTER= 522261.61 cm ²				

Total Activity Calculation

Smear Result R/hr	Smear sample Area cm ²	Total Surface Area cm ²	Wipe Efficiency	dpm/cm ²	Total dpm	Total Act (Ci)
6	100	522261.6	10%	4020000	2.09949E+12	9.46

1. Per RP Engineer - 1mR/hr =67,000 dpm B'

APPENDIX 12 - Activity Calculation for Surface Contamination of Exterior of MELTER

Airborne Sample Data		From Refractory		Final Isotopic Data Used for Characterization			
Isotope	Ave Data Set Scaling Factor (from Airborne)	Isotope	Scaling Factors	Isotope	Scaling Factors	% Abundance	Act (Ci)
Cs-137	1.00E+00	Cs-137	1.00E+00	Cs-137	1.00E+00	67.975%	6.43E+00
Ba-137m				Ba-137m		0.944 times Cs-137	6.07E+00
Sr-90	3.48E-01	Sr-90	4.42E-01	Sr-90	4.42E-01	30.045%	2.84E+00
Y-90				Y-90		Same as Sr-90	2.84E+00
Pm-147	1.07E-02			Pm-147	1.07E-02	0.727%	6.88E-02
Am-241	5.33E-03	Am-241	2.66E-03	Am-241	5.33E-03	0.362%	3.43E-02
Eu-154	2.73E-03	Eu-154	4.57E-03	Eu-154	4.57E-03	0.311%	2.94E-02
Ni-63	2.41E-03			Ni-63	2.41E-03	0.164%	1.55E-02
Fe-55	1.45E-03			Fe-55	2.45E-03	0.167%	1.58E-02
Pu-238	5.89E-04	Pu-238	4.82E-04	Pu-238	5.89E-04	0.040%	3.79E-03
C-14	5.88E-04			C-14	5.88E-04	0.040%	3.78E-03
Co-60	1.81E-04	Co-60	2.04E-04	Co-60	2.04E-04	0.014%	1.31E-03
U-232	1.58E-04			U-232	1.58E-04	0.011%	1.02E-03
Pu-239	1.53E-04	Pu-239	1.16E-04	Pu-239	1.53E-04	0.010%	9.84E-04
Pu-240	1.06E-04	Pu-240	8.83E-05	Pu-240	1.06E-04	0.007%	6.82E-04
Ni-59	7.88E-05			Ni-59	7.88E-05	0.005%	5.07E-04
I-129	5.99E-05			I-129	5.99E-05	0.004%	3.85E-04
U-233	3.66E-06	U-233	1.82E-06	U-233	3.66E-06	0.000%	2.35E-05
Tc-99	3.42E-06	Tc-99	1.62E-04	Tc-99	1.62E-04	0.011%	1.04E-03
H-3	2.99E-06			H-3	2.99E-06	0.000%	1.92E-05
U-234	1.29E-06	U-234	8.68E-07	U-234	1.29E-06	0.000%	8.30E-06
U-238	9.48E-07	U-238	3.62E-07	U-238	9.48E-07	0.000%	6.10E-06
U-236	2.98E-07	U-236	6.46E-07	U-236	6.46E-07	0.000%	4.15E-06
U-235	1.28E-07	U-235	2.15E-07	U-235	2.15E-07	0.000%	1.38E-06
		Cm-242	2.13E-05	Cm-242	2.13E-05	0.001%	1.37E-04
		Am-243	2.09E-05	Am-243	2.09E-05	0.001%	1.34E-04
		Cm-243	1.25E-05	Cm-243	1.25E-05	0.001%	8.04E-05
		Th-228	7.08E-06	Th-228	7.08E-06	0.00048%	4.56E-05
		Np-237	2.63E-06	Np-237	2.63E-06	0.00018%	1.69E-05
		Th-232	1.30E-07	Th-232	1.30E-07	0.00001%	8.35E-07
		Th-230	4.73E-08	Th-230	4.73E-08	0.000003%	3.04E-07
		Pu-241	1.15E-03	Pu-241	1.15E-03	0.078%	7.42E-03
		Cm-244	3.34E-04	Cm-244	3.34E-04	0.023%	2.15E-03

1. Used maximum smear result from Survey Number 124255 to calculate total act on exterior of melter.
2. Used 67,000 dpm = 1 mR/hr to convert from Dose to Act/100 cm²
3. Used wiping efficiency of 10% (within DOT guidelines)
4. Activity calculated is presumed to be removable only - no value calculated for fixed.
5. Surface area of melter was derived from Reference Drawings and included ancillary equipment on top lid (electrodes, airlift, passive cooled feed nozzle) for 100 electrodes being 4" tall with a 0.5" radius
6. Decay was not included in activity determination since smear was taken 4/20/04
7. Isotopic distribution included the higher of the two scaling factors when comparing results from Airborne samples and the Average Geomean of all of the batches (refractory distribution). If isotopes did not appear a distribution, they were added at their respective abundance for that material resulting in a relative abundance of 1.47

Radcalc 4.1
File Name: Act Calc for Exterior Surface Contamination.rad

9/9/2014 10:58 AM

This report was generated using an unvalidated installation of Radcalc version 4.1.

Radcalc 4.1: C:\WVDP - Melter\Recharacterization Information\Exterior of Melter\Act Calc for Exterior Surface Contamination.rad

Performed By: Chris Brandjes
Checked By:

===== Input Information =====

Comments:
Activity Calc for Exterior Surface of Melter

Initial Source Data:

Isotope	Ci	Gm	TBq
H-3	1.920E-05	1.997E-09	7.104E-07
C-14	3.780E-03	8.439E-04	1.399E-04
Fe-55	1.580E-02	6.641E-06	5.846E-04
Co-60	1.310E-03	1.158E-06	4.847E-05
Ni-59	5.070E-04	6.352E-03	1.876E-05
Ni-63	1.550E-02	2.745E-04	5.735E-04
Sr-90	2.840E+00	2.056E-02	1.051E-01
Tc-99	1.040E-03	6.157E-02	3.848E-05
I-129	3.850E-04	2.235E+00	1.425E-05
Cs-137	6.430E+00	7.397E-02	2.379E-01
Pm-147	6.880E-02	7.417E-05	2.546E-03
Eu-154	2.940E-02	1.088E-04	1.088E-03
Th-228	4.560E-05	5.563E-08	1.687E-06
Th-230	3.040E-07	1.475E-05	1.125E-08
Th-232	8.350E-07	7.615E+00	3.090E-08
U-232	1.020E-03	4.621E-05	3.774E-05
U-233	2.350E-05	2.440E-03	8.695E-07
U-234	8.300E-06	1.335E-03	3.071E-07
U-235	1.380E-06	6.386E-01	5.106E-08
U-236	4.150E-06	6.494E-02	1.536E-07
U-238	6.100E-06	1.815E+01	2.257E-07
Np-237	1.690E-05	2.398E-02	6.253E-07
Pu-238	3.790E-03	2.213E-04	1.402E-04
Pu-239	9.840E-04	1.587E-02	3.641E-05
Pu-240	6.820E-04	3.005E-03	2.523E-05
Pu-241	7.420E-03	7.170E-05	2.745E-04
Am-241	3.430E-02	1.001E-02	1.269E-03
Am-243	1.340E-04	6.710E-04	4.958E-06
Cm-242	1.370E-04	4.138E-08	5.069E-06
Cm-243	8.040E-05	1.640E-06	2.975E-06
Cm-244	2.150E-03	2.642E-05	7.955E-05

Total Activity: 9.457E+00 3.499E-01

* Radionuclides with an A1/A2 fraction of less than 0.001 will not be shown in the output.

Container Data:

Container Void Volume:	0	m^3
Container Mass:	1	kg
Mass of solid beryllium, lead, graphite, and hydrogenous material enriched with deuterium:	0	kg
Gross Mass:	10430	kg

Waste Data:

Waste Form:	Normal
Waste State:	Solid
Waste Volume:	2 m^3

Radcalc 4.1

9/9/2014 10:58 AM

File Name: Act Calc for Exterior Surface Contamination.rad

Waste Mass:	10430	kg
Mass of solid lead:	0	kg
Mass of solid beryllium, graphite, and hydrogenous material enriched with deuterium:	0	kg
Waste Void Volume:	0	m^3

Decay Time Data:

Date to begin source decay:	4/20/2004
Date container sealed:	9/2/2014

===== Radioactive Decay Results =====

Decayed Source:

Isotope	Ci	Gm	TBq
H-3	1.072E-05	1.115E-09	3.966E-07
C-14	3.775E-03	8.429E-04	1.397E-04
Fe-55	1.141E-03	4.797E-07	4.223E-05
Co-60	3.351E-04	2.961E-07	1.240E-05
Ni-59	5.070E-04	6.352E-03	1.876E-05
Ni-63	1.443E-02	2.556E-04	5.340E-04
Sr-90	2.213E+00	1.602E-02	8.187E-02
Y-90	2.213E+00	4.070E-06	8.189E-02
Tc-99	1.040E-03	6.157E-02	3.848E-05
I-129	3.850E-04	2.235E+00	1.424E-05
Cs-137	5.062E+00	5.823E-02	1.873E-01
Ba-137m	4.778E+00	8.879E-09	1.768E-01
Pm-147	4.445E-03	4.792E-06	1.645E-04
Sm-147	1.593E-12	6.938E-05	5.893E-14
Eu-154	1.274E-02	4.713E-05	4.713E-04
Hg-206	3.774E-18	3.369E-26	1.396E-19
Tl-206	2.650E-16	1.220E-24	9.805E-18
Tl-207	4.377E-11	2.298E-19	1.620E-12
Tl-208	3.317E-04	1.120E-12	1.227E-05
Tl-209	4.920E-10	1.203E-18	1.820E-11
Tl-210	2.861E-13	4.153E-22	1.058E-14
Pb-209	2.278E-08	4.941E-15	8.428E-10
Pb-210	1.986E-10	2.585E-12	7.349E-12
Pb-211	4.389E-11	1.778E-18	1.624E-12
Pb-212	9.232E-04	6.645E-10	3.416E-05
Pb-214	1.362E-09	4.154E-17	5.039E-11
Bi-209	4.268E-27	4.740E-11	1.579E-28
Bi-210	1.979E-10	1.595E-15	7.322E-12
Bi-211	4.389E-11	1.069E-19	1.624E-12
Bi-212	9.232E-04	6.301E-11	3.416E-05
Bi-213	2.278E-08	1.176E-15	8.428E-10
Bi-214	1.362E-09	3.085E-17	5.040E-11
Bi-215	3.602E-17	3.048E-25	1.333E-18
Po-210	1.789E-10	3.982E-14	6.621E-12
Po-211	1.198E-13	1.156E-24	4.433E-15
Po-212	5.914E-04	3.311E-21	2.188E-05
Po-213	2.229E-08	1.767E-24	8.247E-10
Po-214	1.362E-09	4.229E-24	5.039E-11
Po-215	4.389E-11	1.489E-24	1.624E-12
Po-216	9.232E-04	2.651E-15	3.416E-05
Po-218	1.362E-09	4.893E-18	5.040E-11
At-215	1.756E-16	3.346E-31	6.496E-18
At-217	2.278E-08	1.415E-20	8.429E-10
At-218	2.588E-13	7.502E-24	9.576E-15
At-219	3.714E-17	3.893E-26	1.374E-18
Rn-217	2.734E-12	2.839E-26	1.011E-13
Rn-218	2.588E-16	1.750E-28	9.576E-18
Rn-219	4.389E-11	3.374E-21	1.624E-12

Radcalc 4.1

9/9/2014 10:58 AM

File Name: Act Calc for Exterior Surface Contamination.rad

Rn-220	9.232E-04	1.005E-12	3.416E-05
Rn-222	1.362E-09	8.855E-15	5.040E-11
Fr-221	2.278E-08	1.312E-16	8.429E-10
Fr-223	6.190E-13	1.600E-20	2.290E-14
Ra-223	4.389E-11	8.569E-16	1.624E-12
Ra-224	9.232E-04	5.765E-09	3.416E-05
Ra-225	2.287E-08	5.833E-13	8.461E-10
Ra-226	1.364E-09	1.380E-09	5.047E-11
Ra-228	5.957E-07	2.185E-09	2.204E-08
Ac-225	2.278E-08	3.926E-13	8.429E-10
Ac-227	4.485E-11	6.202E-13	1.660E-12
Ac-228	5.957E-07	2.666E-13	2.204E-08
Th-227	4.364E-11	1.420E-15	1.615E-12
Th-228	9.232E-04	1.126E-06	3.416E-05
Th-229	2.300E-08	1.081E-07	8.509E-10
Th-230	3.048E-07	1.479E-05	1.128E-08
Th-231	1.380E-06	2.596E-12	5.106E-08
Th-232	8.350E-07	7.615E+00	3.090E-08
Th-234	6.100E-06	2.634E-10	2.257E-07
Pa-231	3.026E-10	6.406E-09	1.120E-11
Pa-233	1.701E-05	8.198E-10	6.295E-07
Pa-234	9.149E-09	4.633E-15	3.385E-10
Pa-234m	6.100E-06	8.883E-15	2.257E-07
U-232	9.202E-04	4.169E-05	3.405E-05
U-233	2.350E-05	2.440E-03	8.695E-07
U-234	8.406E-06	1.352E-03	3.110E-07
U-235	1.380E-06	6.386E-01	5.106E-08
U-235m	9.832E-04	3.195E-11	3.638E-05
U-236	4.150E-06	6.494E-02	1.536E-07
U-237	1.107E-07	1.356E-12	4.095E-09
U-238	6.100E-06	1.815E+01	2.257E-07
Np-237	1.701E-05	2.414E-02	6.295E-07
Np-239	1.339E-04	5.772E-10	4.953E-06
Pu-238	3.492E-03	2.039E-04	1.292E-04
Pu-239	9.838E-04	1.586E-02	3.640E-05
Pu-240	6.832E-04	3.011E-03	2.528E-05
Pu-241	4.494E-03	4.342E-05	1.663E-04
Am-241	3.383E-02	9.873E-03	1.252E-03
Am-243	1.339E-04	6.703E-04	4.953E-06
Cm-242	1.380E-11	4.168E-15	5.106E-13
Cm-243	6.327E-05	1.291E-06	2.341E-06
Cm-244	1.442E-03	1.772E-05	5.336E-05

Total Activity:	1.436E+01	5.313E-01
w/o Daughters:	7.361E+00	2.724E-01

Decay Heat:

Heat Generated on Start Date:	0.01185	W
Heat Generated on Seal Date:	0.04054	W

===== Regulatory Requirements Warning =====

Radcalc utilizes numerically based criteria to classify packages against the regulations. Many regulations also include subjective criteria that Radcalc does not consider. The user must check to ensure that all requirements in the regulations are met.

===== DOT Classification Results =====

* DOT classification calculations are made at the end of the user-specified decay time.

Radioactive Determination:

Radioactive:	Yes	(ACEMs and ALECs > 1.0)
--------------	-----	-------------------------

Radcalc 4.1

9/9/2014 10:58 AM

File Name: Act Calc for Exterior Surface Contamination.rad

ACEM Limit Fraction:	2022	ACEMs	(Number of ACEMs)
ALEC Limit Fraction:	27130000	ALECs	(Number of ALECs)
* This package is not exempt from 49 CFR Subchapter C.			
Effective A2s for Mixture:	1.275E+11	Bq	
Type Determination:			
Type:	B		(A2s > 1.0)
A2 Limit Fraction:	2.136	A2s	(Number of A2s)
Limited Quantity Determination:			
Limited Quantity:	No		(Solid, activity > 0.001 A2)
Activity:	2.136	A2	
	14.36	Ci	
	0.5313	TBq	
Fissile:	Yes		
Fissile Excepted:	Yes (a)		
LSA Determination:			
LSA-I:	No		(Fissile excepted, ACEMs > 30 x rad limits)
LSA-II:	Yes		(A2s/gm <= 0.0001)
LSA-III:	Yes		(A2s/gm <= 0.002)
Specific Activity:	2.047E-07	A2/gm	
	1.376E-06	Ci/gm	
HRCQ Determination:			
HRCQ:	No		(A2s <= 3000, Activity <= 1000 TBq)
A2 Limit Fraction:	2.136	A2s	
Activity:	14.36	Ci	
	0.5313	TBq	
Fissile Determination:			
Fissile:	Yes		(Contains fissile isotopes per 49 CFR 173.403)
Fissile Excepted Determination:			
Fissile Excepted:	Yes (a)		(Fissile isotopes <= 2 grams)
Fissile Mass:	0.6569	gm	
Container beryllium, lead, graphite, and hydrogenous material enriched with deuterium:	0	gm	
Container Mass:	1000	gm	
Waste lead:	0	gm	
Waste beryllium, graphite, and hydrogenous material enriched with deuterium:	0	gm	
Waste Mass:	10430000	gm	
Solid Non-Fissile Mass:	0	gm	
Total Uranium Mass:	18.86	gm	
U-233 Mass:	0.00244	gm	
U-235 Mass:	0.6386	gm	
Uranium Enrichment:	3.387	%	
Total Plutonium Mass:	0.01912	gm	
Pu-239 Mass:	0.01586	gm	
Pu-241 Mass:	4.342E-05	gm	
Reportable Quantity Determination:			
Reportable Quantity:	Yes		(RQs >= 1.0)
RQ Limit Fraction:	36.84	RQs	(Number of RQs)
Shipping Papers and Labels:			
Isotope	Number of A2s	Fraction of A2s	Cumulative A2s
+ Am-241	1.252	0.586	1.252
			Cumulative Fraction of A2s
			0.586

Radcalc 4.1

9/9/2014 10:58 AM

File Name: Act Calc for Exterior Surface Contamination.rad

+ Cs-137	0.3121	0.1461	1.564	0.7322
+ Sr-90	0.2729	0.1278	1.837	0.8599
+ Pu-238	0.1292	0.0605	1.966	0.9204
+ Pu-239	0.0364	0.01704	2.002	0.9374
+ Th-228	0.03416	0.01599	2.037	0.9534
U-232	0.03405	0.01594	2.071	0.9694
Cm-244	0.02668	0.01249	2.097	0.9819
Pu-240	0.02528	0.01183	2.123	0.9937
Am-243	0.004953	0.002319	2.128	0.996
Pu-241	0.002771	0.001297	2.13	0.9973
Cm-243	0.002341	0.001096	2.133	0.9984

+ Contains 95% of the total A2s and must be included per 49 CFR 173.433.

* Radionuclides comprising less than 0.1% of the total A2s are not shown in the list.

===== DOE Classification Results =====

* DOE classification calculations are made at the end of the user-specified decay time.

DOE-STD-1027 Category Determination:

Category:	< Cat 3	(Cat3s <= 1.0)
Cat 2 Limit Fraction:	0.000995	
Cat 3 Limit Fraction:	0.309	

* The DOE-STD-1027 category determination is based on dose-related limits.
The user must apply any criticality-related limits separately.

Dose-Equivalent Curies:

ICRP-72 DE-Ci:	0.0374
FGR-11 DE-Ci:	0.05027

TRU Waste Determination:

TRU Waste:	No	(TRU activity <= 100 nCi/gm)
TRU Activity:	3.758	nCi/g

WIPP Quantities:

FGE Value:	0.4294
PE-Ci Value:	0.04041

===== NRC Classification Results =====

* NRC classification calculations are made at the end of the user-specified decay time.

NRC Container Category:

Container Category:	III	
LSA-I:	No	
LSA-II:	Yes	
LSA-III:	Yes	
Total Activity:	14.36	Ci
A2 Limit Fraction:	2.136	A2s

Drawing 1

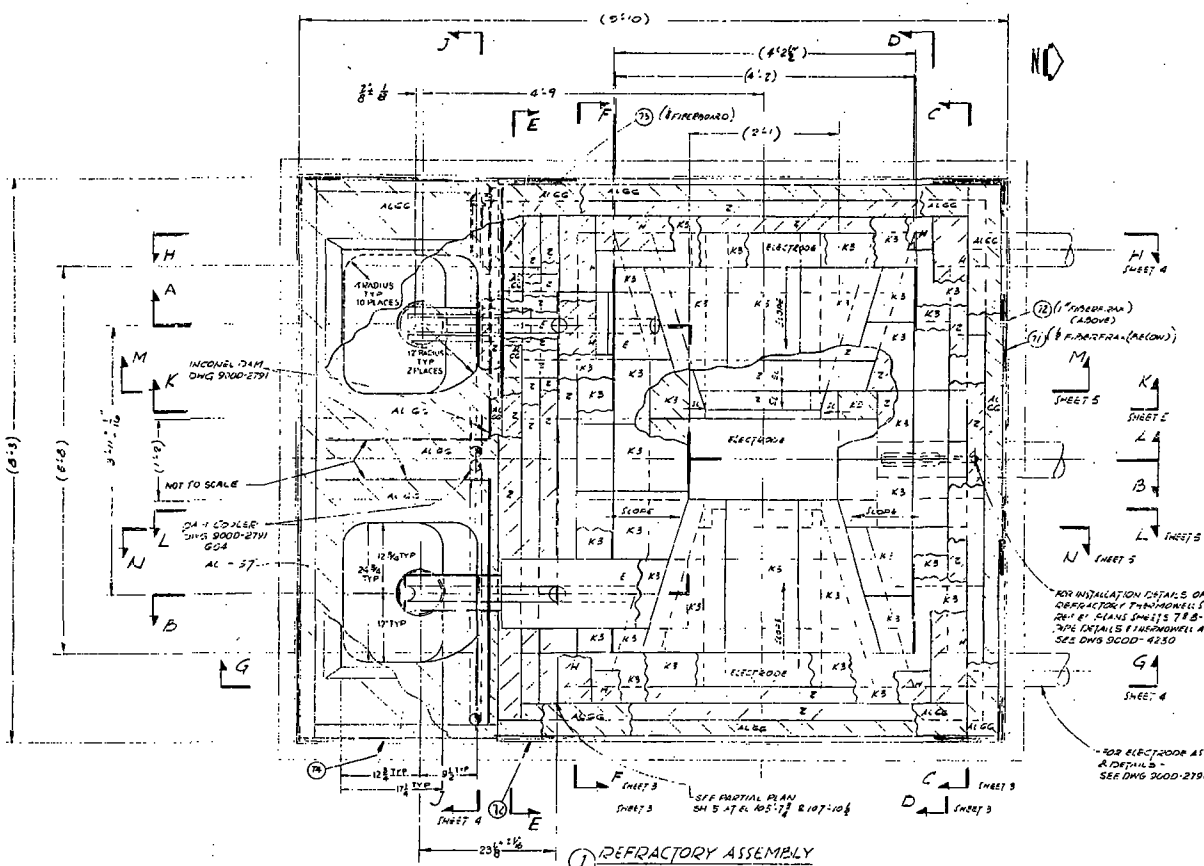
Melter Refractory Assembly Drawings

~~900B-314-21~~
PNL-011-01

1. ALL K-3 BLOCKS, MINUS EPIE-30R DCL CAST MONOFLEX K-3 MFD. BY THE CARBORUNDUM COMPANY, ALL MATING SURFACES SHALL BE DIAMOND TRUED, GROUND OR DIAMOND SAW CUT EXCEPT WHERE THE VERTICAL WALLS MEET WITH THE FLOOR BLOCKS, DIAMOND TRUED IS OPTIONAL, CASTING SCAR SHALL BE INSTALLED AT THE BOTTOM WHERE APPLICABLE.
2. ALL E BLOCKS SHALL BE EPIE-30R DCL CAST MONOFLEX E, MFD. BY THE CARBORUNDUM COMPANY, ALL MATING SURFACES SHALL BE DIAMOND TRUED, GROUND OR DIAMOND SAW CUT. CASTING SCAR SHALL BE INSTALLED AT THE TOP.
3. ALL H BLOCKS SHALL BE DCL CAST MONOFLEX H, MFD. BY THE CARBORUNDUM COMPANY, ALL MATING SURFACES SHALL BE DIAMOND TRUED, GROUND OR DIAMOND SAW CUT. CASTING SCAR SHALL BE INSTALLED AT THE TOP OR ON THE COOLD FACE.
4. ALL Z BLOCKS SHALL BE PREPRESSED OR CAST ZIRMAU, MFD. BY DIDIER TAYLOR REFRACTORIES CORP.
5. MONOFLEX K LAYING CEMENT, MFD. BY THE CARBORUNDUM COMPANY, SHALL BE USED BETWEEN ALL K-3 AND E BLOCK MATING SURFACES TO FILL SURFACE VARIATIONS AND GAPS IN JOINTS, THE MINIMUM LENGTH REQUIRED TO FILL JOINT SHALL BE USED.
6. MONOFLEX 1015 LAYING CEMENT, MFD. BY THE CARBORUNDUM COMPANY, SHALL BE USED BETWEEN ALL MONOFLEX H TO MONOFLEX 4 VERTICAL JOINTS TO FILL SURFACE VARIATIONS AND GAPS IN JOINTS. MONOFLEX 1015 LAYING CEMENT SHALL ALSO BE USED TO FILL ANY CASTING SCAR AT THE TOP OF H BLOCKS. THE MINIMUM CEMENT REQUIRED TO FILL JOINT SHALL BE USED.
7. ZIRMAU 3M LAYING CEMENT, MFD BY THE DIDIER TAYLOR REFRACTORIES CORP., SHALL BE USED BETWEEN ALL Z BLOCKS IN THE SAME VERTICAL PLANE IN THE HEATER WALLS BETWEEN ALL Z BLOCK JOINTS IN THE FLOOR BETWEEN ALL FIVE JOINTS BETWEEN ZIRMAU LAYERS, & BETWEEN ZIRMAU-K-3/E LAYERS.
8. UNLESS OTHERWISE SPECIFIED, Z BLOCKS SHALL HAVE THE NOMINAL DIMENSIONS OF 8"-11" OR 4"-11"-13" OR AS NOTED ON DOWNSHIMS 900E-115 SH-12.
9. AL-57 AND AL-66 SHALL BE SUPPLIED BY CARBORUNDUM CO.
10. FIBER BOARD SHALL BE FIBERFRAX, MFD. BY THE CARBORUNDUM COMPANY DOWNSHIM-10 IN THE HEATER FLOOR AND UNDERSIDE OF LID, AND DOWNSHIM-10 ON ALL VERTICAL WALLS OR AN APPROVED EQUIVALENT.
11. PROVIDE A MOLD RELEASE ON ALL SURFACES WHICH CONTACT CASTABLE SURFACES PRIOR TO CASTING THE CASTABLE.
12. THE VERTICAL CASTABLE WALLS SHALL BE CAST AFTER INSTALLATION OF THE K-3 AND E BLOCKS. A MOLD RELEASE SHALL BE APPLIED THE EAST AND WEST WALL CASTING FIRST, THEN THE NORTH WALL, CASTING AND THE VERTICAL WALLS FROM THE FLOOR.
13. CONTRACTOR SHALL PLACE THE VERTICAL K-3 BLOCKS AND CASTABLE WALL PLACEMENT OF THE E THROAT BLOCKS. TOLERANCES FOR PLACEMENT OF E THROAT BLOCKS ARE PER SHEET 2.
14. DURING INSTALLATION OF REFRACTORIES, AFTER PLACEMENT OF THE K-3 AND E BLOCKS, PROVIDE A REMOVABLE FORM FOR THE MELTER CAVITY TO PREVENT MOVEMENT OF K-3'S AND E BLOCKS.
15. DIMENSIONING AND TOLERANCING PER ANSI Y14.5 1973.
16. FOR PROPOSED FABRICATION OF SPECIAL SHAPES (K-3 REFRATORY TUN 310) PER AVAILABLE STOCK SIZES - SEE SHEET 2.
17. ALL MATERIAL SHALL BE AS SPECIFIED OR APPROVED EQUIVA.

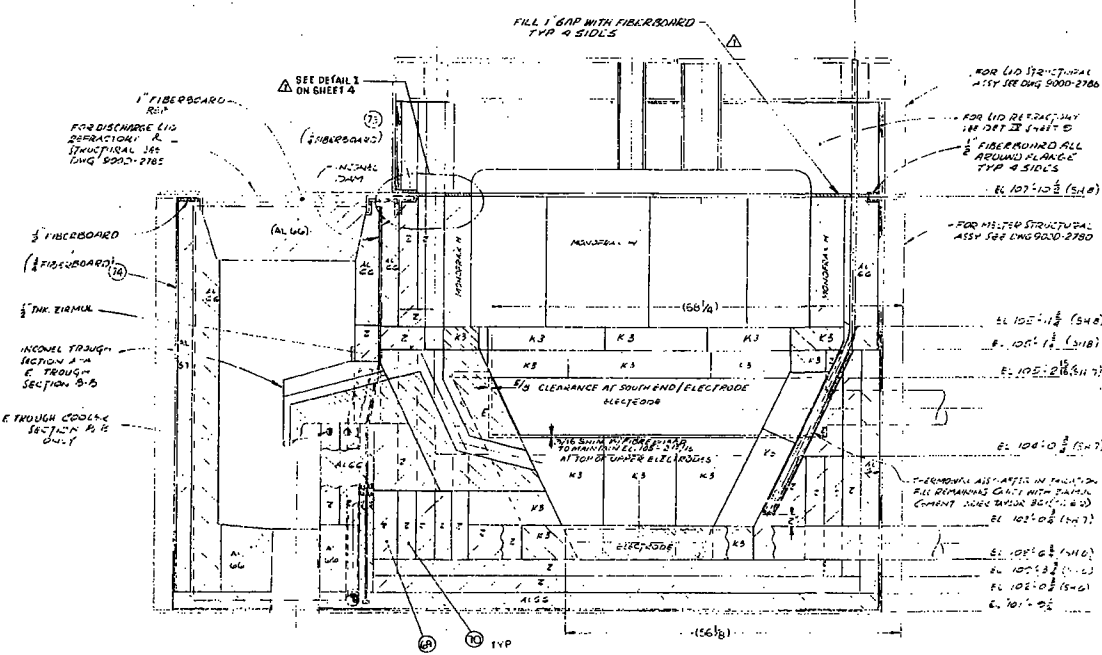
AR	75	LINER $\frac{1}{8}$ " THICK			FIBERBOARD	SEE NOTE 10
AR	74	LINER $\frac{1}{8}$ " THICK DURALBOARD LD				
AR	73	LINER $\frac{1}{8}$ " THICK DURALBOARD MD				
AR	72	LINER 1" THICK				
AR	71	LINER $\frac{1}{2}$ " THICK			FIBERBOARD	SEE NOTE 10
AR	70	BLOCK 5"x12"x18"			Z	SEE NOTE 6
AR	69	BLOCK 4"x12"x18"			Z	SEE NOTE 4
AR	68	ADHESIVE	QP-180			SEE NOTE 10
Z	67				Z	
Z	66					
Z	65					
Z	64					
Z	63					
Z	62	BLOCK		PNZ-GH-16	Z	SEE NOTE 4
QTY	15th	15th	NOMENCLATURE OR DESCRIPTION	CODE IDENT NO	PART OR IDENTIFYING NO	MATERIAL SPECIFICATION

[illegible]



1) REFRACTORY ASSEMBLY

NOTE:
LIDS IDENTIFIED FOR CLARITY
FOR PARTS LIST & QTY NOTED - SEE SHEET 1
FOR DIMENSIONS SEE ELEV. PLANS - SEE SHEETS G THROUGH J
REINFORCED STRUCTURAL STEEL SHOWN IN EXPLANATION TYP

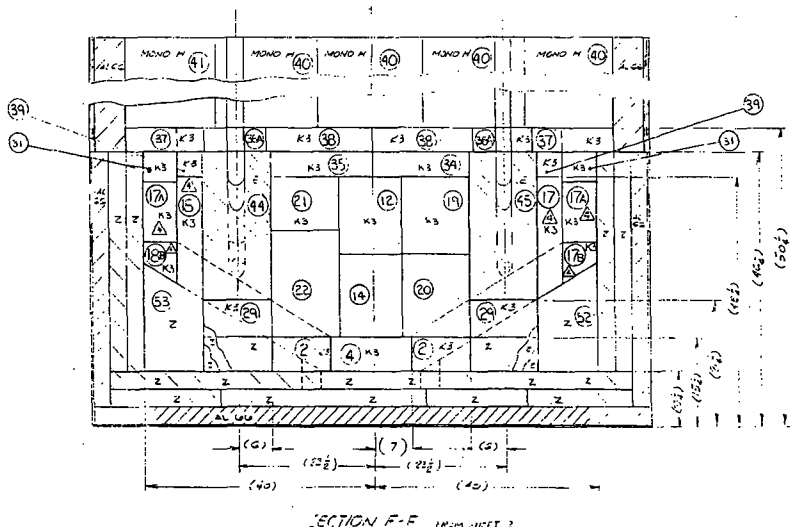
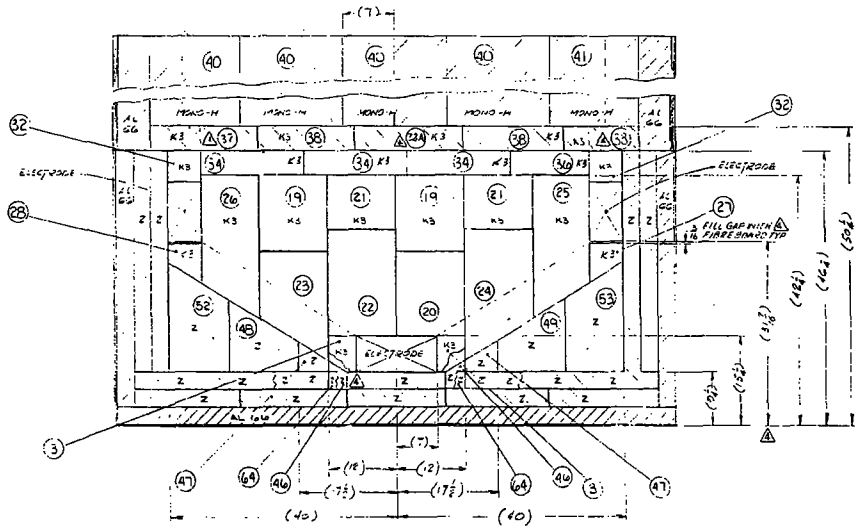
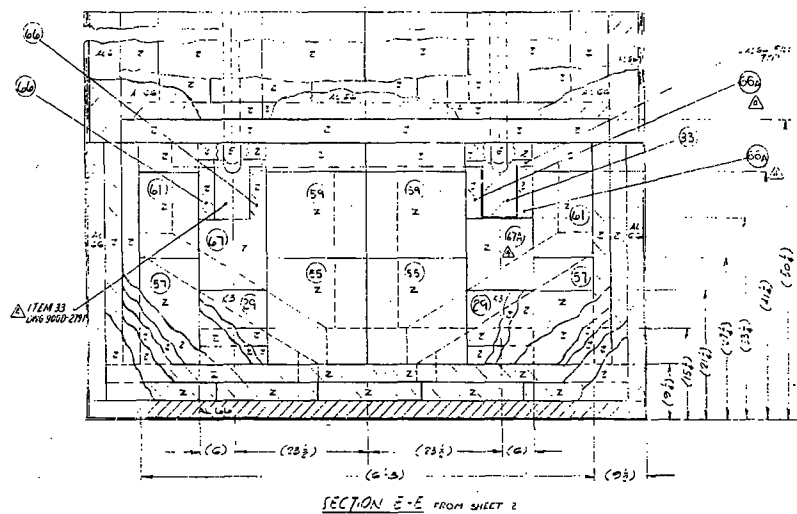
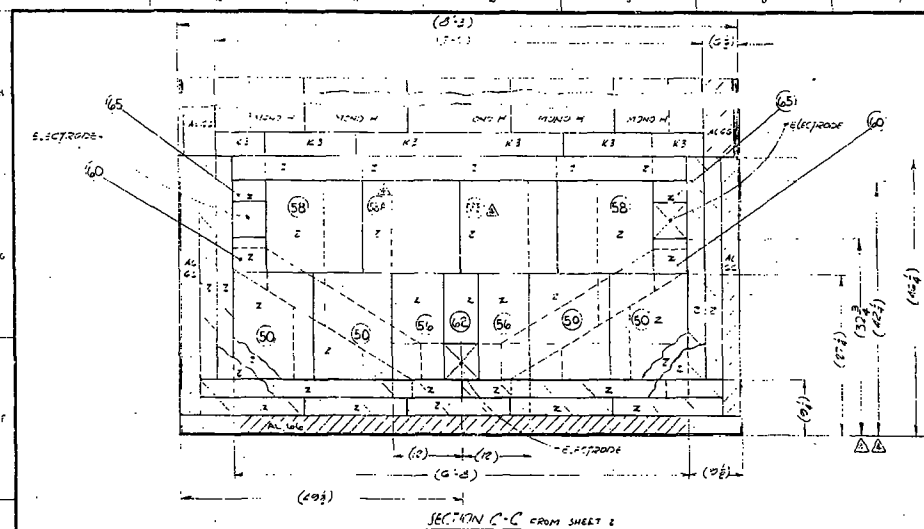


SECTION A-A (SHOWN)
SECTION B-B (GRR HAND HAS NOTED)

NO.	DESCRIPTION	QTY	UNIT	REMARKS
1	REFRACTORY ASSEMBLY	1	EA	
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

PNL-011-02

PNL-011-03

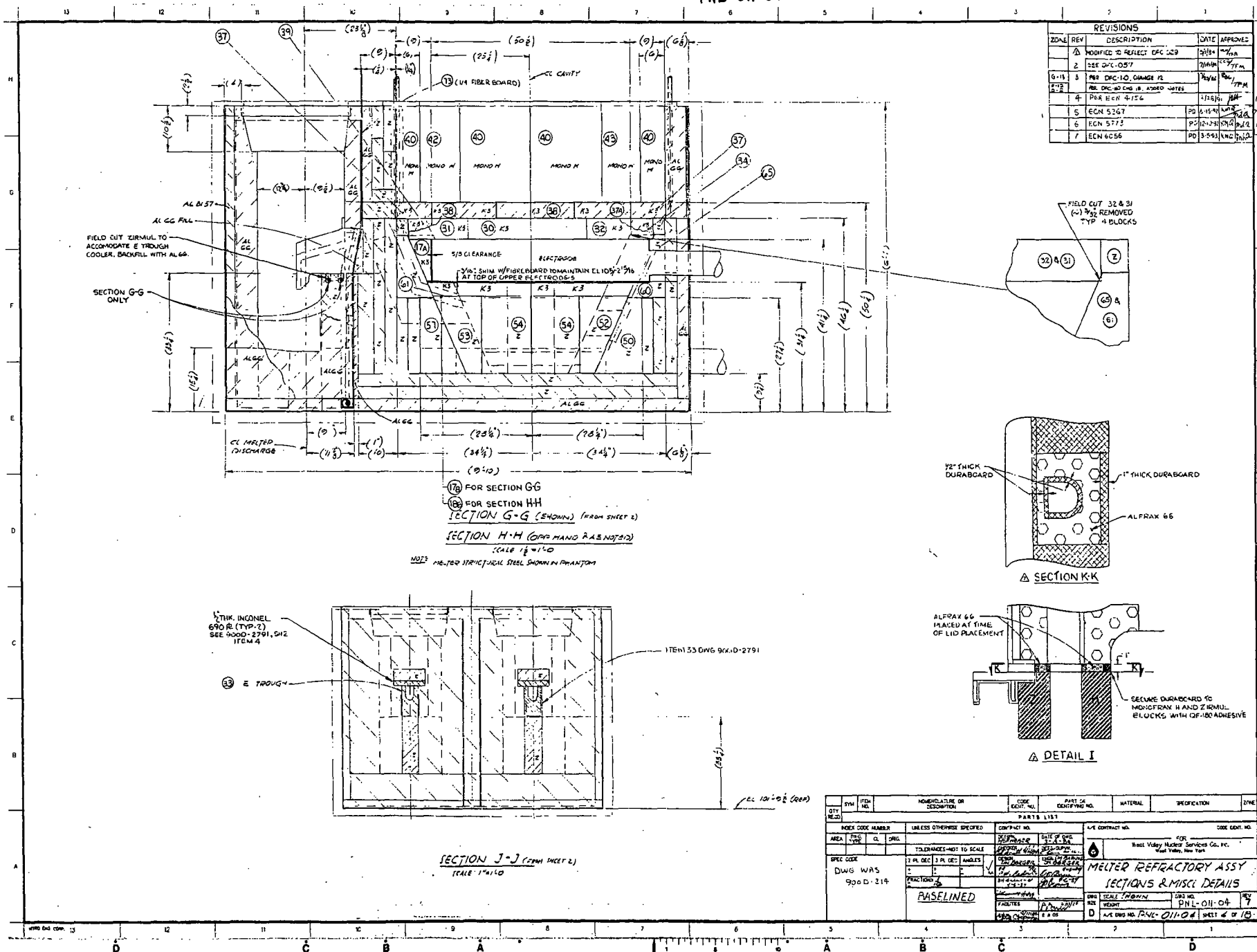


SECTION D-D FROM SHEET C

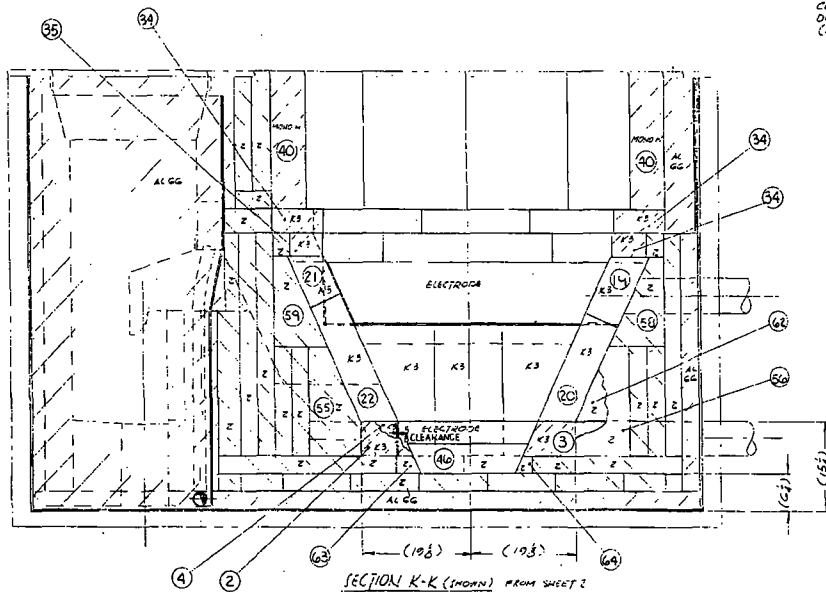
NOTE AND NOT IN ALL DIMENSIONS DEFINED FOR CLARITY

4	ECN 5267	PC 6-15-78	ECN 5267
3	PER E.W. 4:56	REVIEWED	11/11
2	REVISED PER DAC 057	REVIEWED	11/11
1	MODIFIED TO REFLECT JPL 025	REVIEWED	11/11
ZONE	DESCRIPTION	DATE	APPROVED
REVISIONS			

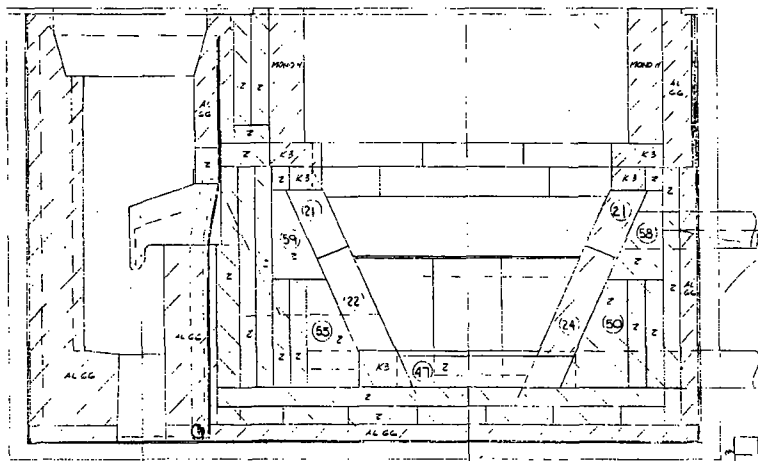
[illegible]



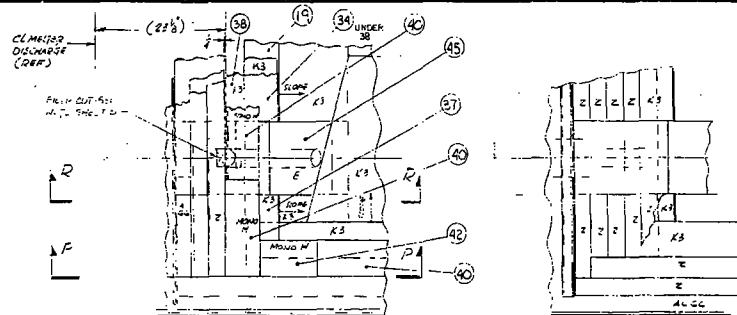
~~4008-34~~
PNL-011-05



NOTE STRUCTURAL MEMBER STEEL SHOWN IN PHANTOM -
ALL INFORMATION NOT SHOWN - SEE SECTION 04 SHEET 4



SECTION M-M (DOWN) FROM GROUND
SECTION N-N (0.25 MINS)

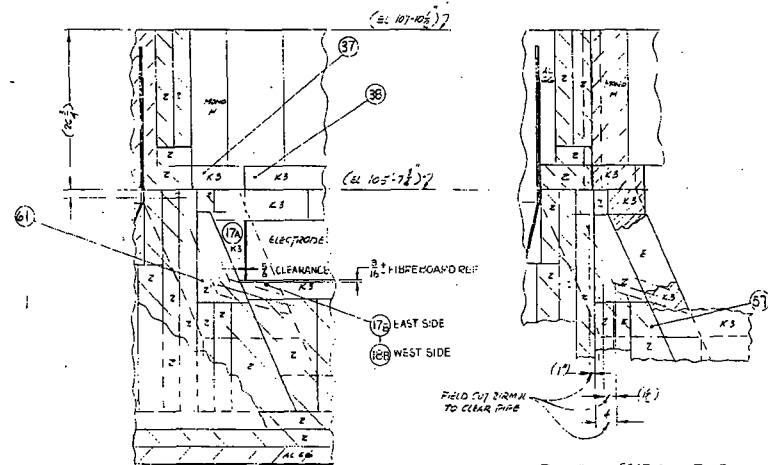


PARTIAL PLAN AT EL 107'-10"

NOTES EAST SING BROWN - WEST SIDE OFF ROAD
FIELD SET DIM GIVEN ARE RECOMMENDED ONLY
ACTUAL FIELD CONDITIONS MAY VARY

PARTIAL PLAN AT $\approx 105^{\circ} 7 \frac{1}{2}''$

NOTE EAST SIDE MOON - WEST SIDE OPP HAND

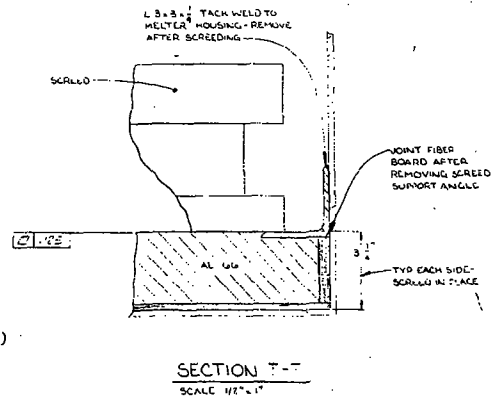
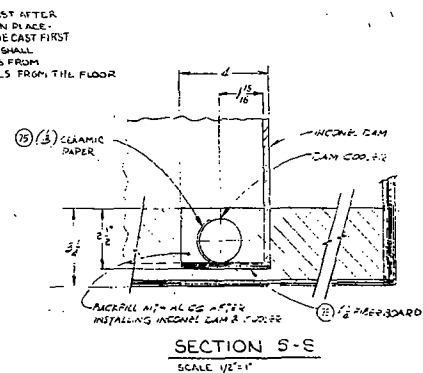
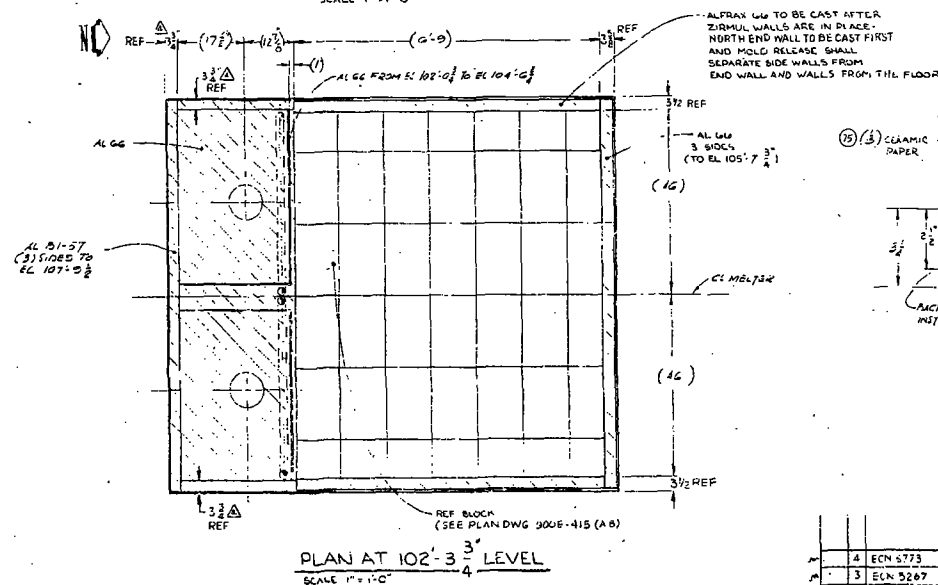
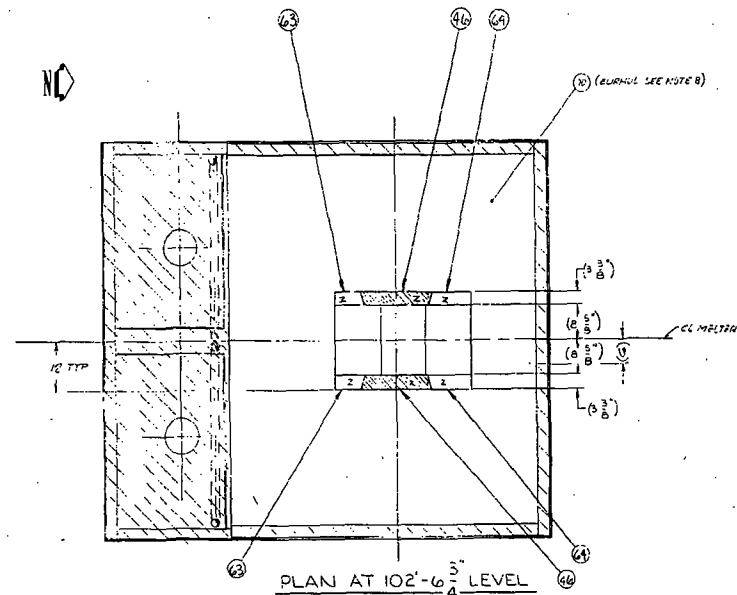
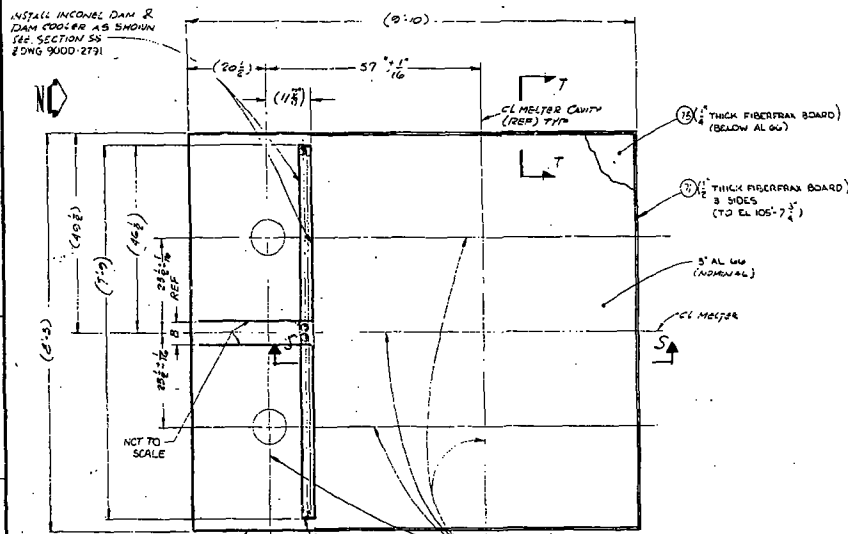


PARTIAL SECTION R-R

SECTION P-P

QTY REQD		ITEM NO.	HOMELAND OR DESCRIPTION		QTY REQD. NO.	ASST. CH. DESCRIPTION	MATERIAL	PREPARATION	COMMENTS
PARTS LIST									
ORDER CODE NUMBER			UNLESS OTHERWISE SPECIFIED			CONTRACT NO.		AVE CONTRACT NO.	
JANAL TIME C. ORG.			TOLERANCES-ALL TO SCALE			DATE OF ORDER		FOR	
SPEC CODE			2 PL. REC. 1 PL. SEC. ANGLES			EXPIRATION DATE		West Valley Metals Services Co., Inc.	
DRAWING NO.			1/8" ± .005			EXPIRATION DATE		West Valley P. & T. Co.	
DATE APPROVED			CUTTING			EXPIRATION DATE		MELTER REFRACTORY ASSEMBLY	
REVISIONS			BASELINED			EXPIRATION DATE		MISS: SECTIONS 4 & 5	
DATE APPROVED			REVISIONS			EXPIRATION DATE		MISS: SECTIONS 4 & 5	

900B-34 Sh. 6
PNL-011-06



QTY	SYM	ITEM NO.	DESCRIPTION	CODE	UNIT	AMOUNT	DATE	BY	CHKD	APPROV
4	ECN	5773	ECN 5773	ECN	5773	1	10/1/80	WVS	WVS	WVS
3	ECN	5267	ECN 5267	ECN	5267	1	10/1/80	WVS	WVS	WVS
2	PER	ECN 4156	PER ECN 4156	PER	ECN 4156	1	10/1/80	WVS	WVS	WVS
1	SEE	DEC-057	SEE DEC-057	DEC	057	1	10/1/80	WVS	WVS	WVS

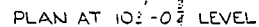
QTY	SYM	ITEM NO.	DESCRIPTION	CODE	UNIT	AMOUNT	DATE	BY	CHKD	APPROV
1	ECN	5773	ECN 5773	ECN	5773	1	10/1/80	WVS	WVS	WVS
1	ECN	5267	ECN 5267	ECN	5267	1	10/1/80	WVS	WVS	WVS
1	PER	ECN 4156	PER ECN 4156	PER	ECN 4156	1	10/1/80	WVS	WVS	WVS
1	SEE	DEC-057	SEE DEC-057	DEC	057	1	10/1/80	WVS	WVS	WVS

QTY	SYM	ITEM NO.	DESCRIPTION	CODE	UNIT	AMOUNT	DATE	BY	CHKD	APPROV
1	ECN	5773	ECN 5773	ECN	5773	1	10/1/80	WVS	WVS	WVS
1	ECN	5267	ECN 5267	ECN	5267	1	10/1/80	WVS	WVS	WVS
1	PER	ECN 4156	PER ECN 4156	PER	ECN 4156	1	10/1/80	WVS	WVS	WVS
1	SEE	DEC-057	SEE DEC-057	DEC	057	1	10/1/80	WVS	WVS	WVS

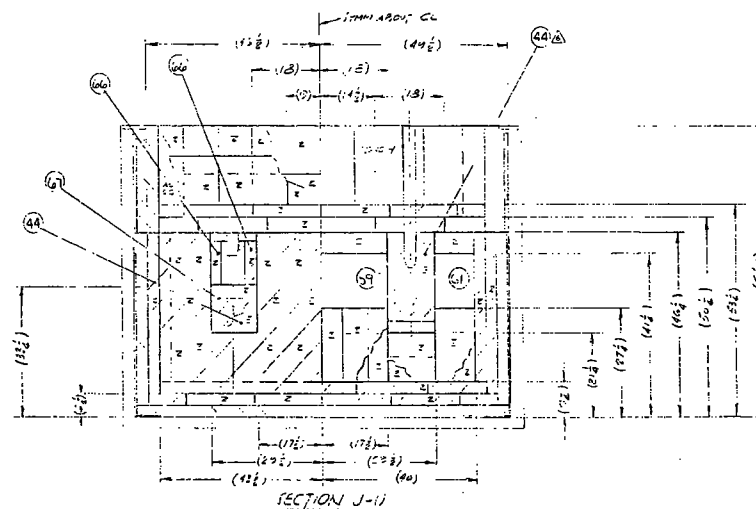
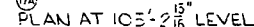
MELTER REFRACTORY ASSY
PLANS & DETAILS

SCALE: SHOWN
Dwg No: PNL-011-06, 4
Rev: 0
Date: 10/1/80
By: WVS
Chkd: WVS
Apprv: WVS

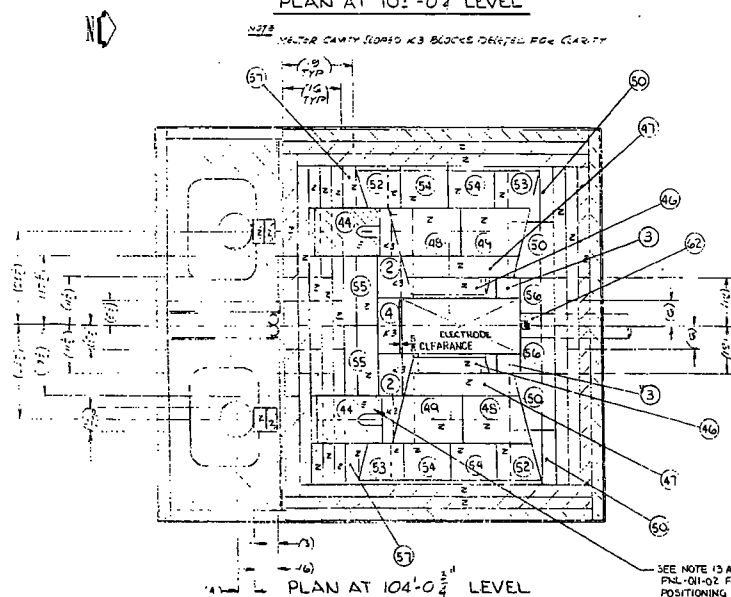
9000-344 Sh. 7
PNL-011-07



4278 MELTOR CAVITY DEPOSED K3 BLOCKS DELETED FOR CLARITY



SECTION J-1.

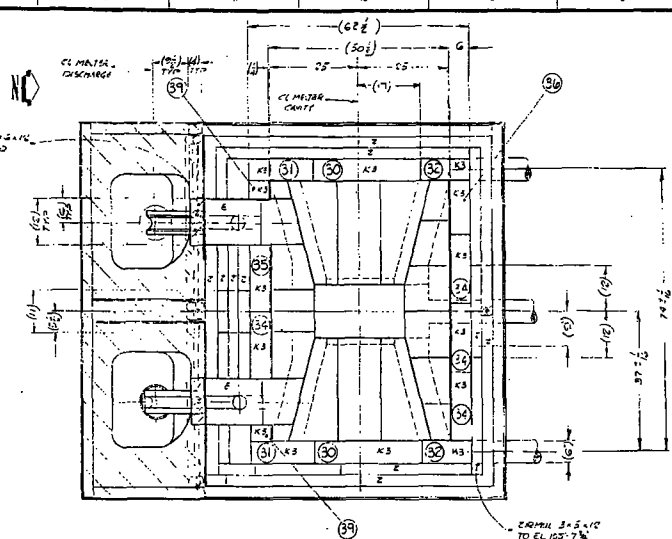


PLAN AT 104'-0 $\frac{1}{4}$ " LEVEL

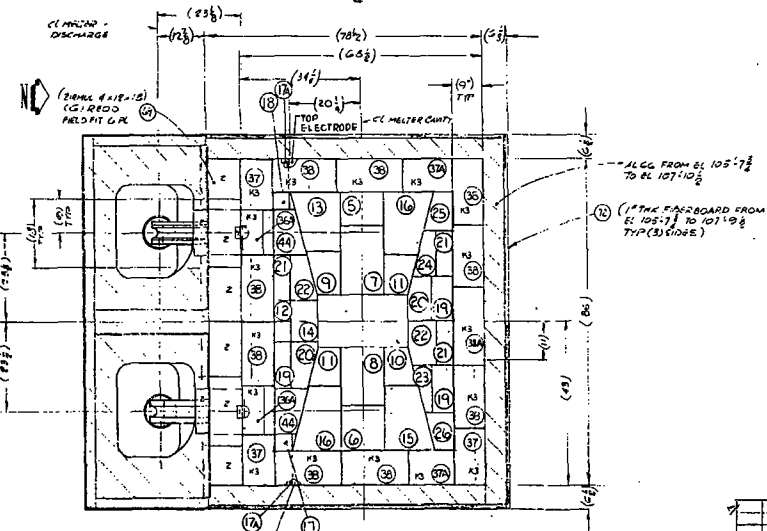
NOTE :
MELTBY CA-17 - SEC'DO K'S BLOCKS DEBIT'D FOR CLARITY

QTY		SYM	ITEM NO.	DESCRIPTION	CODE	PLANT ID	PLANT NO.	MATERIAL	SPECIFICATION	ZONE
PARTS LIST										
INDEX CODE NUMBER				UNLESS OTHERWISE SPECIFIED		CONTRACT NO.		A/E CONTRACT NO.		CODE EXT. NO.
AREA		END	CL	TOLERANCES - NOT TO SCALE		ITEM NO. DATE OF SUBMITTAL		FOR		
SPEC CODE		WAS LW-9		1/8 DEC 3 PL DEC ANGLES		REVISIONS		West Valley Nuclear Serv. Corp. Inc.		
DATE		JUNE - 74		DATE		DATE		West Valley, New York		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE		DATE		DATE		DATE		
DATE		DATE								

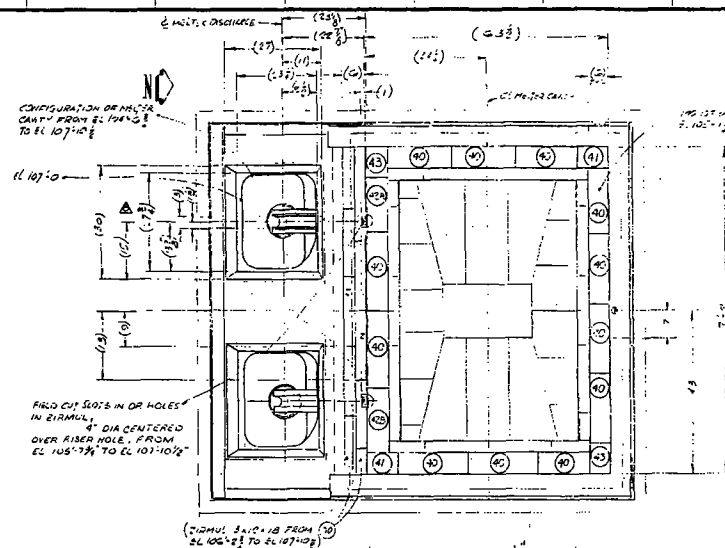
4008-314 Sh. 8
PNL-011-08



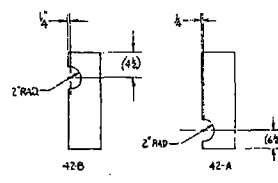
PLAN AT 105'-7 3/4 LEVEL



PLAN AT 105'-11 3/4 LEVEL



PLAN AT 107'-10 1/2 LEVEL

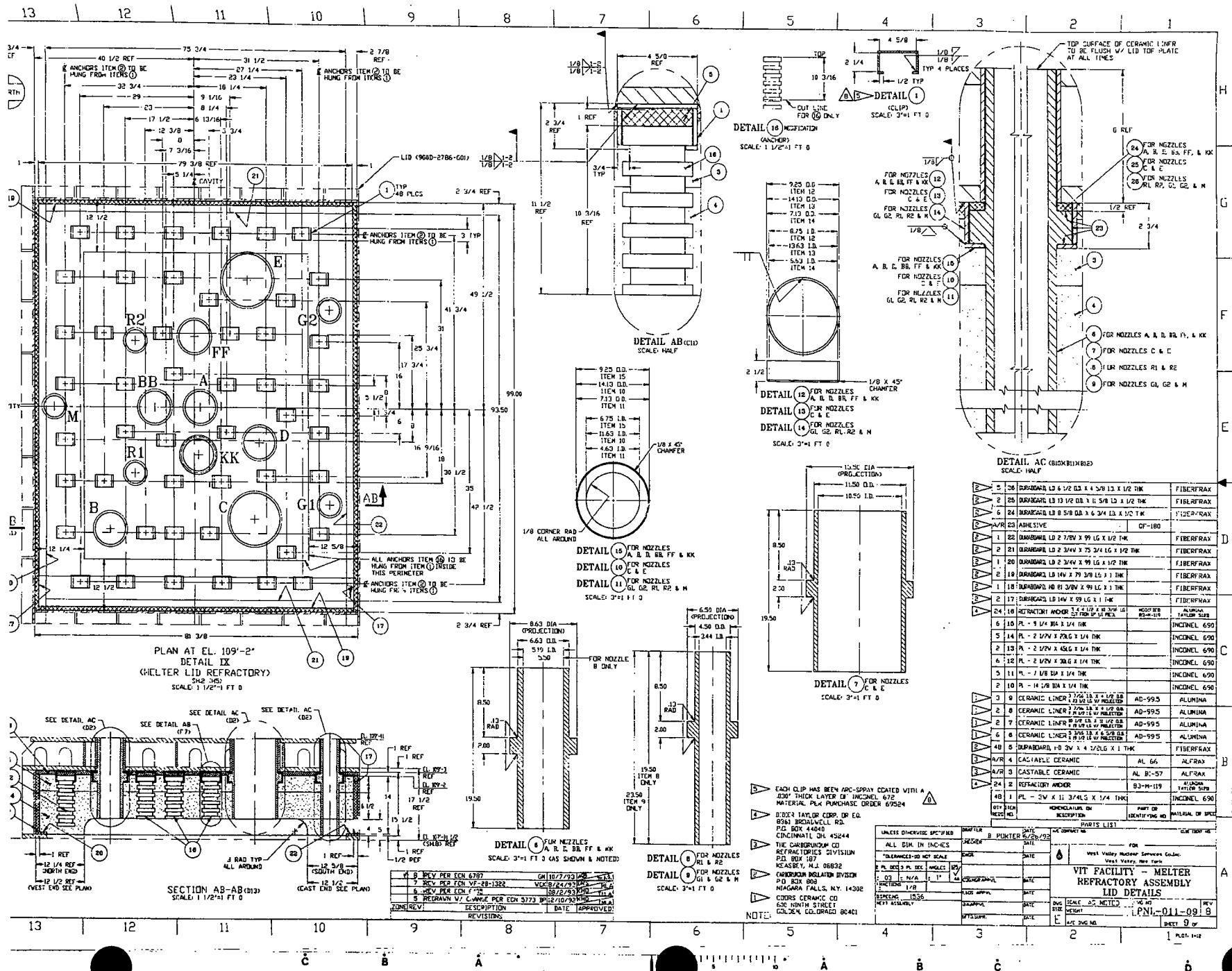


REV	DESCRIPTION	DATE	BY	CHKD	APPROVED
1	REV PER CH 47-28-1087	01/10/87	WJG	WJG	WJG
2	ECN 5606	01/10/87	WJG	WJG	WJG
3	ECN 5773	01/10/87	WJG	WJG	WJG
4	ECN 5267	01/10/87	WJG	WJG	WJG
5	ECN 4156	01/10/87	WJG	WJG	WJG
6	REVISED PER MFG CMT	01/10/87	WJG	WJG	WJG
7	MODIFIED TO REFLECT CFC CMT	01/10/87	WJG	WJG	WJG
8	REVISION	01/10/87	WJG	WJG	WJG

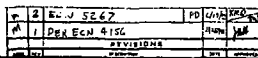
ITEM	FROM	TO	DESCRIPTION	DATE	BY	CHKD	APPROVED
1	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
2	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
3	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
4	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
5	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
6	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
7	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
8	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
9	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
10	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
11	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
12	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
13	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
14	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
15	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
16	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
17	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
18	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
19	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
20	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
21	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
22	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
23	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
24	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
25	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
26	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
27	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
28	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
29	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
30	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
31	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
32	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
33	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
34	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
35	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
36	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG

ITEM	FROM	TO	DESCRIPTION	DATE	BY	CHKD	APPROVED
1	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
2	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
3	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
4	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
5	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
6	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
7	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
8	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
9	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
10	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
11	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
12	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
13	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
14	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
15	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
16	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
17	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
18	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
19	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
20	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
21	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
22	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
23	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
24	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
25	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
26	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
27	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
28	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
29	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
30	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
31	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
32	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
33	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
34	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
35	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG
36	WJG	WJG	WJG	01/10/87	WJG	WJG	WJG

MELTER REFRACTORY ASSY
PLANS
SCALE 1" = 1'-0"
DATE 01/10/87
BY WJG
CHKD WJG
APPROVED WJG
SHEET 8 OF 18



~~FOUO-34~~
PNL-011-11

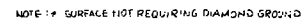


PNL-011-12



	3	ECN 5267	PC 4/12/92	Rev	
	2	DEK 6264156	11/8/91	Yell	
	1	CHANGED DIMENSIONS - 24" TO 25 1/2", 21 1/2" TO 22 1/2", 4 1/2" TO 4 1/4", 17 1/2" TO 17 1/4", 3 1/2" TO 3 1/4" (PLOCKS 17 LK)	4/17/94	Yell	
ZONE	REV.	DESCRIPTION	DATE	BY	
REVISIONS					

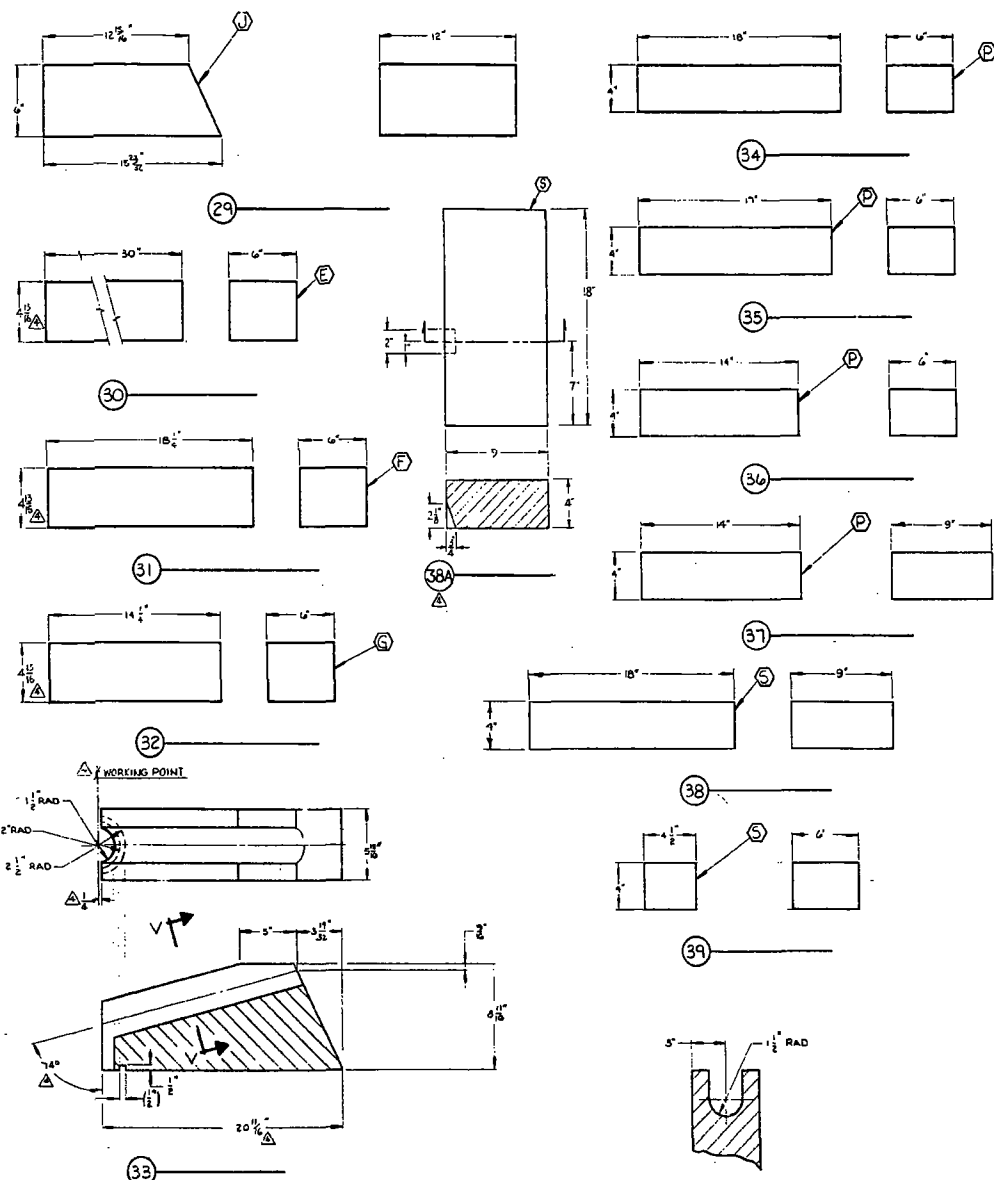
PNL-011-12



VENDOR INFORMATION

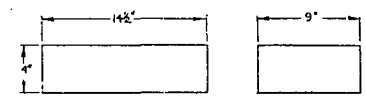
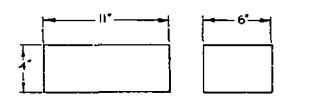
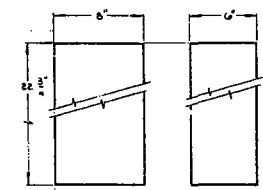
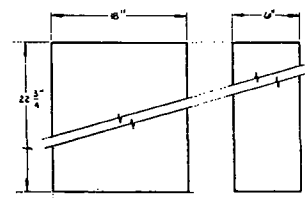
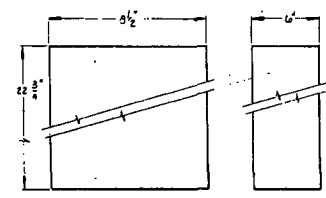
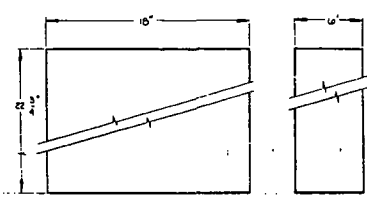
A/E CONTRACT NO.		C/O# REV# NO.	
FOR			
West Valley Nuclear Services Co., Inc.			
West Valley, New York			
MELTER REFRACTORY ASSY			
BLOCK DETAILS			
DRG REV	SCALE 3" = 1'-0" REV001	DRG NO.	REV
		PNL-04-12	3

400-377
PNL-011-13 Sh. 13



SECTION V-V

REVISIONS			
DATE	REV	DESCRIPTION	APPROVED
7/28/81	1	SEE DFC-057	EEC / D.N.
8/10/81	2	FOR DFC-10, DIMENSION 13 - 1/2" WAS 1" 8/16" WAS 8/16", 5/16" WAS 5/8"	EEC / J.T.H.
7/29/81	3	PLA ECH 4156	EEC
6/7/92	4	ECN 5267	EEC / J.T.H.



VENDOR INFORMATION

SYM	REV	DESCRIPTION	DATE	BY	CHKD
1	1	SEE DFC-057	7/28/81	EEC	D.N.
2	2	FOR DFC-10, DIMENSION 13 - 1/2\"/>			

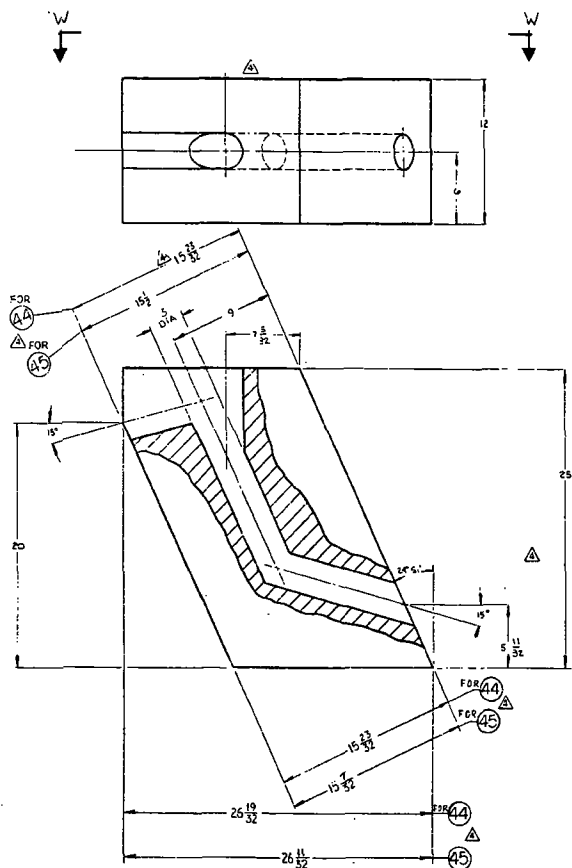
ITEM	QTY	DESCRIPTION	UNIT
1	1	REFRAC BLOCK	EA

ITEM	QTY	DESCRIPTION	UNIT
1	1	REFRAC BLOCK	EA

ITEM	QTY	DESCRIPTION	UNIT
1	1	REFRAC BLOCK	EA

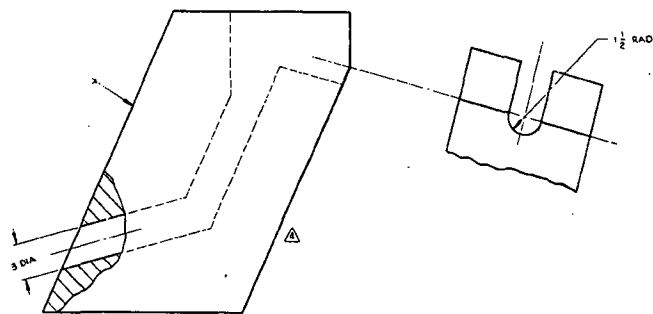
PNL-011-14

REVISIONS				
NO.	REV.	DESCRIPTION	DATE	APPROVED
1		MINOR CHANGES	4/1/84	W. KARP
2		SEE DEC-087	7/24/84	C. Y. TUNG
3		PER DEC 4756	4/18/84	W. KARP
4		ECN 5207	SU 6-17-84	W. KARP



(44) SHOWN AS NOTED

45 SHOWN AS NOTED



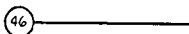
ELEVATION W-W

NOTE : * THIS SURFACE DOES NOT REQUIRE DIAMOND GRINDING

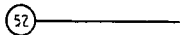
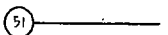
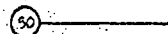
VENDOR INFORMATION

QTY	STN	ITEM NO.	HOMOLOGATION OR CLASSIFICATION	CODE IDENT. NO.	PART OR IDENTIFYING NO.	IN FORMAL	SPECIFICATION	ZONE
PARTS LIST								
MILY CODE NUMBER	UNLESS OTHERWISE SPECIFIED			CONTRACT NO.	A/E CONTRACT NO.	CODE IDENT. NO.		
ANAL	PLG	CL	GRD	TOLERANCES-NOT TO SCALE			EST West Valley Nuclear Services Co., Inc. West Valley, New York	
WELD CODE	7 PL GDS 2 PL GDS ANGLES			MELTER REFRACTORY ASSY				
Welding Details See 0-0-314				BLOCK DETAILS				
<u>BASELINED</u>								

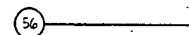
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVE
	1	SEE JFC-059	2/2/84	REAL T/M
	2	PER ECN 4126	2/14/84	W



49 OPPOSITE HAND



53 OPPOSITE HAND

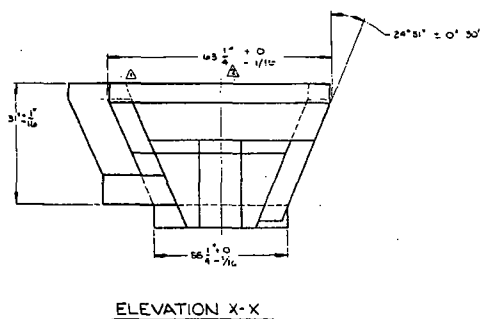
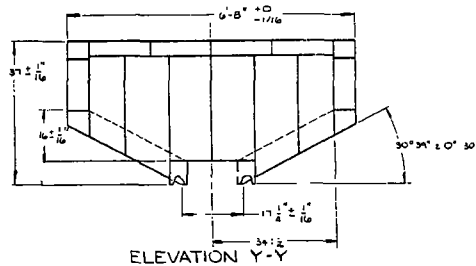
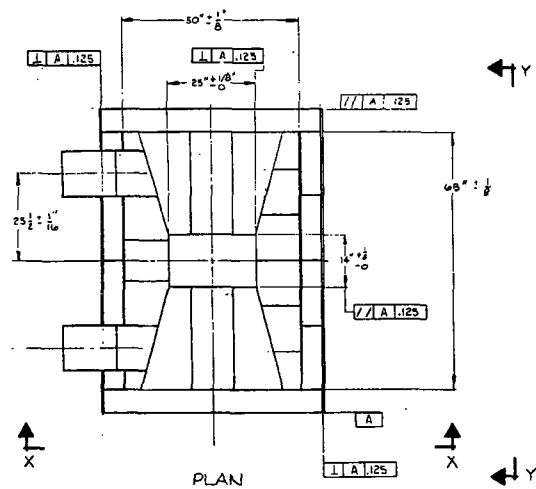


VENDOR INFORMATION

STN 11000	STN NO 11000	NOMENCLATURE OR DESCRIPTION		CODE NO.	PART OR DISPOSAL NO.	UNITARY	PLANT	PLANT
PARTS LIST								
MOCK CODE NAME		UNLESS OTHERWISE SPECIFIED		CONTAINER NO.		DATE RECEIVED		
AREA	PROJ CL	CL	ORIG	TOLERANCES-NOT TO SCALE		DRAWN BY		
SPEC DESC		3 A. DEC 3 R. DEC		JANUARY		MELTHERALPHACON LAB		
WAS DING 9006-314		BASELINED		JANUARY		BLOOD		

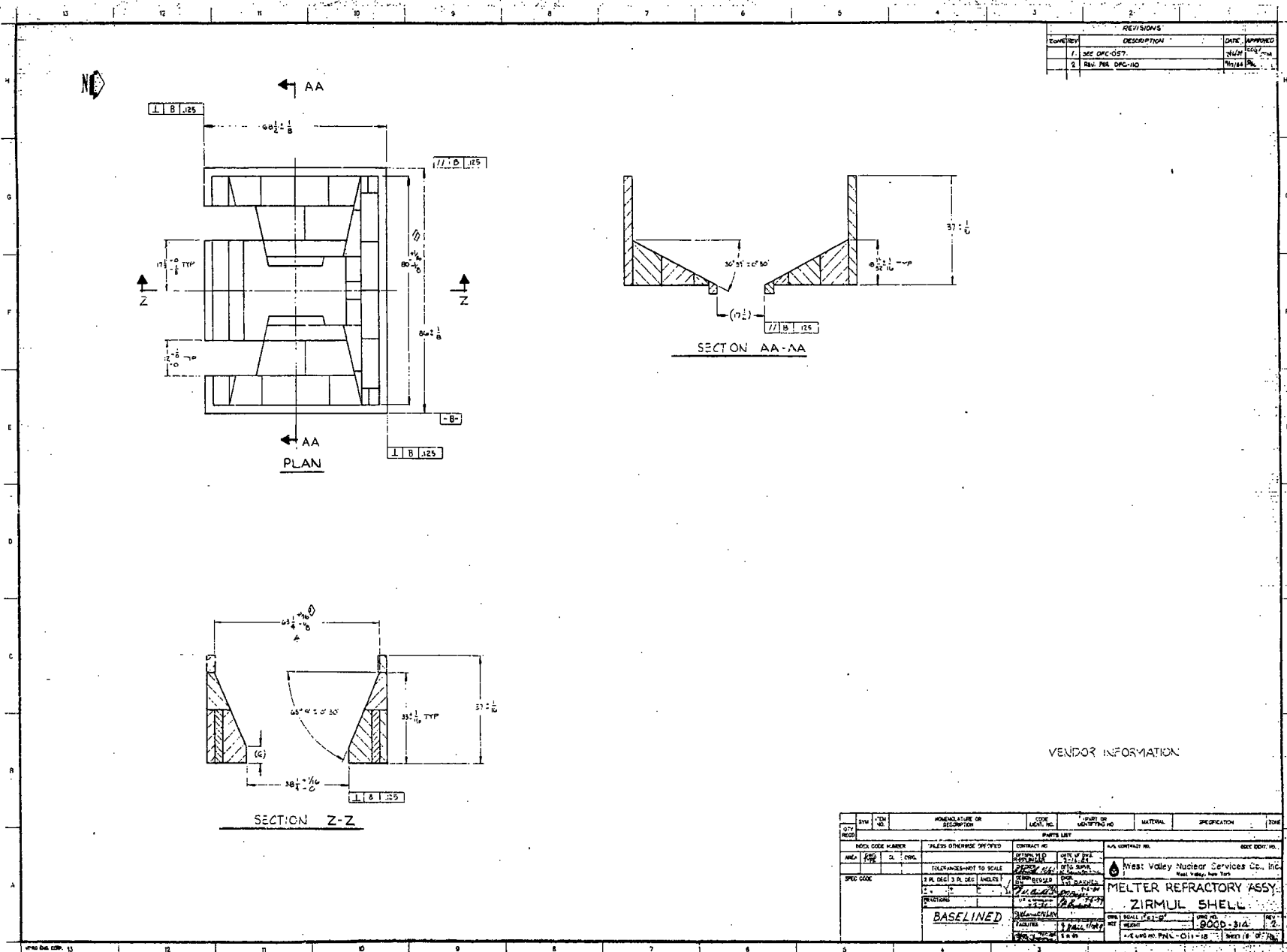
92-2-34

REVISIONS				
ZONE	REV.	DESCRIPTION	DATE	APPROVED
D-12	△	MODIFIED TO REFLECT DFC 020 ¹⁰ PM / 10/1/79		
	?	REV. PER DFC-110	9/5/84	REL/TFN



VENDOR INFORMATION

[illegible]



WVDP RECORD OF REVISION

Rev. No.	Description of Changes	Revision On Page(s)	Dated
0	Original Issue This document affects the Waste Planning & Disposition Department	All	09/18/14

WVMP SAR Reference 3-8

Refractory with Ave. Geomean 6-77 Act.rad, C. Brandjes,
Ameripysics, LLC, Knoxville, Tennessee, June 26, 2014.

Isotope	Ci	Gm	TBq
Co-60	1.332E-02	1.177E-05	4.927E-04
Sr-90	1.068E+02	7.732E-01	3.951E+00
Y-90	1.068E+02	1.964E-04	3.952E+00
Tc-99	5.220E-02	3.090E+00	1.931E-03
Cs-137	2.132E+02	2.452E+00	7.887E+00
Ba-137m	2.012E+02	3.739E-07	7.446E+00
Eu-154	5.527E-01	2.045E-03	2.045E-02
Hg-206	2.537E-16	2.265E-24	9.385E-18
Tl-206	1.782E-14	8.204E-23	6.594E-16
Tl-207	2.960E-09	1.554E-17	1.095E-10
Tl-208	1.806E-04	6.098E-13	6.681E-06
Tl-209	1.434E-08	3.507E-17	5.307E-10
Tl-210	1.672E-11	2.427E-20	6.186E-13
Pb-209	6.641E-07	1.441E-13	2.457E-08
Pb-210	1.335E-08	1.738E-10	4.940E-10
Pb-211	2.968E-09	1.202E-16	1.098E-10
Pb-212	5.026E-04	3.617E-10	1.860E-05
Pb-214	7.960E-08	2.428E-15	2.945E-09
Bi-209	1.457E-25	1.618E-09	5.392E-27
Bi-210	1.331E-08	1.073E-13	4.925E-10
Bi-211	2.968E-09	7.227E-18	1.098E-10
Bi-212	5.026E-04	3.430E-11	1.860E-05
Bi-213	6.640E-07	3.429E-14	2.457E-08
Bi-214	7.962E-08	1.803E-15	2.946E-09
Bi-215	2.428E-15	2.054E-23	8.984E-17
Po-210	1.222E-08	2.720E-12	4.522E-10
Po-211	8.103E-12	7.819E-23	2.998E-13
Po-212	3.219E-04	1.803E-21	1.191E-05
Po-213	6.498E-07	5.152E-23	2.404E-08
Po-214	7.960E-08	2.472E-22	2.945E-09
Po-215	2.968E-09	1.007E-22	1.098E-10
Po-216	5.026E-04	1.443E-15	1.859E-05
Po-218	7.962E-08	2.860E-16	2.946E-09
At-215	1.187E-14	2.263E-29	4.393E-16
At-217	6.641E-07	4.126E-19	2.457E-08
At-218	1.513E-11	4.385E-22	5.597E-13
At-219	2.503E-15	2.624E-24	9.262E-17
Rn-217	7.969E-11	8.278E-25	2.949E-12
Rn-218	1.513E-14	1.023E-26	5.597E-16
Rn-219	2.968E-09	2.282E-19	1.098E-10
Rn-220	5.026E-04	5.469E-13	1.859E-05
Rn-222	7.962E-08	5.176E-13	2.946E-09
Fr-221	6.641E-07	3.825E-15	2.457E-08
Fr-223	4.172E-11	1.079E-18	1.544E-12
Ra-223	2.968E-09	5.794E-14	1.098E-10
Ra-224	5.026E-04	3.138E-09	1.859E-05
Ra-225	6.663E-07	1.699E-11	2.465E-08
Ra-226	7.972E-08	8.064E-08	2.950E-09
Ra-228	3.211E-05	1.178E-07	1.188E-06
Ac-225	6.641E-07	1.144E-11	2.457E-08
Ac-227	3.023E-09	4.180E-11	1.119E-10
Ac-228	3.211E-05	1.437E-11	1.188E-06

Th-227	2.947E-09	9.592E-14	1.091E-10
Th-228	5.024E-04	6.129E-07	1.859E-05
Th-229	6.695E-07	3.148E-06	2.477E-08
Th-230	1.523E-05	7.389E-04	5.635E-07
Th-231	6.920E-05	1.302E-10	2.560E-06
Th-232	4.180E-05	3.812E+02	1.547E-06
Th-234	1.160E-04	5.008E-09	4.292E-06
Pa-231	1.775E-08	3.757E-07	6.566E-10
Pa-233	8.493E-04	4.093E-08	3.142E-05
Pa-234	1.740E-07	8.810E-14	6.438E-09
Pa-234m	1.160E-04	1.689E-13	4.292E-06
U-232	4.406E-04	1.996E-05	1.630E-05
U-233	5.850E-04	6.073E-02	2.165E-05
U-234	2.841E-04	4.569E-02	1.051E-05
U-235	6.920E-05	3.202E+01	2.560E-06
U-235m	3.717E-02	1.208E-09	1.375E-03
U-236	2.080E-04	3.255E+00	7.696E-06
U-237	5.083E-06	6.229E-11	1.881E-07
U-238	1.160E-04	3.451E+02	4.292E-06
Np-237	8.493E-04	1.205E+00	3.143E-05
Np-239	6.722E-03	2.898E-08	2.487E-04
Pu-238	1.409E-01	8.226E-03	5.212E-03
Pu-239	3.719E-02	5.997E-01	1.376E-03
Pu-240	2.847E-02	1.255E-01	1.054E-03
Pu-241	2.064E-01	1.994E-03	7.636E-03
Am-241	8.449E-01	2.466E-01	3.126E-02
Am-243	6.722E-03	3.366E-02	2.487E-04
Cm-242	4.488E-11	1.356E-14	1.661E-12
Cm-243	3.038E-03	6.196E-05	1.124E-04
Cm-244	6.771E-02	8.320E-04	2.505E-03

WVMP SAR Reference 3-9

Melter Heal (sp) with Shard Data_062714.rad, C. Brandjes,
Ameripphysics, LLC, Knoxville, Tennessee, June 27, 2014.

cayed Source:

Isotope	Ci	Gm	TBq
C-14	3.465E-03	7.736E-04	1.282E-04
K-40	1.500E-02	2.121E+03	5.550E-04
Mn-54	1.437E-06	1.853E-10	5.318E-08
Co-60	3.157E-03	2.790E-06	1.168E-04
Ni-63	1.520E-01	2.691E-03	5.622E-03
Sr-90	3.120E+01	2.259E-01	1.154E+00
Y-90	3.121E+01	5.739E-05	1.155E+00
Zr-95	1.299E-20	6.045E-25	4.805E-22
Nb-95	2.864E-20	7.283E-25	1.060E-21
Nb-95m	1.487E-22	3.900E-28	5.502E-24
Tc-99	2.010E-03	1.190E-01	7.437E-05
Cs-137	5.419E+02	6.234E+00	2.005E+01
Ba-137m	5.116E+02	9.506E-07	1.893E+01
Eu-154	8.123E-02	3.005E-04	3.005E-03
Hg-206	9.794E-16	8.744E-24	3.624E-17
Ti-206	6.881E-14	3.167E-22	2.546E-15
Ti-207	2.559E-09	1.344E-17	9.468E-11
Ti-208	2.717E-03	9.176E-12	1.005E-04
Ti-209	8.094E-08	1.979E-16	2.995E-09
Ti-210	6.540E-11	9.495E-20	2.420E-12
Pb-209	3.747E-06	8.129E-13	1.386E-07
Pb-210	5.155E-08	6.709E-10	1.907E-09
Pb-211	2.566E-09	1.039E-16	9.494E-11
Pb-212	7.563E-03	5.443E-09	2.798E-04
Pb-214	3.114E-07	9.497E-15	1.152E-08
Bi-209	8.103E-25	9.000E-09	2.998E-26
Bi-210	5.139E-08	4.142E-13	1.901E-09
Bi-211	2.566E-09	6.248E-18	9.494E-11
Bi-212	7.563E-03	5.162E-10	2.798E-04
Bi-213	3.747E-06	1.935E-13	1.386E-07
Bi-214	3.114E-07	7.053E-15	1.152E-08
Bi-215	2.100E-15	1.777E-23	7.768E-17
Po-210	4.712E-08	1.049E-11	1.743E-09
Po-211	7.005E-12	6.760E-23	2.592E-13
Po-212	4.844E-03	2.713E-20	1.792E-04
Po-213	3.667E-06	2.907E-22	1.357E-07
Po-214	3.114E-07	9.668E-22	1.152E-08
Po-215	2.566E-09	8.704E-23	9.494E-11
Po-216	7.563E-03	2.172E-14	2.798E-04
Po-218	3.114E-07	1.119E-15	1.152E-08
At-215	1.026E-14	1.956E-29	3.798E-16
At-217	3.748E-06	2.328E-18	1.387E-07
At-218	5.917E-11	1.715E-21	2.189E-12
At-219	2.165E-15	2.269E-24	8.009E-17
Rn-217	4.497E-10	4.671E-24	1.664E-11
Rn-218	5.917E-14	4.002E-26	2.189E-15
Rn-219	2.566E-09	1.973E-19	9.494E-11
Rn-220	7.563E-03	8.230E-12	2.798E-04
Rn-222	3.114E-07	2.024E-12	1.152E-08

Fr-221	3.748E-06	2.158E-14	1.387E-07
Fr-223	3.608E-11	9.328E-19	1.335E-12
Ra-223	2.566E-09	5.009E-14	9.494E-11
Ra-224	7.563E-03	4.723E-08	2.798E-04
Ra-225	3.760E-06	9.590E-11	1.391E-07
Ra-226	3.118E-07	3.154E-07	1.154E-08
Ra-228	5.144E-05	1.887E-07	1.903E-06
Ac-225	3.748E-06	6.458E-11	1.387E-07
Ac-227	2.614E-09	3.615E-11	9.672E-11
Ac-228	5.144E-05	2.302E-11	1.903E-06
Th-227	2.548E-09	8.293E-14	9.429E-11
Th-228	7.562E-03	9.225E-06	2.798E-04
Th-229	3.778E-06	1.777E-05	1.398E-07
Th-230	6.047E-05	2.934E-03	2.237E-06
Th-231	6.150E-05	1.157E-10	2.276E-06
Th-232	6.740E-05	6.146E+02	2.494E-06
Th-234	3.740E-04	1.615E-08	1.384E-05
Pa-231	1.554E-08	3.291E-07	5.751E-10
Pa-233	1.052E-03	5.069E-08	3.892E-05
Pa-234	5.610E-07	2.840E-13	2.076E-08
Pa-234m	3.740E-04	5.446E-13	1.384E-05
U-232	7.309E-03	3.311E-04	2.704E-04
U-233	3.350E-03	3.478E-01	1.239E-04
U-234	1.604E-03	2.579E-01	5.933E-05
U-235	6.150E-05	2.846E+01	2.276E-06
U-235m	2.608E-02	8.476E-10	9.649E-04
U-236	1.840E-04	2.879E+00	6.808E-06
U-237	7.365E-06	9.025E-11	2.725E-07
U-238	3.740E-04	1.113E+03	1.384E-05
Np-237	1.052E-03	1.493E+00	3.892E-05
Np-239	5.973E-03	2.575E-08	2.210E-04
Pu-238	1.039E-01	6.067E-03	3.844E-03
Pu-239	2.609E-02	4.207E-01	9.655E-04
Pu-240	2.005E-02	8.836E-02	7.418E-04
Pu-241	2.990E-01	2.889E-03	1.106E-02
Am-241	4.952E-01	1.445E-01	1.832E-02
Am-243	5.973E-03	2.991E-02	2.210E-04
Cm-242	3.084E-10	9.315E-14	1.141E-11
Cm-243	2.162E-03	4.411E-05	8.001E-05
Cm-244	4.696E-02	5.771E-04	1.737E-03
Total Activity:	1.117E+03		4.134E+01

WVMP SAR Reference 3-10

Melter Spout_062614.rad, C. Brandjes, Brandjes,
Ameriphysics, LLC, Knoxville, Tennessee, June 26, 2014.

Isotope	Ci	Gm	TBq
C-14	2.217E-03	4.949E-04	8.201E-05
K-40	8.600E-03	1.216E+03	3.182E-04
Mn-54	4.997E-07	6.443E-11	1.849E-08
Co-60	5.467E-03	4.831E-06	2.023E-04
Ni-63	9.799E-02	1.735E-03	3.626E-03
Sr-90	6.332E+01	4.584E-01	2.343E+00
Y-90	6.333E+01	1.165E-04	2.343E+00
Zr-95	3.172E-22	1.476E-26	1.174E-23
Nb-95	6.994E-22	1.779E-26	2.588E-23
Nb-95m	3.631E-24	9.524E-30	1.344E-25
Tc-99	1.570E-02	9.295E-01	5.809E-04
Cs-137	8.566E+02	9.854E+00	3.169E+01
Ba-137m	8.086E+02	1.503E-06	2.992E+01
Eu-154	1.043E-01	3.857E-04	3.858E-03
Hg-206	7.135E-16	6.370E-24	2.640E-17
Ti-206	5.014E-14	2.308E-22	1.855E-15
Ti-207	1.863E-09	9.781E-18	6.893E-11
Ti-208	1.733E-03	5.852E-12	6.412E-05
Ti-209	5.578E-08	1.364E-16	2.064E-09
Ti-210	4.495E-11	6.527E-20	1.663E-12
Pb-209	2.582E-06	5.602E-13	9.555E-08
Pb-210	3.755E-08	4.888E-10	1.390E-09
Pb-211	1.868E-09	7.567E-17	6.911E-11
Pb-212	4.823E-03	3.471E-09	1.785E-04
Pb-214	2.140E-07	6.528E-15	7.919E-09
Bi-209	5.969E-25	6.629E-09	2.208E-26
Bi-210	3.745E-08	3.018E-13	1.385E-09
Bi-211	1.868E-09	4.548E-18	6.911E-11
Bi-212	4.823E-03	3.292E-10	1.785E-04
Bi-213	2.582E-06	1.334E-13	9.554E-08
Bi-214	2.141E-07	4.848E-15	7.921E-09
Bi-215	1.527E-15	1.292E-23	5.648E-17
Po-210	3.454E-08	7.686E-12	1.278E-09
Po-211	5.099E-12	4.921E-23	1.887E-13
Po-212	3.089E-03	1.730E-20	1.143E-04
Po-213	2.527E-06	2.004E-22	9.349E-08
Po-214	2.140E-07	6.646E-22	7.919E-09
Po-215	1.868E-09	6.337E-23	6.911E-11
Po-216	4.823E-03	1.385E-14	1.784E-04
Po-218	2.141E-07	7.689E-16	7.921E-09
At-215	7.472E-15	1.424E-29	2.765E-16
At-217	2.583E-06	1.605E-18	9.555E-08
At-218	4.067E-11	1.179E-21	1.505E-12
At-219	1.574E-15	1.650E-24	5.823E-17
Rn-217	3.099E-10	3.219E-24	1.147E-11
Rn-218	4.067E-14	2.751E-26	1.505E-15
Rn-219	1.868E-09	1.436E-19	6.911E-11
Rn-220	4.823E-03	5.248E-12	1.784E-04
Rn-222	2.141E-07	1.392E-12	7.921E-09

Fr-221	2.583E-06	1.487E-14	9.555E-08
Fr-223	2.623E-11	6.782E-19	9.705E-13
Ra-223	1.868E-09	3.647E-14	6.911E-11
Ra-224	4.823E-03	3.012E-08	1.784E-04
Ra-225	2.591E-06	6.607E-11	9.585E-08
Ra-226	2.143E-07	2.168E-07	7.930E-09
Ra-228	3.409E-05	1.250E-07	1.261E-06
Ac-225	2.583E-06	4.451E-11	9.555E-08
Ac-227	1.901E-09	2.628E-11	7.033E-11
Ac-228	3.409E-05	1.525E-11	1.261E-06
Th-227	1.854E-09	6.035E-14	6.861E-11
Th-228	4.822E-03	5.883E-06	1.784E-04
Th-229	2.602E-06	1.224E-05	9.629E-08
Th-230	3.892E-05	1.888E-03	1.440E-06
Th-231	3.950E-05	7.432E-11	1.462E-06
Th-232	4.340E-05	3.958E+02	1.606E-06
Th-234	2.410E-04	1.041E-08	8.917E-06
Pa-231	1.066E-08	2.258E-07	3.946E-10
Pa-233	7.086E-04	3.414E-08	2.622E-05
Pa-234	3.615E-07	1.830E-13	1.337E-08
Pa-234m	2.410E-04	3.510E-13	8.917E-06
U-232	4.660E-03	2.111E-04	1.724E-04
U-233	2.160E-03	2.242E-01	7.992E-05
U-234	1.034E-03	1.664E-01	3.827E-05
U-235	3.950E-05	1.828E+01	1.462E-06
U-235m	3.007E-02	9.774E-10	1.113E-03
U-236	1.190E-04	1.862E+00	4.403E-06
U-237	4.556E-06	5.583E-11	1.686E-07
U-238	2.410E-04	7.170E+02	8.917E-06
Np-237	7.086E-04	1.005E+00	2.622E-05
Np-239	4.545E-03	1.959E-08	1.681E-04
Pu-238	1.139E-01	6.653E-03	4.215E-03
Pu-239	3.009E-02	4.852E-01	1.113E-03
Pu-240	2.294E-02	1.011E-01	8.488E-04
Pu-241	1.850E-01	1.787E-03	6.844E-03
Am-241	3.804E-01	1.110E-01	1.408E-02
Am-243	4.545E-03	2.276E-02	1.681E-04
Cm-242	1.047E-11	3.164E-15	3.876E-13
Cm-243	1.854E-03	3.781E-05	6.860E-05
Cm-244	4.067E-02	4.998E-04	1.505E-03

WVMP SAR Reference 3-11

"Nuclear Decay Data for Dosimetric Calculations," Ann. ICRP, 38(3), 1-96, 2008, ICRP Paper 107, International Commission on Radiation Protection.

Annex A. Radionuclides of the ICRP-07 Collection

ANNEX A. RADIONUCLIDES OF THE ICRP-07 COLLECTION

(A1) The 1252 radionuclides of the ICRP-07 collection are listed in Table A.1 in order of atomic number. Indented on the line following the radionuclide is the identity of the daughter nuclide formed by the nuclear transformation (nt) of the parent, along with the fraction of the parent's transformation creating the daughter. If the daughter nucleus is stable then it is shown in italics. The half-life, decay mode, and energy emitted per nuclear transformation are also shown.

(A2) The units of the half-life are abbreviated as: μ s - microsecond, ms - millisecond, s - second, m - minute, d - day, and y - year. The decay modes are abbreviated as: A - alpha, B- - beta minus, B+ - beta plus, EC - electron capture, IT - isomeric transition, SF-spontaneous fission. The contribution of fission fragments and neutrons associated with spontaneous fission are included in the total energy.

Table A.1 Properties of the radionuclides of the ICRP-07 collection.

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
1	Hydrogen	H-3	12.32 y	B-	—	0.005	—	0.0057
			<i>He-3</i>	1.00				
4	Beryllium	Be-7	53.22 d	EC	—	<E-04	0.0499	0.0499
			<i>Li-7</i>	1.00				
		Be-10	1.51E+6 y	B-	—	0.2525	—	0.2525
			<i>B-10</i>	1.00				
6	Carbon	C-10	19.255 s	ECB+	—	0.8087	1.7443	2.5531
			<i>B-10</i>	1.00				
		C-11	20.39 m	ECB+	—	0.3847	1.0196	1.4043
			<i>B-11</i>	1.00				
		C-14	5.70E+3 y	B-	—	0.0495	—	0.0495
			<i>N-14</i>	1.00				
7	Nitrogen	N-13	9.965 m	ECB+	—	0.4909	1.0200	1.5109
			<i>C-13</i>	1.00				
		N-16	7.13 s	B-	—	2.7646	4.4932	7.2579
			<i>O-16</i>	1.00				
8	Oxygen	O-14	70.606 s	ECB+	—	0.7763	3.3201	4.0965
			<i>N-14</i>	1.00				
		O-15	122.24 s	ECB+	—	0.7347	1.0210	1.7557
			<i>N-15</i>	1.00				
		O-19	26.464 s	B-	—	1.7608	0.9397	2.7006
			<i>F-19</i>	1.00				
9	Fluorine	F-17	64.49 s	ECB+	—	0.7385	1.0208	1.7593
			<i>O-17</i>	1.00				
		F-18	109.77 m	ECB+	—	0.2416	0.9886	1.2302
			<i>O-18</i>	1.00				
10	Neon	Ne-19	17.22 s	ECB+	—	0.9624	1.0210	1.9834
			<i>F-19</i>	1.00				
		Ne-24	3.38 m	B-	—	0.8035	0.5419	1.3455
			<i>Na-24</i>	1.00				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
11	Sodium	Na-22	2.6019 y	ECB+	—	0.1941	2.1926	2.3866
			<i>Ne-22</i>	1.00				
		Na-24	14.9590 h	B-	—	0.5538	4.1232	4.6770
12	Magnesium		<i>Mg-24</i>	1.00				
		Mg-27	9.458 m	B-	—	0.7021	0.8912	1.5933
			<i>Al-27</i>	1.00				
13	Aluminium	Mg-28	20.915 h	B-	—	0.1610	1.3700	1.5310
			<i>Al-28</i>	1.00				
		Al-26	7.17E+5 y	ECB+	—	0.4444	2.6751	3.1195
14	Silicon		<i>Mg-26</i>	1.00				
		Al-28	2.2414 m	B-	—	1.2417	1.7789	3.0205
			<i>Si-28</i>	1.00				
15	Phosphorus	Al-29	6.56 m	B-	—	0.9764	1.3794	2.3558
			<i>Si-29</i>	1.00				
		Si-31	157.3 m	B-	—	0.5949	0.0009	0.5957
16	Sulphur		<i>P-31</i>	1.00				
		Si-32	132 y	B-	—	0.0686	—	0.0686
			<i>P-32</i>	1.00				
17	Chlorine	P-30	2.498 m	ECB+	—	1.4389	1.0222	2.4610
			<i>Si-30</i>	1.00				
		P-32	14.263 d	B-	—	0.6948	—	0.6948
18	Argon		<i>S-32</i>	1.00				
		P-33	25.34 d	B-	—	0.0764	—	0.0764
			<i>S-33</i>	1.00				
19	Potassium	S-35	87.51 d	B-	—	0.0487	—	0.0487
			<i>Cl-35</i>	1.00				
		S-37	5.05 m	B-	—	0.7998	2.9311	3.7309
20	Calcium		<i>Cl-37</i>	1.00				
		S-38	170.3 m	B-	—	0.4898	1.6953	2.1851
			<i>Cl-38</i>	1.00				
21	Scandium	Cl-34	1.5264 s	ECB+	—	2.0508	1.0212	3.0720
			<i>S-34</i>	1.00				
		Cl-34m	32.00 m	ECB+IT	—	0.4596	2.1127	2.5722
22	Titanium		<i>Cl-34</i>	4.4600E-01				
			<i>S-34</i>	5.5400E-01				
		Cl-36	3.01E+5 y	B-ECB+	—	0.2732	0.0001	0.2733
23	Vanadium		<i>Ar-36</i>	9.8100E-01				
			<i>S-36</i>	1.9000E-02				
		Cl-38	37.24 m	B-	—	1.5504	1.4430	2.9934
24	Chromium		<i>Ar-38</i>	1.00				
		Cl-39	55.6 m	B-	—	0.8246	1.4509	2.2755
			<i>Ar-39</i>	1.00				
25	Manganese	Cl-40	1.35 m	B-	—	1.5265	4.0821	5.6085
			<i>Ar-40</i>	1.00				
		Ar-37	35.04 d	EC	—	0.0023	0.0003	0.0025
26	Iron		<i>Cl-37</i>	1.00				
		Ar-39	269 y	B-	—	0.2188	—	0.2188
			<i>K-39</i>	1.00				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)					
					Alpha	Electron	Photon	Total		
19	Potassium	Ar-41	109.61 m	B-	—	0.4637	1.2836	1.7474		
			<i>K-41</i>	1.00						
		Ar-42	32.9 y	B-	—	0.2325	—	0.2325		
			<i>K-42</i>	1.00						
		Ar-43	5.37 m	B-	—	1.3570	1.5352	2.8921		
			<i>K-43</i>	1.00						
		Ar-44	11.87 m	B-	—	0.5245	1.9376	2.4621		
			<i>K-44</i>	1.00						
		K-38	7.636 m	ECB+	—	1.2107	3.1867	4.3974		
			<i>Ar-38</i>	1.00						
		K-40	1.251E+9 y	B-ECB+	—	0.5218	0.1567	0.6785		
			<i>Ca-40</i>	8.9140E-01						
			<i>Ar-40</i>	1.0860E-01						
		K-42	12.360 h	B-	—	1.4303	0.2787	1.7090		
			<i>Ca-42</i>	1.00						
		K-43	22.3 h	B-	—	0.3097	0.9641	1.2739		
			<i>Ca-43</i>	1.00						
20	Calcium	K-44	22.13 m	B-	—	1.4567	2.3846	3.8413		
			<i>Ca-44</i>	1.00						
		K-45	17.3 m	B-	—	0.9959	1.8360	2.8319		
			<i>Ca-45</i>	1.00						
		K-46	105 s	B-	—	2.3161	2.8710	5.1871		
			<i>Ca-46</i>	1.00						
		Ca-41	1.02E+5 y	EC	—	0.0027	0.0005	0.0032		
			<i>K-41</i>	1.00						
		Ca-45	162.67 d	B-	—	0.0772	<E-04	0.0772		
			<i>Sc-45</i>	1.00						
		Ca-47	4.536 d	B-	—	0.3521	1.0521	1.4042		
			<i>Sc-47</i>	1.00						
		Ca-49	8.718 m	B-	—	0.8693	3.1675	4.0369		
			<i>Sc-49</i>	1.00						
		21	Scandium	Sc-42m	62.0 s	ECB+	—	1.2565	4.2042	5.4607
					<i>Ca-42</i>	1.00				
				Sc-43	3.891 h	ECB+	—	0.4195	0.9841	1.4035
	<i>Ca-43</i>			1.00						
Sc-44	3.97 h			ECB+	—	0.5961	2.1369	2.7330		
	<i>Ca-44</i>			1.00						
Sc-44m	58.61 h			ITEC	—	0.0328	0.2743	0.3071		
	<i>Sc-44</i>			9.8800E-01						
	<i>Ca-44</i>			1.2000E-02						
Sc-46	83.79 d			B-	—	0.1121	2.0096	2.1217		
	<i>Ti-46</i>			1.00						
Sc-47	3.3492 d			B-	—	0.1624	0.1089	0.2713		
	<i>Ti-47</i>			1.00						
Sc-48	43.67 h			B-	—	0.2216	3.3529	3.5744		
	<i>Ti-48</i>			1.00						

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
22	Titanium	Sc-49	57.2 m	B-	—	0.8177	0.0010	0.8188
		<i>Ti-49</i>		1.00				
		Sc-50	102.5 s	B-	—	1.6362	3.2022	4.8384
		<i>Ti-50</i>		1.00				
		Ti-44	60.0 y	EC	—	0.0108	0.1396	0.1504
		Sc-44		1.00				
		Ti-45	184.8 m	ECB+	—	0.3728	0.8703	1.2431
		<i>Sc-45</i>		1.00				
		Ti-51	5.76 m	B-	—	0.8692	0.3692	1.2383
		<i>V-51</i>		1.00				
23	Vanadium	Ti-52	1.7 m	B-	—	0.7530	0.1282	0.8812
		<i>V-52</i>		1.00				
		V-47	32.6 m	ECB+	—	0.8027	0.9951	1.7978
		<i>Ti-47</i>		1.00				
		V-48	15.9735 d	ECB+	—	0.1526	2.9140	3.0666
		<i>Ti-48</i>		1.00				
		V-49	330 d	EC	—	0.0035	0.0009	0.0045
		<i>Ti-49</i>		1.00				
		V-50	1.50E+17 y	ECB-	—	0.0158	1.4235	1.4393
		<i>Ti-50</i>		8.3000E-01				
24	Chromium	<i>Cr-50</i>		1.7000E-01				
		V-52	3.743 m	B-	—	1.0684	1.4449	2.5133
		<i>Cr-52</i>		1.00				
		V-53	1.61 m	B-	—	1.0048	1.0382	2.0430
		<i>Cr-53</i>		1.00				
		Cr-48	21.56 h	ECB+	—	0.0086	0.4363	0.4449
		V-48		1.00				
		Cr-49	42.3 m	ECB+	—	0.6047	1.0538	1.6584
		V-49		1.00				
		Cr-51	27.7025 d	EC	—	0.0038	0.0329	0.0367
25	Manganese	<i>V-51</i>		1.00				
		Cr-55	3.497 m	B-	—	1.1007	0.0007	1.1013
		<i>Mn-55</i>		1.00				
		Cr-56	5.94 m	B-	—	0.6083	0.0918	0.7000
		<i>Mn-56</i>		1.00				
		Mn-50m	1.75 m	ECB+	—	1.5243	4.6397	6.1640
		<i>Cr-50</i>		1.00				
		Mn-51	46.2 m	ECB+	—	0.9344	0.9977	1.9321
		Cr-51		1.00				
		Mn-52m	21.1 m	ECB+IT	—	1.1321	2.4086	3.5407
26	Iron	<i>Mn-52</i>		1.7500E-02				
		<i>Cr-52</i>		9.8250E-01				
		Mn-52	5.591 d	ECB+	—	0.0750	3.4585	3.5335
		<i>Cr-52</i>		1.00				
		Mn-53	3.7E+6 y	EC	—	0.0040	0.0014	0.0053
		<i>Cr-53</i>		1.00				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
26	Iron	Mn-54	312.12 d	ECB+B-	—	0.0042	0.8360	0.8402
			<i>Cr-54</i>	1.00				
			<i>Fe-54</i>	2.9000E-06				
		Mn-56	2.5789 h	B-	—	0.8299	1.6916	2.5215
			<i>Fe-56</i>	1.00				
		Mn-57	85.4 s	B-	—	1.1013	0.0996	1.2009
			<i>Fe-57</i>	1.00				
		Mn-58m	65.2 s	B-	—	1.7443	2.3854	4.1297
			<i>Fe-58</i>	1.00				
		Fe-52	8.275 h	ECB+	—	0.1917	0.7405	0.9322
			Mn-52m	1.00				
		Fe-53	8.51 m	ECB+	—	1.1013	1.1782	2.2795
			Mn-53	1.00				
		Fe-53m	2.526 m	IT	—	0.0023	3.0547	3.0570
			<i>Fe-53</i>	1.00				
		Fe-55	2.737 y	EC	—	0.0042	0.0017	0.0058
			<i>Mn-55</i>	1.00				
		Fe-59	44.495 d	B-	—	0.1179	1.1883	1.3062
			<i>Co-59</i>	1.00				
27	Cobalt	Fe-60	1.5E+6 y	B-	—	0.0647	—	0.0647
			<i>Co-60m</i>	1.00				
		Fe-61	5.98 m	B-	—	1.0934	1.3910	2.4844
			<i>Co-61</i>	1.00				
		Fe-62	68 s	B-	—	0.8258	0.5061	1.3319
			<i>Co-62</i>	1.00				
		Co-54m	1.48 m	ECB+	—	2.0484	3.9306	5.9790
			<i>Fe-54</i>	1.00				
		Co-55	17.53 h	ECB+	—	0.4312	1.9960	2.4272
			<i>Fe-55</i>	1.00				
		Co-56	77.23 d	ECB+	—	0.1198	3.6404	3.7602
			<i>Fe-56</i>	1.00				
		Co-57	271.74 d	EC	—	0.0186	0.1252	0.1439
			<i>Fe-57</i>	1.00				
		Co-58	70.86 d	ECB+	—	0.0340	0.9749	1.0089
			<i>Fe-58</i>	1.00				
		Co-58m	9.04 h	IT	—	0.0229	0.0020	0.0249
			<i>Co-58</i>	1.00				
		Co-60	5.2713 y	B-	—	0.0969	2.5038	2.6007
			<i>Ni-60</i>	1.00				
		Co-60m	10.467 m	ITB-	—	0.0565	0.0067	0.0632
			<i>Co-60</i>	9.9760E-01				
			<i>Ni-60</i>	2.4000E-03				
		Co-61	1.650 h	B-	—	0.4664	0.0970	0.5634
			<i>Ni-61</i>	1.00				
		Co-62	1.50 m	B-	—	1.6336	1.6050	3.2386
			<i>Ni-62</i>	1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
28	Nickel	Co-62m	13.91 m	B- <i>Ni-62</i>	—	1.0974	2.6923	3.7897
		Ni-56	6.075 d	ECB+ <i>Co-56</i>	—	0.0073	1.7207	1.7280
		Ni-57	35.60 h	ECB+ <i>Co-57</i>	—	0.1571	1.9382	2.0953
		Ni-59	1.01E+5 y	ECB+ <i>Co-59</i>	—	0.0045	0.0024	0.0069
		Ni-63	100.1 y	B- <i>Cu-63</i>	—	0.0174	—	0.0174
		Ni-65	2.51719 h	B- <i>Cu-65</i>	—	0.6277	0.5583	1.1860
		Ni-66	54.6 h	B- <i>Cu-66</i>	—	0.0734	—	0.0734
		Cu-57	0.1963 s	ECB+ <i>Ni-57</i>	—	3.5987	1.1407	4.7394
		Cu-59	81.5 s	ECB+ <i>Ni-59</i>	—	1.4892	1.4451	2.9342
		Cu-60	23.7 m	ECB+ <i>Ni-60</i>	—	0.8975	3.9111	4.8087
29	Copper	Cu-61	3.333 h	ECB+ <i>Ni-61</i>	—	0.3090	0.8237	1.1327
		Cu-62	9.673 m	ECB+ <i>Ni-62</i>	—	1.2843	1.0069	2.2912
		Cu-64	12.700 h	ECB+B- <i>Ni-64</i>	—	0.1248	0.1855	0.3102
		Cu-66	5.120 m	B- <i>Zn-66</i>	—	1.0664	0.0978	1.1642
		Cu-67	61.83 h	B- <i>Zn-67</i>	—	0.1504	0.1154	0.2657
		Cu-69	2.85 m	B- <i>Zn-69</i>	—	0.8863	0.5284	1.4147
		Zn-60	2.38 m	ECB+ <i>Cu-60</i>	—	1.1301	1.5282	2.6584
		Zn-61	89.1 s	ECB+ <i>Cu-61</i>	—	1.8571	1.5327	3.3898
		Zn-62	9.186 h	ECB+ <i>Cu-62</i>	—	0.0326	0.4431	0.4757
		Zn-63	38.47 m	ECB+ <i>Cu-63</i>	—	0.9204	1.0967	2.0171
30	Zinc	Zn-65	244.06 d	ECB+ <i>Cu-65</i>	—	0.0069	0.5819	0.5888
		Zn-69m	13.76 h	ITB- <i>Zn-69</i>	—	0.0226	0.4162	0.4388
		Zn-69	56.4 m	B- <i>Ga-69</i>	—	0.3216	<E-04	0.3216

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
31	Gallium	Zn-71m	3.96 h	B-	—	0.5430	1.5606	2.1037
		<i>Ga-71</i>		1.00				
		Zn-71	2.45 m	B-	—	1.0474	0.3150	1.3624
		<i>Ga-71</i>		1.00				
		Zn-72	46.5 h	B-	—	0.1021	0.1519	0.2541
		<i>Ga-72</i>		1.00				
		Ga-64	2.627 m	ECB+	—	1.7031	3.3726	5.0756
		<i>Zn-64</i>		1.00				
		Ga-65	15.2 m	ECB+	—	0.8158	1.1650	1.9808
		<i>Zn-65</i>		1.00				
		Ga-66	9.49 h	ECB+	—	0.9634	2.4944	3.4577
		<i>Zn-66</i>		1.00				
		Ga-67	3.2612 d	EC	—	0.0363	0.1595	0.1959
		<i>Zn-67</i>		1.00				
		Ga-68	67.71 m	ECB+	—	0.7379	0.9487	1.6866
		<i>Zn-68</i>		1.00				
		Ga-70	21.14 m	B-EC	—	0.6441	0.0073	0.6514
		<i>Ge-70</i>		9.9590E-01				
		<i>Zn-70</i>		4.1000E-03				
		Ga-72	14.10 h	B-	—	0.5060	2.7071	3.2131
		<i>Ge-72</i>		1.00				
32	Germanium	Ga-73	4.86 h	B-	—	0.4999	0.3520	0.8519
		<i>Ge-73</i>		1.00				
		Ga-74	8.12 m	B-	—	0.9945	3.1540	4.1486
		<i>Ge-74</i>		1.00				
		Ge-66	2.26 h	ECB+	—	0.0984	0.6780	0.7764
		<i>Ga-66</i>		1.00				
		Ge-67	18.9 m	ECB+	—	1.1688	1.4254	2.5942
		<i>Ga-67</i>		1.00				
		Ge-68	270.95 d	EC	—	0.0050	0.0041	0.0091
		<i>Ga-68</i>		1.00				
		Ge-69	39.05 h	ECB+	—	0.1203	0.9505	1.0708
		<i>Ga-69</i>		1.00				
		Ge-71	11.43 d	EC	—	0.0050	0.0042	0.0092
		<i>Ga-71</i>		1.00				
33	Arsenic	Ge-75	82.78 m	B-	—	0.4206	0.0352	0.4558
		<i>As-75</i>		1.00				
		Ge-77	11.30 h	B-	—	0.6493	1.0787	1.7280
		<i>As-77</i>		1.00				
		Ge-78	88 m	B-	—	0.2273	0.2781	0.5053
		<i>As-78</i>		1.00				
		As-68	151.6 s	ECB+	—	1.9985	3.7113	5.7097
		<i>Ge-68</i>		1.00				
		As-69	15.23 m	ECB+	—	1.2182	1.1431	2.3613
		<i>Ge-69</i>		1.00				
		As-70	52.6 m	ECB+	—	0.8799	4.2528	5.1327
		<i>Ge-70</i>		1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
34	Selenium	As-71	65.28 h	ECB+	—	0.1167	0.5765	0.6932
		Ge-71	1.00					
		As-72	26.0 h	ECB+	—	1.0409	1.7832	2.8240
		Ge-72	1.00					
		As-73	80.30 d	EC	—	0.0606	0.0159	0.0765
		Ge-73	1.00					
		As-74	17.77 d	ECB+B-	—	0.2658	0.7582	1.0241
		Ge-74	6.6000E-01					
		Se-74	3.4000E-01					
		As-76	1.0778 d	B-	—	1.0670	0.4166	1.4836
		Se-76	1.00					
		As-77	38.83 h	B-	—	0.2258	0.0083	0.2342
		Se-77	1.00					
		As-78	90.7 m	B-	—	1.2460	1.3066	2.5525
		Se-78	1.00					
		As-79	9.01 m	B-	—	0.8771	0.0338	0.9109
		Se-79m	9.7188E-01					
		Se-79	2.8121E-02					
		Se-70	41.1 m	ECB+	—	0.2375	0.7211	0.9586
		As-70	1.00					
		Se-71	4.74 m	ECB+	—	1.3844	1.6056	2.9900
		As-71	1.00					
		Se-72	8.40 d	EC	—	0.0228	0.0343	0.0571
		As-72	1.00					
		Se-73	7.15 h	ECB+	—	0.3871	1.0924	1.4795
		As-73	1.00					
		Se-73m	39.8 m	ITECB+	—	0.1642	0.2633	0.4275
		Se-73	7.2600E-01					
		As-73	2.7400E-01					
		Se-75	119.779 d	EC	—	0.0144	0.3890	0.4034
		As-75	1.00					
		Se-77m	17.36 s	IT	—	0.0737	0.0888	0.1625
		Se-77	1.00					
		Se-79	2.95E+5 y	B-	—	0.0529	—	0.0529
		Br-79	1.00					
		Se-79m	3.92 m	ITB-	—	0.0820	0.0138	0.0957
		Se-79	9.9944E-01					
		Br-79	5.6000E-04					
		Se-81	18.45 m	B-	—	0.6108	0.0080	0.6188
		Br-81	1.00					
		Se-81m	57.28 m	ITB-	—	0.0871	0.0183	0.1054
		Se-81	9.9948E-01					
		Br-81	5.2000E-04					
		Se-83	22.3 m	B-	—	0.4528	2.6254	3.0782
		Br-83	1.00					
		Se-83m	70.1 s	B-	—	1.2570	0.9849	2.2419
		Br-83	1.00					

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
35	Bromine	Se-84	3.1 m	B-	—	0.5499	0.4202	0.9701
		Br-84		1.00				
		Br-72	78.6 s	ECB+	—	2.7880	2.9624	5.7504
		Se-72		1.00				
		Br-73	3.4 m	ECB+	—	1.3434	1.4331	2.7765
		Se-73m		9.9881E-01				
		Se-73		1.1920E-03				
		Br-74	25.4 m	ECB+	—	1.0616	4.6130	5.6746
		Se-74		1.00				
		Br-74m	46 m	ECB+	—	1.2747	4.1467	5.4214
		Se-74		1.00				
		Br-75	96.7 m	ECB+	—	0.5283	1.1981	1.7263
		Se-75		1.00				
		Br-76	16.2 h	ECB+	—	0.6497	2.7933	3.4430
		Se-76		1.00				
		Br-76m	1.31 s	ITECB+	—	0.0690	0.0433	0.1123
		Br-76		9.9700E-01				
		Se-76		3.0000E-03				
		Br-77	57.036 h	ECB+	—	0.0094	0.3209	0.3303
		Se-77		1.00				
		Br-77m	4.28 m	IT	—	0.0876	0.0197	0.1073
		Br-77		1.00				
		Br-78	6.46 m	ECB+B-	—	1.0235	1.0336	2.0571
		Se-78		9.9990E-01				
		Kr-78		1.0000E-04				
		Br-80	17.68 m	B-ECB+	—	0.7247	0.0761	0.8007
		Kr-80		9.1700E-01				
		Se-80		8.3000E-02				
		Br-80m	4.4205 h	IT	—	0.0617	0.0242	0.0859
		Br-80		1.00				
		Br-82	35.30 h	B-	—	0.1454	2.6389	2.7844
		Kr-82		1.00				
		Br-82m	6.13 m	ITB-	—	0.0704	0.0081	0.0785
		Br-82		9.7600E-01				
		Kr-82		2.4000E-02				
		Br-83	2.40 h	B-	—	0.3258	0.0069	0.3326
		Kr-83m		9.9845E-01				
		Kr-83		1.5519E-03				
		Br-84	31.80 m	B-	—	1.2364	1.7595	2.9959
		Kr-84		1.00				
		Br-84m	6.0 m	B-	—	0.8983	2.7684	3.6667
		Kr-84		1.00				
		Br-85	2.90 m	B-	—	1.0384	0.0660	1.1045
		Kr-85m		9.9779E-01				
		Kr-85		2.2112E-03				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
36	Krypton	Kr-74	11.50 m	ECB+	—	0.6006	1.0579	1.6585
		Br-74	1.00					
		Kr-75	4.29 m	ECB+	—	1.5430	1.2800	2.8230
		Br-75	1.00					
		Kr-76	14.8 h	EC	—	0.0154	0.4276	0.4430
		Br-76	9.9189E-01					
		Br-76m	8.1144E-03					
		Kr-77	74.4 m	ECB+	—	0.6744	1.0384	1.7128
		Br-77	9.0386E-01					
		Br-77m	9.6135E-02					
		Kr-79	35.04 h	ECB+	—	0.0237	0.2549	0.2786
		Br-79	1.00					
		Kr-81	2.29E+5 y	EC	—	0.0052	0.0072	0.0124
		Br-81	1.00					
		Kr-81m	13.10 s	ITEC	—	0.0596	0.1309	0.1905
		Kr-81	9.9998E-01					
		Br-81	2.5000E-05					
		Kr-83m	1.83 h	IT	—	0.0388	0.0028	0.0416
		Kr-83	1.00					
		Kr-85	10.756 y	B-	—	0.2507	0.0022	0.2529
		Rb-85	1.00					
		Kr-85m	4.480 h	B-IT	—	0.2549	0.1574	0.4123
		Kr-85	2.1400E-01					
		Rb-85	7.8600E-01					
		Kr-87	76.3 m	B-	—	1.3281	0.7919	2.1201
		Rb-87	1.00					
		Kr-88	2.84 h	B-	—	0.3689	1.9538	2.3227
		Rb-88	1.00					
		Kr-89	3.15 m	B-	—	1.3705	1.9313	3.3018
		Rb-89	1.00					
37	Rubidium	Rb-77	3.77 m	ECB+	—	1.6865	1.5452	3.2318
		Kr-77	1.00					
		Rb-78	17.66 m	ECB+	—	1.2889	4.0918	5.3808
		Kr-78	1.00					
		Rb-78m	5.74 m	ECB+IT	—	1.4992	3.2149	4.7141
		Rb-78	1.0000E-01					
		Kr-78	9.0000E-01					
		Rb-79	22.9 m	ECB+	—	0.8099	1.4493	2.2592
		Kr-79	1.00					
		Rb-80	33.4 s	ECB+	—	2.0455	1.1900	3.2355
		Kr-80	1.00					
		Rb-81	4.576 h	ECB+	—	0.1222	0.5081	0.6304
		Kr-81m	9.5691E-01					
		Kr-81	4.3091E-02					
		Rb-81m	30.5 m	ITECB+	—	0.0817	0.0303	0.1120
		Rb-81	9.7600E-01					
		Kr-81	2.3786E-02					
		Kr-81m	2.1355E-04					

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
38	Strontium	Rb-82	1.273 m	ECB+	—	1.4112	1.1083	2.5195
		<i>Kr-82</i>		1.00				
		Rb-82m	6.472 h	ECB+	—	0.0935	2.9212	3.0147
		<i>Kr-82</i>		1.00				
		Rb-83	86.2 d	EC	—	0.0083	0.4914	0.4997
		<i>Kr-83m</i>		7.4292E-01				
		<i>Kr-83</i>		2.5708E-01				
		Rb-84	32.77 d	ECB+B-	—	0.1633	0.9077	1.0710
		<i>Kr-84</i>		9.6200E-01				
		<i>Sr-84</i>		3.8000E-02				
		Rb-84m	20.26 m	IT	—	0.0813	0.3831	0.4644
		Rb-84		1.00				
		Rb-86	18.642 d	B-EC	—	0.6680	0.0930	0.7610
		<i>Sr-86</i>		9.9995E-01				
		<i>Kr-86</i>		5.2000E-05				
		Rb-86m	1.017 m	IT	—	0.0100	0.5461	0.5561
		Rb-86		1.00				
		Rb-87	4.923E10 y	B-	—	0.1154	—	0.1154
		<i>Sr-87</i>		1.00				
		Rb-88	17.78 m	B-	—	2.0720	0.6370	2.7089
		<i>Sr-88</i>		1.00				
		Rb-89	15.15 m	B-	—	0.9528	2.2430	3.1959
		<i>Sr-89</i>		1.00				
		Rb-90	158 s	B-	—	2.0443	2.0286	4.0729
		<i>Sr-90</i>		1.00				
		Rb-90m	258 s	B-IT	—	1.4104	3.2406	4.6510
		<i>Sr-90</i>		9.7400E-01				
		<i>Rb-90</i>		2.6000E-02				
		Sr-79	2.25 m	ECB+	—	1.8572	1.1801	3.0373
		<i>Rb-79</i>		1.00				
		Sr-80	106.3 m	ECB+	—	0.0418	0.4371	0.4789
		<i>Rb-80</i>		1.00				
		Sr-81	22.3 m	ECB+	—	0.9743	1.3866	2.3609
		<i>Rb-81</i>		9.9856E-01				
		<i>Rb-81m</i>		1.4422E-03				
		Sr-82	25.36 d	EC	—	0.0054	0.0079	0.0132
		<i>Rb-82</i>		1.00				
		Sr-83	32.41 h	ECB+	—	0.1604	0.8213	0.9817
		<i>Rb-83</i>		1.00				
		Sr-85	64.84 d	EC	—	0.0089	0.5001	0.5090
		<i>Rb-85</i>		1.00				
		Sr-85m	67.63 m	ITECB+	—	0.0130	0.2177	0.2307
		<i>Sr-85</i>		8.6600E-01				
		<i>Rb-85</i>		1.3400E-01				
		Sr-87m	2.815 h	ITEC	—	0.0672	0.3202	0.3874
		<i>Rb-87</i>		3.0000E-03				
		<i>Sr-87</i>		9.9700E-01				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
39	Yttrium	Sr-89	50.53 d	B-	—	0.5845	<E-04	0.5846
		Y-89	1.00	1.00	—	0.1957	—	0.1957
		Sr-90	28.79 y	B-	—	0.1957	—	0.1957
		Y-90	1.00	1.00	—	0.6549	0.7072	1.3621
		Sr-91	9.63 h	B-	—	0.6549	0.7072	1.3621
		Y-91m	5.8247E-01	5.8247E-01	—	0.2025	1.3368	1.5393
		Y-91	4.1753E-01	4.1753E-01	—	0.2025	1.3368	1.5393
		Sr-92	2.66 h	B-	—	0.8094	2.2637	3.0731
		Y-92	1.00	1.00	—	0.8094	2.2637	3.0731
		Sr-93	7.423 m	B-	—	0.8381	1.4270	2.2651
		Y-93	1.00	1.00	—	0.8381	1.4270	2.2651
		Sr-94	75.3 s	B-	—	1.9658	1.1702	3.1360
		Y-94	1.00	1.00	—	1.9658	1.1702	3.1360
		Y-81	70.4 s	ECB+	—	1.3138	1.3458	2.6596
		Sr-81	1.00	1.00	—	1.3138	1.3458	2.6596
		Y-83	7.08 m	ECB+	—	0.8177	0.8370	1.6546
		Sr-83	1.00	1.00	—	0.8177	0.8370	1.6546
		Y-83m	2.85 m	ECB+IT	—	0.8177	0.8370	1.6546
		Sr-83	6.0000E-01	6.0000E-01	—	1.2253	3.9751	5.2003
		Y-83	4.0000E-01	4.0000E-01	—	1.2253	3.9751	5.2003
		Y-84m	39.5 m	ECB+	—	1.2253	3.9751	5.2003
		Sr-84	1.00	1.00	—	0.4881	1.0795	1.5676
		Y-85	2.68 h	ECB+	—	0.4881	1.0795	1.5676
		Sr-85m	1.00	1.00	—	0.5765	1.3242	1.9007
		Y-85m	4.86 h	ECB+	—	0.5765	1.3242	1.9007
		Sr-85	9.6000E-01	9.6000E-01	—	0.2179	3.5777	3.7956
		Sr-85m	3.9998E-02	3.9998E-02	—	0.2179	3.5777	3.7956
		Y-86	14.74 h	ECB+	—	0.2179	3.5777	3.7956
		Sr-86	1.00	1.00	—	0.0243	0.2203	0.2446
		Y-86m	48 m	ITECB+	—	0.0243	0.2203	0.2446
		Y-86	9.9310E-01	9.9310E-01	—	0.0072	0.4462	0.4534
		Sr-86	6.9000E-03	6.9000E-03	—	0.0072	0.4462	0.4534
		Y-87	79.8 h	ECB+	—	0.0072	0.4462	0.4534
		Sr-87m	1.00	1.00	—	0.0794	0.3072	0.3866
		Y-87m	13.37 h	ITECB+	—	0.0794	0.3072	0.3866
		Y-87	9.8430E-01	9.8430E-01	—	0.0067	2.6950	2.7017
		Sr-87	1.5700E-02	1.5700E-02	—	0.0067	2.6950	2.7017
		Y-88	106.65 d	ECB+	—	0.0067	2.6950	2.7017
		Sr-88	1.00	1.00	—	0.0077	0.9014	0.9091
		Y-89m	15.663 s	IT	—	0.0077	0.9014	0.9091
		Y-89	1.00	1.00	—	0.9331	<E-04	0.9331
		Y-90	64.10 h	B-	—	0.9331	<E-04	0.9331
		Zr-90	1.00	1.00	—	0.0470	0.6354	0.6823
		Y-90m	3.19 h	ITB-	—	0.0470	0.6354	0.6823
		Y-90	9.9998E-01	9.9998E-01	—	0.6032	0.0031	0.6063
		Zr-90	1.8000E-05	1.8000E-05	—	0.6032	0.0031	0.6063
		Y-91	58.51 d	B-	—	0.6032	0.0031	0.6063
		Zr-91	1.00	1.00	—	0.6032	0.0031	0.6063

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
40	Zirconium	Y-91m	49.71 m	IT	—	0.0279	0.5283	0.5562
		Y-91	Y-91	1.00	—	—	—	—
		Y-92	3.54 h	B-	—	1.4494	0.2517	1.7011
		Zr-92	Zr-92	1.00	—	—	—	—
		Y-93	10.18 h	B-	—	1.1721	0.0961	1.2682
		Zr-93	Zr-93	1.00	—	—	—	—
		Y-94	18.7 m	B-	—	1.8133	0.7725	2.5858
		Zr-94	Zr-94	1.00	—	—	—	—
		Y-95	10.3 m	B-	—	1.4288	1.1080	2.5368
		Zr-95	Zr-95	1.00	—	—	—	—
		Zr-85	7.86 m	ECB+	—	1.3252	1.4718	2.7970
		Y-85m	Y-85m	9.6841E-01	—	—	—	—
		Y-85	Y-85	3.1588E-02	—	—	—	—
		Zr-86	16.5 h	ECB+	—	0.0310	0.2952	0.3263
		Y-86	Y-86	1.00	—	—	—	—
		Zr-87	1.68 h	ECB+	—	0.8218	0.9271	1.7488
		Y-87m	Y-87m	9.9704E-01	—	—	—	—
		Y-87	Y-87	2.9636E-03	—	—	—	—
		Zr-88	83.4 d	EC	—	0.0160	0.3918	0.4078
		Y-88	Y-88	1.00	—	—	—	—
		Zr-89	78.41 h	ECB+	—	0.1019	1.1581	1.2600
		Y-89	Y-89	1.00	—	—	—	—
		Zr-89m	4.161 m	ITECB+	—	0.0318	0.6344	0.6662
		Zr-89	Zr-89	9.3770E-01	—	—	—	—
		Y-89	Y-89	6.2300E-02	—	—	—	—
41	Niobium	Zr-93	1.53E+6 y	B-	—	0.0194	—	0.0194
		Nb-93m	Nb-93m	9.7500E-01	—	—	—	—
		Nb-93	Nb-93	2.5000E-02	—	—	—	—
		Zr-95	64.032 d	B-	—	0.1185	0.7321	0.8506
		Nb-95	Nb-95	9.8920E-01	—	—	—	—
		Nb-95m	Nb-95m	1.0802E-02	—	—	—	—
		Zr-97	16.744 h	B-	—	0.7212	0.8792	1.6004
		Nb-97	Nb-97	1.00	—	—	—	—
		Nb-87	3.75 m	ECB+	—	1.7709	1.2202	2.9911
		Zr-87	Zr-87	1.00	—	—	—	—
		Nb-88	14.5 m	ECB+	—	1.4555	4.2188	5.6743
		Zr-88	Zr-88	1.00	—	—	—	—
		Nb-88m	7.78 m	ECB+	—	1.4589	4.1063	5.5652
		Zr-88	Zr-88	1.00	—	—	—	—
		Nb-89	2.03 h	ECB+	—	1.0859	1.3668	2.4527
		Zr-89	Zr-89	9.8772E-01	—	—	—	—
		Zr-89m	Zr-89m	1.2278E-02	—	—	—	—
41	Niobium	Nb-89m	66 m	ECB+	—	0.7855	1.3058	2.0913
		Zr-89m	Zr-89m	1.00	—	—	—	—
		Nb-90	14.60 h	ECB+	—	0.4032	4.2135	4.6167
		Zr-90	Zr-90	1.00	—	—	—	—

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
		Nb-91	680 y	ECB+	—	0.0058	0.0118	0.0176
		<i>Zr-91</i>		1.00				
		Nb-91m	60.86 d	ITECB+	—	0.0963	0.0340	0.1303
		Nb-91		9.6600E-01				
		<i>Zr-91</i>		3.4000E-02				
		Nb-92	3.47E+7 y	EC	—	0.0079	1.5055	1.5133
		<i>Zr-92</i>		1.00				
		Nb-92m	10.15 d	ECB+	—	0.0065	0.9689	0.9753
		<i>Zr-92</i>		1.00				
		Nb-93m	16.13 y	IT	—	0.0294	0.0020	0.0314
		<i>Nb-93</i>		1.00				
		Nb-94	2.03E+4 y	B-	—	0.1684	1.5581	1.7265
		<i>Mo-94</i>		1.00				
		Nb-94m	6.263 m	ITB-	—	0.0356	0.0117	0.0473
		Nb-94		9.9500E-01				
		<i>Mo-94</i>		5.0000E-03				
		Nb-95	34.991 d	B-	—	0.0446	0.7645	0.8091
		<i>Mo-95</i>		1.00				
		Nb-95m	3.61 d	ITB-	—	0.1800	0.0697	0.2497
		Nb-95		9.4400E-01				
		<i>Mo-95</i>		5.6000E-02				
		Nb-96	23.35 h	B-	—	0.2534	2.4614	2.7149
		<i>Mo-96</i>		1.00				
		Nb-97	72.1 m	B-	—	0.4683	0.6650	1.1333
		<i>Mo-97</i>		1.00				
		Nb-98m	51.3 m	B-	—	0.7636	2.8177	3.5813
		<i>Mo-98</i>		1.00				
		Nb-99	15.0 s	B-	—	1.5132	0.1743	1.6875
		<i>Mo-99</i>		1.00				
		Nb-99m	2.6 m	B-IT	—	1.4148	0.7567	2.1714
		<i>Mo-99</i>		9.8000E-01				
		Nb-99		2.0000E-02				
42	Molybdenum	Mo-89	2.11 m	ECB+	—	1.9620	1.2173	3.1793
		Nb-89		1.00				
		Mo-90	5.56 h	ECB+	—	0.2107	0.8331	1.0438
		Nb-90		1.00				
		Mo-91	15.49 m	ECB+	—	1.4510	0.9773	2.4283
		Nb-91		9.9966E-01				
		Nb-91m		3.4232E-04				
		Mo-91m	64.6 s	ECB+IT	—	0.5559	1.3857	1.9416
		Nb-91m		5.0000E-01				
		Mo-91		5.0000E-01				
		Mo-93	4.0E+3 y	EC	—	0.0056	0.0107	0.0163
		Nb-93m		8.8000E-01				
		<i>Nb-93</i>		1.2000E-01				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
43	Technetium	Mo-93m	6.85 h	ITEC	—	0.1045	2.3183	2.4228
		Mo-93		9.9880E-01				
		Nb-93		1.2000E-03				
		Mo-99	65.94 h	B-	—	0.3929	0.1484	0.5413
		Tc-99m		8.7730E-01				
		Tc-99		1.2270E-01				
		Mo-101	14.61 m	B-	—	0.5524	1.4706	2.0230
		Tc-101		1.00				
		Mo-102	11.3 m	B-	—	0.3509	0.0185	0.3694
		Tc-102		1.00				
		Tc-91	3.14 m	ECB+	—	1.6985	2.4847	4.1832
		Mo-91		9.9302E-01				
		Mo-91m		6.9789E-03				
		Tc-91m	3.3 m	ECB+	—	1.8871	1.4231	3.3102
		Mo-91m		9.7976E-01				
		Mo-91		2.0245E-02				
		Tc-92	4.25 m	ECB+	—	1.7984	3.8278	5.6263
		Mo-92		1.00				
		Tc-93	2.75 h	ECB+	—	0.0436	1.5686	1.6122
		Mo-93		1.00				
		Tc-93m	43.5 m	ITECB+	—	0.1015	0.9522	1.0537
		Tc-93		7.6600E-01				
		Mo-93		2.3400E-01				
		Tc-94	293 m	ECB+	—	0.0475	2.6608	2.7083
		Mo-94		1.00				
		Tc-94m	52.0 m	ECB+	—	0.7543	1.9567	2.7110
		Mo-94		1.00				
		Tc-95	20.0 h	EC	—	0.0069	0.7965	0.8033
		Mo-95		1.00				
		Tc-95m	61 d	ECB+IT	—	0.0154	0.6887	0.7042
		Tc-95		3.8800E-02				
		Mo-95		9.6120E-01				
		Tc-96	4.28 d	EC	—	0.0089	2.5032	2.5121
		Mo-96		1.00				
		Tc-96m	51.5 m	ITECB+	—	0.0269	0.0480	0.0749
		Tc-96		9.8000E-01				
		Mo-96		2.0000E-02				
		Tc-97	2.6E+6 y	EC	—	0.0055	0.0114	0.0169
		Mo-97		1.00				
		Tc-97m	90.1 d	IT	—	0.0869	0.0096	0.0964
		Tc-97		1.00				
		Tc-98	4.2E+6 y	B-	—	0.1415	1.4127	1.5542
		Ru-98		1.00				
		Tc-99	2.111E+5 y	B-	—	0.1013	<E-04	0.1013
		Ru-99		1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
44	Ruthenium	Tc-99m	6.015 h	ITB-	—	0.0162	0.1266	0.1428
		Tc-99		9.9996E-01				
		Ru-99		3.7000E-05				
		Tc-101	14.2 m	B-	—	0.4725	0.3367	0.8092
		Ru-101		1.00				
		Tc-102	5.28 s	B-	—	1.9441	0.0808	2.0249
		Ru-102		1.00				
		Tc-102m	4.35 m	B-IT	—	0.7902	2.4744	3.2646
		Tc-102		2.0000E-02				
		Ru-102		9.8000E-01				
		Tc-104	18.3 m	B-	—	1.6014	2.2453	3.8467
		Ru-104		1.00				
		Tc-105	7.6 m	B-	—	1.2708	0.7981	2.0690
		Ru-105		1.00				
		Ru-92	3.65 m	ECB+	—	0.7939	2.0844	2.8783
		Tc-92		1.00				
		Ru-94	51.8 m	ECB+	—	0.0085	0.5197	0.5282
		Tc-94m		1.00				
		Ru-95	1.643 h	ECB+	—	0.0831	1.2419	1.3249
		Tc-95		9.7387E-01				
		Tc-95m		2.6131E-02				
		Ru-97	2.9 d	EC	—	0.0132	0.2408	0.2540
		Tc-97		9.9958E-01				
		Tc-97m		4.2179E-04				
45	Rhodium	Ru-103	39.26 d	B-	—	0.0660	0.4962	0.5622
		Rh-103m		9.8755E-01				
		Rh-103		1.2453E-02				
		Ru-105	4.44 h	B-	—	0.4406	0.7480	1.1886
		Rh-105		1.00				
		Ru-106	373.59 d	B-	—	0.0100	—	0.0100
		Rh-106		1.00				
		Ru-107	3.75 m	B-	—	1.0704	0.3453	1.4157
		Rh-107		1.00				
		Ru-108	4.55 m	B-	—	0.4803	0.0626	0.5429
		Rh-108		1.00				
		Rh-94	70.6 s	ECB+	—	2.9012	3.7634	6.6645
		Ru-94		1.00				
		Rh-95	5.02 m	ECB+	—	0.8973	2.5603	3.4576
		Ru-95		1.00				
		Rh-95m	1.96 m	ITECB+	—	0.1822	0.8973	1.0794
		Rh-95		8.8000E-01				
		Ru-95		1.2000E-01				
		Rh-96	9.90 m	ECB+	—	0.7419	3.9266	4.6685
		Ru-96		1.00				
		Rh-96m	1.51 m	ITECB+	—	0.5673	1.2819	1.8492
		Rh-96		6.0000E-01				
		Ru-96		4.0000E-01				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
		Rh-97	30.7 m	ECB+	—	0.5211	1.4448	1.9660
		Ru-97		1.00				
		Rh-97m	46.2 m	ECB+IT	—	0.1992	2.2017	2.4009
		Ru-97		9.4400E-01				
		Rh-97		5.6000E-02				
		Rh-98	8.7 m	ECB+	—	1.3371	1.8115	3.1486
		Ru-98		1.00				
		Rh-99	16.1 d	ECB+	—	0.0611	0.5627	0.6238
		Ru-99		1.00				
		Rh-99m	4.7 h	ECB+	—	0.0367	0.6511	0.6878
		Ru-99		1.00				
		Rh-100	20.8 h	ECB+	—	0.0494	2.7425	2.7920
		Ru-100		1.00				
		Rh-100m	4.6 m	ITECB+	—	0.0802	0.0637	0.1439
		Rh-100		9.8300E-01				
		Ru-100		1.7000E-02				
		Rh-101	3.3 y	EC	—	0.0267	0.2878	0.3145
		Ru-101		1.00				
		Rh-101m	4.34 d	ECIT	—	0.0199	0.2877	0.3076
		Rh-101		6.4000E-02				
		Ru-101		9.3600E-01				
		Rh-102	207 d	ECB+B-	—	0.1717	0.5060	0.6777
		Ru-102		7.8000E-01				
		Pd-102		2.2000E-01				
		Rh-102m	3.742 y	ECB+IT	—	0.0125	2.1536	2.1661
		Rh-102		2.3300E-03				
		Ru-102		9.9767E-01				
		Rh-103m	56.114 m	IT	—	0.0377	0.0017	0.0394
		Rh-103		1.00				
		Rh-104	42.3 s	B-EC	—	0.9823	0.0124	0.9947
		Pd-104		9.9550E-01				
		Ru-104		4.5000E-03				
		Rh-104m	4.34 m	ITB-	—	0.0846	0.0441	0.1287
		Rh-104		9.9870E-01				
		Pd-104		1.3000E-03				
		Rh-105	35.36 h	B-	—	0.1533	0.0773	0.2306
		Pd-105		1.00				
		Rh-106	29.80 s	B-	—	1.4111	0.2061	1.6172
		Pd-106		1.00				
		Rh-106m	131 m	B-	—	0.3492	2.8526	3.2018
		Pd-106		1.00				
		Rh-107	21.7 m	B-	—	0.4407	0.3133	0.7539
		Pd-107		1.00				
		Rh-108	16.8 s	B-	—	1.8209	0.3172	2.1381
		Pd-108		1.00				
		Rh-109	80 s	B-	—	0.9320	0.2995	1.2315
		Pd-109		1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
46	Palladium	Pd-96	122 s	ECB+	—	0.2257	1.4403	1.6660
			Rh-96m	1.00				
		Pd-97	3.10 m	ECB+	—	0.7524	2.3813	3.1337
			Rh-97	9.8838E-01				
		Pd-98	Rh-97m	1.1622E-02	—	0.0455	0.4154	0.4609
			17.7 m	ECB+				
		Pd-99	Rh-98	1.00	—	0.4499	1.2833	1.7331
			21.4 m	ECB+				
		Pd-100	Rh-99m	9.6647E-01	—	0.0455	0.1231	0.1686
			Rh-99	3.3529E-02				
		Pd-101	3.63 d	EC	—	0.0328	0.3518	0.3846
			Rh-100	1.00				
		Pd-103	8.47 h	ECB+	—	0.0058	0.0146	0.0204
			Rh-101m	9.9730E-01				
		Pd-107	Rh-101	2.7000E-03	—	0.0096	—	0.0096
			16.991 d	EC				
		Pd-109	Rh-103m	9.9875E-01	—	0.4380	0.0118	0.4497
			Rh-103	1.2512E-03				
		Pd-109m	6.5E+6 y	B-	—	0.0777	0.1112	0.1889
			Ag-107	1.00				
		Pd-111	13.7012 h	B-	—	0.8409	0.0478	0.8887
			Ag-109	1.00				
		Pd-112	4.69 m	IT	—	0.0900	0.0051	0.0951
			Pd-109	1.00				
		Pd-114	23.4 m	B-	—	0.5317	0.0259	0.5576
			Ag-111m	9.9756E-01				
47	Silver	Ag-99	Ag-111	2.4368E-03	—	1.3076	2.3092	3.6168
			21.03 h	B-				
		Ag-100m	Ag-112	1.00	—	1.9068	2.8248	4.7316
			2.42 m	B-				
		Ag-101	Ag-114	1.00	—	0.8396	1.5703	2.4099
			11.1 m	ECB+				
		Ag-102	Pd-101	1.00	—	0.8430	3.4092	4.2522
			12.9 m	ECB+				
		Ag-102m	Pd-102	1.00	—	0.3964	1.9933	2.3897
			7.7 m	ECB+IT				
		Ag-103	Ag-102	4.9000E-01	—	0.1973	0.8440	1.0412
			Pd-102	5.1000E-01				
		Ag-104	65.7 m	ECB+	—	0.0917	2.7066	2.7982
			Pd-103	1.00				
		Ag-104	69.2 m	ECB+	—	0.0917	2.7066	2.7982
			Pd-104	1.00				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
		Ag-104m	33.5 m	ECB+IT	—	0.7331	1.8047	2.5377
		Ag-104		7.0000E-04				
		<i>Pd-104</i>		9.9930E-01				
		Ag-105	41.29 d	EC	—	0.0192	0.5138	0.5330
		<i>Pd-105</i>		1.00				
		Ag-105m	7.23 m	ITECB+	—	0.0252	0.0013	0.0265
		Ag-105		9.9660E-01				
		<i>Pd-105</i>		3.4000E-03				
		Ag-106	23.96 m	ECB+B-	—	0.4967	0.6996	1.1963
		<i>Pd-106</i>		9.9000E-01				
		<i>Cd-106</i>		1.0000E-02				
		Ag-106m	8.28 d	EC	—	0.0131	2.8091	2.8222
		<i>Pd-106</i>		1.00				
		Ag-108	2.37 m	B-ECB+	—	0.6071	0.0186	0.6256
		<i>Cd-108</i>		9.7150E-01				
		<i>Pd-108</i>		2.8500E-02				
		Ag-108m	418 y	ECIT	—	0.0159	1.6209	1.6368
		Ag-108		8.7000E-02				
		<i>Pd-108</i>		9.1300E-01				
		Ag-109m	39.6 s	IT	—	0.0770	0.0111	0.0880
		<i>Ag-109</i>		1.00				
		Ag-110	24.6 s	B-EC	—	1.1812	0.0307	1.2119
		<i>Cd-110</i>		9.9700E-01				
		<i>Pd-110</i>		3.0000E-03				
		Ag-110m	249.76 d	B-IT	—	0.0758	2.7606	2.8363
		Ag-110		1.3600E-02				
		<i>Cd-110</i>		9.8640E-01				
		Ag-111	7.45 d	B-	—	0.3539	0.0265	0.3804
		<i>Cd-111</i>		1.00				
		Ag-111m	64.8 s	ITB-	—	0.0568	0.0079	0.0646
		Ag-111		9.9300E-01				
		<i>Cd-111</i>		7.0000E-03				
		Ag-112	3.130 h	B-	—	1.3540	0.6905	2.0445
		<i>Cd-112</i>		1.00				
		Ag-113	5.37 h	B-	—	0.7614	0.0719	0.8333
		<i>Cd-113</i>		9.8261E-01				
		<i>Cd-113m</i>		1.7388E-02				
		Ag-113m	68.7 s	ITB-	—	0.2278	0.2134	0.4412
		Ag-113		6.4000E-01				
		<i>Cd-113</i>		3.6000E-01				
		Ag-114	4.6 s	B-	—	2.1091	0.2589	2.3681
		<i>Cd-114</i>		1.00				
		Ag-115	20.0 m	B-	—	1.0928	0.4831	1.5760
		<i>Cd-115</i>		9.4210E-01				
		<i>Cd-115m</i>		5.7870E-02				
		Ag-116	2.68 m	B-	—	1.7540	2.1473	3.9014
		<i>Cd-116</i>		1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
48	Cadmium	Ag-117	73.6 s	B-	—	1.2813	1.3028	2.5841
		Cd-117		8.4703E-01				
		Cd-117m		1.5297E-01				
		Cd-101	1.36 m	ECB+	—	1.0685	2.4853	3.5538
		Ag-101		1.00				
		Cd-102	5.5 m	ECB+	—	0.0756	0.8380	0.9136
		Ag-102m		9.4624E-01				
		Ag-102		5.3762E-02				
		Cd-103	7.3 m	ECB+	—	0.3636	2.0891	2.4527
		Ag-103		1.00				
		Cd-104	57.7 m	EC	—	0.0306	0.2513	0.2819
		Ag-104m		1.00				
		Cd-105	55.5 m	ECB+	—	0.2167	1.2995	1.5161
		Ag-105m		8.2963E-01				
		Ag-105		1.7037E-01				
		Cd-107	6.50 h	ECB+	—	0.0870	0.0337	0.1207
		Ag-107		1.00				
		Cd-109	461.4 d	EC	—	0.0827	0.0265	0.1092
		Ag-109		1.00				
		Cd-111m	48.50 m	IT	—	0.1066	0.2843	0.3908
		Cd-111		1.00				
		Cd-113	7.7E+15 y	B-	—	0.0926	—	0.0926
		In-113		1.00				
		Cd-113m	14.1 y	B-IT	—	0.1847	<E-04	0.1848
		Cd-113		1.4000E-03				
		In-113		9.9860E-01				
		Cd-115	53.46 h	B-	—	0.3182	0.1926	0.5107
		In-115m		1.00				
		Cd-115m	44.6 d	B-	—	0.6045	0.0329	0.6374
		In-115		9.9989E-01				
		In-115m		1.0578E-04				
		Cd-117	2.49 h	B-	—	0.4379	1.0796	1.5175
		In-117m		9.1507E-01				
		In-117		8.4933E-02				
		Cd-117m	3.36 h	B-	—	0.2279	2.0437	2.2716
		In-117		9.9002E-01				
		In-117m		9.9831E-03				
		Cd-118	50.3 m	B-	—	0.1614	—	0.1614
		In-118		1.00				
		Cd-119	2.69 m	B-	—	0.8186	1.6380	2.4566
		In-119m		9.0091E-01				
		In-119		9.9092E-02				
		Cd-119m	2.20 m	B-	—	0.6898	2.3021	2.9919
		In-119		9.9787E-01				
		In-119m		2.1328E-03				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
49	Indium	In-103	60 s	ECB+	—	1.5404	2.7528	4.2932
		Cd-103		1.00				
		In-105	5.07 m	ECB+	—	1.0358	1.9307	2.9666
		Cd-105		1.00				
		In-106m	5.2 m	ECB+	—	1.5889	2.8243	4.4132
		Cd-106		1.00				
		In-106	6.2 m	ECB+	—	1.0844	3.5541	4.6385
		Cd-106		1.00				
		In-107	32.4 m	ECB+	—	0.3263	1.5307	1.8570
		Cd-107		1.00				
		In-108m	39.6 m	ECB+	—	0.7021	2.7655	3.4675
		Cd-108		1.00				
		In-108	58.0 m	ECB+	—	0.1620	3.9164	4.0784
		Cd-108		1.00				
		In-109m	1.34 m	IT	—	0.0416	0.6085	0.6501
		In-109		1.00				
		In-109	4.2 h	ECB+	—	0.0334	0.6441	0.6775
		Cd-109		1.00				
		In-110m	69.1 m	ECB+	—	0.6282	1.5782	2.2065
		Cd-110		1.00				
		In-110	4.9 h	ECB+	—	0.0122	3.0972	3.1094
		Cd-110		1.00				
		In-111m	7.7 m	IT	—	0.0675	0.4706	0.5380
		In-111		1.00				
		In-111	2.8047 d	EC	—	0.0348	0.4061	0.4409
		Cd-111m		4.9998E-05				
		Cd-111		9.9995E-01				
		In-112m	20.56 m	IT	—	0.1217	0.0347	0.1564
		In-112		1.00				
		In-112	14.97 m	ECB+B-	—	0.2452	0.2675	0.5127
		Cd-112		5.6000E-01				
		Sn-112		4.4000E-01				
		In-113m	1.6579 h	IT	—	0.1361	0.2606	0.3967
		In-113		1.00				
		In-114m	49.51 d	ITEC	—	0.1450	0.0804	0.2254
		In-114		9.6750E-01				
		Cd-114		3.2500E-02				
		In-114	71.9 s	B-ECB+	—	0.7740	0.0023	0.7764
		Sn-114		9.9500E-01				
		Cd-114		5.0000E-03				
		In-115m	4.486 h	ITB-	—	0.1748	0.1627	0.3376
		In-115		9.5000E-01				
		Sn-115		5.0000E-02				
		In-115	4.41E+14 y	B-	—	0.1526	—	0.1526
		Sn-115		1.00				
		In-116m	54.41 m	B-	—	0.3128	2.4691	2.7819
		Sn-116		1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
50	Tin	In-117m	116.2 m	B-IT	—	0.4344	0.0910	0.5254
		In-117		4.7100E-01				
		<i>Sn-117</i>		5.2900E-01				
		In-117	43.2 m	B-	—	0.2673	0.6939	0.9612
		Sn-117m		3.5321E-03				
		<i>Sn-117</i>		9.9647E-01				
		In-118m	4.364 m	B-	—	0.6708	2.7765	3.4473
		<i>Sn-118</i>		1.00				
		In-118	5.0 s	B-	—	1.8792	0.0778	1.9570
		<i>Sn-118</i>		1.00				
		In-119m	18.0 m	B-IT	—	1.0221	0.0660	1.0882
		In-119		5.6000E-02				
		<i>Sn-119</i>		9.4400E-01				
		In-119	2.4 m	B-	—	0.6148	0.7701	1.3849
		Sn-119m		9.4773E-03				
		<i>Sn-119</i>		9.9052E-01				
		In-121m	3.88 m	B-IT	—	1.5288	0.0635	1.5922
		Sn-121		9.8800E-01				
		In-121		1.2000E-02				
		In-121	23.1 s	B-	—	0.9869	0.9266	1.9135
		Sn-121		8.8650E-01				
		Sn-121m		1.1350E-01				
		Sn-106	1.92 m	ECB+	—	0.1279	1.2091	1.3370
		In-106m		1.00				
		Sn-108	10.30 m	ECB+	—	0.0269	0.6847	0.7117
		In-108m		1.00				
		Sn-109	18.0 m	ECB+	—	0.0571	2.2063	2.2634
		In-109		7.1734E-01				
		In-109m		2.8266E-01				
		Sn-110	4.11 h	EC	—	0.0152	0.2918	0.3070
		In-110m		1.00				
		Sn-111	35.3 m	ECB+	—	0.1915	0.4903	0.6818
		In-111		9.9793E-01				
		In-111m		2.0745E-03				
		Sn-113m	21.4 m	ITEC	—	0.0588	0.0137	0.0725
		Sn-113		9.1100E-01				
		<i>In-113</i>		8.9000E-02				
		Sn-113	115.09 d	EC	—	0.0063	0.0237	0.0300
		In-113m		9.9998E-01				
		<i>In-113</i>		2.2352E-05				
		Sn-117m	13.76 d	IT	—	0.1616	0.1581	0.3197
		<i>Sn-117</i>		1.00				
		Sn-119m	293.1 d	IT	—	0.0781	0.0151	0.0932
		<i>Sn-119</i>		1.00				
		Sn-121m	43.9 y	ITB-	—	0.0354	0.0052	0.0405
		Sn-121		7.7600E-01				
		<i>Sb-121</i>		2.2400E-01				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
51	Antimony	Sn-121	27.03 h <i>Sb-121</i>	B- 1.00	—	0.1156	—	0.1156
		Sn-123m	40.06 m <i>Sb-123</i>	B- 1.00	—	0.4788	0.1407	0.6196
		Sn-123	129.2 d <i>Sb-123</i>	B- 1.00	—	0.5227	0.0069	0.5296
		Sn-125m	9.52 m <i>Sb-125</i>	B- 1.00	—	0.8070	0.3464	1.1534
		Sn-125	9.64 d <i>Sb-125</i>	B- 1.00	—	0.8037	0.3346	1.1383
		Sn-126	2.30E+5 y <i>Sb-126m</i>	B- 1.00	—	0.1380	0.0569	0.1949
		Sn-127m	4.13 m <i>Sb-127</i>	B- 1.00	—	1.1140	0.5686	1.6826
		Sn-127	2.10 h <i>Sb-127</i>	B- 1.00	—	0.5199	1.9075	2.4274
		Sn-128	59.07 m <i>Sb-128m</i>	B- 1.00	—	0.2457	0.6041	0.8498
		Sn-129	2.23 m <i>Sb-129</i>	B- 1.00	—	1.2576	1.0081	2.2657
		Sn-130m	1.7 m <i>Sb-130</i>	B- 8.6005E-01	—	1.4040	0.8861	2.2901
			<i>Sb-130m</i>	1.3995E-01				
		Sn-130	3.72 m <i>Sb-130m</i>	B- 1.00	—	0.4612	0.9372	1.3984
		Sb-111	75 s <i>Sn-111</i>	ECB+ 1.00	—	1.3640	1.4859	2.8499
		Sb-113	6.67 m <i>Sn-113</i>	ECB+ 7.7569E-01	—	0.7203	1.2683	1.9886
			<i>Sn-113m</i>	2.2431E-01				
		Sb-114	3.49 m <i>Sn-114</i>	ECB+ 1.00	—	1.2184	2.6893	3.9077
		Sb-115	32.1 m <i>Sn-115</i>	ECB+ 1.00	—	0.2342	0.8894	1.1236
		Sb-116	15.8 m <i>Sn-116</i>	ECB+ 1.00	—	0.5138	2.2788	2.7926
		Sb-116m	60.3 m <i>Sn-116</i>	ECB+ 1.00	—	0.1408	3.1029	3.2437
		Sb-117	2.80 h <i>Sn-117</i>	ECB+ 1.00	—	0.0298	0.1864	0.2162
		Sb-118	3.6 m <i>Sn-118</i>	ECB+ 1.00	—	0.8730	0.8039	1.6769
		Sb-118m	5.00 h <i>Sn-118</i>	ECB+ 1.00	—	0.0374	2.6130	2.6504
		Sb-119	38.19 h <i>Sn-119</i>	EC 1.00	—	0.0258	0.0234	0.0492

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
		Sb-120	15.89 m	ECB+	—	0.3077	0.4521	0.7599
		<i>Sn-120</i>		1.00				
		Sb-120m	5.76 d	EC	—	0.0449	2.4663	2.5112
		<i>Sn-120</i>		1.00				
		Sb-122	2.7238 d	B-ECB+	—	0.5618	0.4453	1.0072
		<i>Te-122</i>		9.7590E-01				
		<i>Sn-122</i>		2.4100E-02				
		Sb-122m	4.191 m	IT	—	0.0937	0.0707	0.1644
		<i>Sb-122</i>		1.00				
		Sb-124	60.20 d	B-	—	0.3831	1.8531	2.2362
		<i>Te-124</i>		1.00				
		Sb-124m	93 s	ITB-	—	0.1157	0.4401	0.5558
		<i>Sb-124</i>		7.5000E-01				
		<i>Te-124</i>		2.5000E-01				
		Sb-124n	20.2 m	IT	—	0.0256	0.0004	0.0260
		<i>Sb-124m</i>		1.00				
		Sb-125	2.75856 y	B-	—	0.1010	0.4373	0.5383
		<i>Te-125m</i>		2.3136E-01				
		<i>Te-125</i>		7.6864E-01				
		Sb-126	12.35 d	B-	—	0.3545	2.7552	3.1097
		<i>Te-126</i>		1.00				
		Sb-126m	19.15 m	B-IT	—	0.6322	1.5483	2.1805
		<i>Sb-126</i>		1.4000E-01				
		<i>Te-126</i>		8.6000E-01				
		Sb-127	3.85 d	B-	—	0.3160	0.6934	1.0094
		<i>Te-127</i>		8.2320E-01				
		<i>Te-127m</i>		1.7680E-01				
		Sb-128	9.01 h	B-	—	0.4999	3.0934	3.5934
		<i>Te-128</i>		1.00				
		Sb-128m	10.4 m	B-IT	—	0.9580	1.9063	2.8643
		<i>Sb-128</i>		3.6000E-02				
		<i>Te-128</i>		9.6400E-01				
		Sb-129	4.40 h	B-	—	0.3953	1.4601	1.8553
		<i>Te-129</i>		7.7381E-01				
		<i>Te-129m</i>		2.2619E-01				
		Sb-130	39.5 m	B-	—	0.7579	3.2724	4.0303
		<i>Te-130</i>		1.00				
		Sb-130m	6.3 m	B-	—	1.0290	2.7077	3.7367
		<i>Te-130</i>		1.00				
		Sb-131	23.03 m	B-	—	0.5867	2.0733	2.6601
		<i>Te-131</i>		9.1793E-01				
		<i>Te-131m</i>		8.2067E-02				
		Sb-133	2.5 m	B-	—	0.6785	2.7434	3.4219
		<i>Te-133</i>		8.2662E-01				
		<i>Te-133m</i>		1.7338E-01				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
52	Tellurium	Te-113	1.7 m	ECB+	—	1.7023	2.2208	3.9231
		Sb-113		1.00				
		Te-114	15.2 m	ECB+	—	0.1551	1.2817	1.4368
		Sb-114		1.00				
		Te-115	5.8 m	ECB+	—	0.8124	2.2449	3.0572
		Sb-115		1.00				
		Tc-115m	6.7 m	ECB+	—	0.6939	2.6041	3.2980
		Sb-115		1.00				
		Te-116	2.49 h	ECB+	—	0.0618	0.1122	0.1740
		Sb-116		1.00				
		Te-117	62 m	ECB+	—	0.2139	1.5492	1.7631
		Sb-117		1.00				
		Te-118	6.00 d	EC	—	0.0061	0.0199	0.0260
		Sb-118		1.00				
		Te-119	16.05 h	ECB+	—	0.0143	0.7679	0.7822
		Sb-119		1.00				
		Te-119m	4.70 d	ECB+	—	0.0180	1.5059	1.5239
		Sb-119		1.00				
		Te-121	19.16 d	EC	—	0.0098	0.5775	0.5872
		Sb-121		1.00				
		Te-121m	154 d	ITEC	—	0.0817	0.2176	0.2993
		Te-121		8.8600E-01				
		Sb-121		1.1400E-01				
		Te-123	6.00E+14 y	EC	—	0.0028	0.0004	0.0031
		Sb-123		1.00				
		Te-123m	119.25 d	IT	—	0.0990	0.1477	0.2467
		Te-123		1.00				
		Te-125m	57.40 d	IT	—	0.1091	0.0360	0.1451
		Te-125		1.00				
		Te-127	9.35 h	B-	—	0.2246	0.0049	0.2294
		I-127		1.00				
		Te-127m	109 d	ITB-	—	0.0824	0.0113	0.0937
		Te-127		9.7600E-01				
		I-127		2.4000E-02				
		Te-129	69.6 m	B-	—	0.5436	0.0625	0.6061
		I-129		1.00				
		Te-129m	33.6 d	ITB-	—	0.2709	0.0376	0.3085
		Te-129		6.3000E-01				
		I-129		3.7000E-01				
		Tc-131	25.0 m	B-	—	0.7122	0.4200	1.1322
		I-131		1.00				
		Tc-131m	30 h	B-IT	—	0.1870	1.4545	1.6415
		I-131		7.7800E-01				
		Te-131		2.2200E-01				
		Te-132	3.204 d	B-	—	0.1108	0.2344	0.3453
		I-132		1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
53	Iodine	Te-133	12.5 m	B-	—	0.6897	1.2007	1.8904
		I-133	1.00					
		Te-133m	55.4 m	B-IT	—	0.3880	1.8597	2.2477
		I-133	8.2500E-01					
		Te-133	1.7500E-01					
		Tc-134	41.8 m	B-	—	0.2266	0.8714	1.0980
		I-134	1.00					
		I-118	13.7 m	ECB+	—	1.9645	2.0163	3.9809
		Te-118	1.00					
		I-118m	8.5 m	ECB+	—	1.1055	3.7513	4.8567
		Te-118	1.00					
		I-119	19.1 m	ECB+	—	0.5116	0.9110	1.4227
		Tc-119	9.9046E-01					
		Te-119m	9.5421E-03					
		I-120	81.6 m	ECB+	—	1.1680	2.6611	3.8291
		Te-120	1.00					
		I-120m	53 m	ECB+	—	0.9070	3.5248	4.4318
		Te-120	1.00					
		I-121	2.12 h	ECB+	—	0.0665	0.3995	0.4660
		Te-121	9.9714E-01					
		Te-121m	2.8631E-03					
		I-122	3.63 m	ECB+	—	1.1055	0.9619	2.0674
		Te-122	1.00					
		I-123	13.27 h	EC	—	0.0282	0.1730	0.2012
		Te-123	9.9996E-01					
		Te-123m	4.4420E-05					
		I-124	4.1760 d	ECB+	—	0.1943	1.1132	1.3075
		Te-124	1.00					
		I-125	59.400 d	EC	—	0.0192	0.0428	0.0621
		Te-125	1.00					
		I-126	12.93 d	ECB+B-	—	0.1606	0.4354	0.5959
		Te-126	5.2700E-01					
		Xe-126	4.7300E-01					
		I-128	24.99 m	B-ECB+	—	0.7463	0.0676	0.8139
		Xe-128	9.3100E-01					
		Te-128	6.9000E-02					
		I-129	1.57E+7 y	B-	—	0.0651	0.0252	0.0902
		Xe-129	1.00					
		I-130	12.36 h	B-	—	0.2786	2.1372	2.4158
		Xe-130	1.00					
		I-130m	8.84 m	ITB-	—	0.1778	0.1097	0.2875
		I-130	8.4000E-01					
		Xe-130	1.6000E-01					
		I-131	8.02070 d	B-	—	0.1918	0.3828	0.5746
		Xe-131m	1.1759E-02					
		Xe-131	9.8824E-01					
		I-132	2.295 h	B-	—	0.4930	2.2645	2.7575
		Xe-132	1.00					

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
54	Xenon	I-132m	1.387 h	ITB-	—	0.1614	0.3403	0.5018
		I-132		8.6000E-01				
		Xe-132		1.4000E-01				
		I-133	20.8 h	B-	—	0.4142	0.6120	1.0262
		Xe-133		9.7115E-01				
		Xe-133m		2.8846E-02				
		I-134	52.5 m	B-	—	0.5776	2.5953	3.1729
		Xe-134		1.00				
		I-134m	3.60 m	ITB-	—	0.0913	0.2887	0.3800
		I-134		9.7700E-01				
		Xe-134		2.3000E-02				
		I-135	6.57 h	B-	—	0.3465	1.5815	1.9280
		Xe-135		8.3432E-01				
		Xe-135m		1.6568E-01				
		Xe-120	40 m	ECB+	—	0.0461	0.4015	0.4476
		I-120		1.00				
		Xe-121	40.1 m	ECB+	—	0.5819	1.4720	2.0539
		I-121		1.00				
		Xe-122	20.1 h	EC	—	0.0100	0.0684	0.0784
		I-122		1.00				
		Xe-123	2.08 h	ECB+	—	0.1875	0.6411	0.8286
		I-123		1.00				
		Xe-125	16.9 h	ECB+	—	0.0350	0.2723	0.3074
		I-125		1.00				
		Xe-127	36.4 d	EC	—	0.0325	0.2806	0.3131
		I-127		1.00				
		Xe-127m	69.2 s	IT	—	0.1293	0.1685	0.2978
		Xe-127		1.00				
		Xe-129m	8.88 d	IT	—	0.1844	0.0517	0.2362
		Xe-129		1.00				
		Xe-131m	11.84 d	IT	—	0.1470	0.0206	0.1676
		Xe-131		1.00				
		Xe-133	5.243 d	B-	—	0.1379	0.0474	0.1854
		Cs-133		1.00				
		Xe-133m	2.19 d	IT	—	0.1924	0.0410	0.2333
		Xe-133		1.00				
		Xe-135	9.14 h	B-	—	0.3208	0.2483	0.5691
		Cs-135		1.00				
		Xe-135m	15.29 m	ITB-	—	0.1008	0.4249	0.5257
		Xe-135		9.9400E-01				
		Cs-135		6.0000E-03				
		Xe-137	3.818 m	B-	—	1.6952	0.1908	1.8859
		Cs-137		1.00				
		Xe-138	14.08 m	B-	—	0.6596	1.1222	1.7818
		Cs-138		1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
55	Caesium	Cs-121	155 s	ECB+	—	1.7391	1.1733	2.9123
			Xe-121	1.00				
		Cs-121m	122 s	ECB+IT	—	1.3475	1.1821	2.5296
			Xe-121	8.3000E-01				
			Cs-121	1.7000E-01				
		Cs-123	5.88 m	ECB+	—	0.9509	1.0860	2.0369
			Xe-123	1.00				
		Cs-124	30.8 s	ECB+	—	1.9908	1.1607	3.1515
			Xe-124	1.00				
		Cs-125	45 m	ECB+	—	0.3524	0.7550	1.1075
			Xe-125	1.00				
		Cs-126	1.64 m	ECB+	—	1.3193	1.1545	2.4738
			Xe-126	1.00				
		Cs-127	6.25 h	ECB+	—	0.0293	0.4334	0.4627
			Xe-127	1.00				
		Cs-128	3.640 m	ECB+	—	0.8735	0.8917	1.7651
			Xe-128	1.00				
		Cs-129	32.06 h	ECB+	—	0.0175	0.2802	0.2977
			Xe-129	1.00				
		Cs-130	29.21 m	ECB+B-	—	0.3869	0.5026	0.8894
			Xe-130	9.8400E-01				
			Ba-130	1.6000E-02				
		Cs-130m	3.46 m	ITEC	—	0.0937	0.0737	0.1674
			Cs-130	9.9840E-01				
			Xe-130	1.6000E-03				
		Cs-131	9.689 d	EC	—	0.0064	0.0232	0.0295
			Xe-131	1.00				
		Cs-132	6.479 d	ECB+B-	—	0.0143	0.7151	0.7294
			Xe-132	9.8130E-01				
			Ba-132	1.8700E-02				
		Cs-134	2.0648 y	B-EC	—	0.1639	1.5551	1.7190
			Ba-134	1.00				
			Xe-134	3.0000E-06				
		Cs-134m	2.903 h	IT	—	0.1122	0.0273	0.1394
			Cs-134	1.00				
		Cs-135	2.3E+6 y	B-	—	0.0894	—	0.0894
			Ba-135	1.00				
		Cs-135m	53 m	IT	—	0.0361	1.5972	1.6333
			Cs-135	1.00				
		Cs-136	13.16 d	B-	—	0.1449	2.1283	2.2732
			Ba-136	1.00				
		Cs-137	30.1671 y	B-	—	0.1884	<E-04	0.1884
			Ba-137m	9.4399E-01				
			Ba-137	5.6005E-02				
		Cs-138	33.41 m	B-	—	1.2462	2.3611	3.6073
			Ba-138	1.00				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
56	Barium	Cs-138m	2.91 m	ITB-	—	0.3201	0.4149	0.7350
		Cs-138		8.1000E-01				
		Ba-138		1.9000E-01				
		Cs-139	9.27 m	B-	—	1.6598	0.3030	1.9629
		Ba-139		1.00				
		Cs-140	63.7 s	B-	—	1.9361	1.7692	3.7054
		Ba-140		1.00				
		Ba-124	11.0 m	ECB+	—	0.1743	0.5728	0.7471
		Cs-124		1.00				
		Ba-126	100 m	ECB+	—	0.0178	0.5803	0.5981
		Cs-126		1.00				
		Ba-127	12.7 m	ECB+	—	0.5971	0.7282	1.3253
		Cs-127		1.00				
		Ba-128	2.43 d	EC	—	0.0086	0.0665	0.0751
		Cs-128		1.00				
		Ba-129	2.23 h	ECB+	—	0.1270	0.3331	0.4601
		Cs-129		1.00				
		Ba-129m	2.16 h	ECB+	—	0.0419	1.5833	1.6252
		Cs-129		1.00				
		Ba-131	11.50 d	EC	—	0.0455	0.4763	0.5219
		Cs-131		1.00				
		Ba-131m	14.6 m	IT	—	0.1102	0.0773	0.1875
		Ba-131		1.00				
		Ba-133	10.52 y	EC	—	0.0553	0.4030	0.4583
		Cs-133		1.00				
		Ba-133m	38.9 h	ITEC	—	0.2259	0.0686	0.2945
		Ba-133		9.9990E-01				
		Cs-133		9.6000E-05				
		Ba-135m	28.7 h	IT	—	0.2080	0.0602	0.2682
		Ba-135		1.00				
		Ba-137m	2.552 m	IT	—	0.0653	0.5963	0.6617
		Ba-137		1.00				
		Ba-139	83.06 m	B-	—	0.9012	0.0457	0.9470
		La-139		1.00				
57	Lanthanum	Ba-140	12.752 d	B-	—	0.3202	0.1826	0.5029
		La-140		1.00				
		Ba-141	18.27 m	B-	—	0.9624	0.9271	1.8895
		La-141		1.00				
		Ba-142	10.6 m	B-	—	0.4141	1.0469	1.4610
		La-142		1.00				
		La-128	5.18 m	ECB+	—	1.3340	2.8283	4.1623
		Ba-128		1.00				
		La-129	11.6 m	ECB+	—	0.6135	0.9212	1.5347
		Ba-129		9.2384E-01				
		Ba-129m		7.6164E-02				
		La-130	8.7 m	ECB+	—	1.1113	2.2324	3.3438
		Ba-130		1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
58	Cerium	La-131	59 m	ECB+	—	0.1963	0.6633	0.8596
		Ba-131	1.00					
		La-132	4.8 h	ECB+	—	0.5693	1.9952	2.5645
		Ba-132	1.00					
		La-132m	24.3 m	ITECB+	—	0.1126	0.6706	0.7832
		La-132	7.6000E-01					
		Ba-132	2.4000E-01					
		La-133	3.912 h	ECB+	—	0.0503	0.1605	0.2108
		Ba-133	1.00					
		La-134	6.45 m	ECB+	—	0.7647	0.7196	1.4844
		Ba-134	1.00					
		La-135	19.5 h	ECB+	—	0.0067	0.0361	0.0428
		Ba-135	1.00					
		La-136	9.87 m	ECB+	—	0.2941	0.4070	0.7011
		Ba-136	1.00					
		La-137	6.0E+4 y	EC	—	0.0065	0.0250	0.0315
		Ba-137	1.00					
		La-138	1.02E+11 y	ECB-	—	0.0377	1.2316	1.2693
		Ba-138	6.6400E-01					
		Ce-138	3.3600E-01					
		La-140	1.6781 d	B-	—	0.5346	2.3084	2.8429
		Ce-140	1.00					
		La-141	3.92 h	B-	—	0.9876	0.0268	1.0144
		Ce-141	1.00					
		La-142	91.1 m	B-	—	0.8697	2.3738	3.2435
		Ce-142	1.00					
		La-143	14.2 m	B-	—	1.2995	0.2631	1.5625
		Ce-143	1.00					
		Ce-130	22.9 m	ECB+	—	0.0738	0.5003	0.5741
		La-130	1.00					
		Ce-131	10.2 m	ECB+	—	0.6153	1.6267	2.2420
		La-131	1.00					
		Ce-132	3.51 h	EC	—	0.0180	0.2727	0.2908
		La-132	1.00					
		Ce-133	97 m	ECB+	—	0.3817	0.5430	0.9247
		La-133	1.00					
		Ce-133m	4.9 h	ECB+	—	0.0739	1.7373	1.8112
		La-133	1.00					
		Ce-134	3.16 d	EC	—	0.0072	0.0281	0.0353
		La-134	1.00					
		Ce-135	17.7 h	ECB+	—	0.0296	0.8237	0.8533
		La-135	1.00					
		Ce-137	9.0 h	ECB+	—	0.0165	0.0388	0.0553
		La-137	1.00					
		Ce-137m	34.4 h	ITEC	—	0.2067	0.0558	0.2625
		Ce-137	9.9220E-01					
		La-137	7.8000E-03					

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
59	Praseodymium	Ce-139	137.641 d	EC	—	0.0355	0.1599	0.1954
			<i>La-139</i>	1.00				
		Ce-141	32.508 d	B-	—	0.1710	0.0768	0.2478
			<i>Pr-141</i>	1.00				
		Ce-143	33.039 h	B-	—	0.4364	0.2796	0.7159
			Pr-143	1.00				
		Ce-144	284.91 d	B-	—	0.0916	0.0194	0.1110
			Pr-144	9.9023E-01				
			Pr-144m	9.7699E-03				
		Ce-145	3.01 m	B-	—	0.6794	0.8142	1.4937
			Pr-145	1.00				
		Pr-134	11 m	ECB+	—	1.0801	3.1504	4.2305
			Ce-134	1.00				
		Pr-134m	17 m	ECB+	—	1.5274	2.3101	3.8375
			Ce-134	1.00				
		Pr-135	24 m	ECB+	—	0.5793	0.8741	1.4534
			Ce-135	1.00				
		Pr-136	13.1 m	ECB+	—	0.7545	2.1458	2.9003
			<i>Ce-136</i>	1.00				
		Pr-137	1.28 h	ECB+	—	0.1947	0.3693	0.5640
			Ce-137	1.00				
		Pr-138	1.45 m	ECB+	—	1.1617	0.8153	1.9770
			<i>Ce-138</i>	1.00				
		Pr-138m	2.12 h	ECB+	—	0.2208	2.4776	2.6984
			<i>Ce-138</i>	1.00				
		Pr-139	4.41 h	ECB+	—	0.0478	0.1298	0.1777
			Ce-139	1.00				
		Pr-140	3.39 m	ECB+	—	0.5516	0.5467	1.0983
			<i>Ce-140</i>	1.00				
		Pr-142	19.12 h	B-EC	—	0.8098	0.0581	0.8679
			<i>Nd-142</i>	9.9984E-01				
			<i>Ce-142</i>	1.6400E-04				
		Pr-142m	14.6 m	IT	—	0.0036	0.0001	0.0037
			Pr-142	1.00				
		Pr-143	13.57 d	B-	—	0.3150	<E-04	0.3150
			<i>Nd-143</i>	1.00				
		Pr-144	17.28 m	B-	—	1.2084	0.0289	1.2373
			Nd-144	1.00				
		Pr-144m	7.2 m	ITB-	—	0.0475	0.0134	0.0608
			Pr-144	9.9930E-01				
			Nd-144	7.0000E-04				
		Pr-145	5.984 h	B-	—	0.6757	0.0186	0.6943
			<i>Nd-145</i>	1.00				
		Pr-146	24.15 m	B-	—	1.3277	1.0105	2.3382
			<i>Nd-146</i>	1.00				
		Pr-147	13.4 m	B-	—	0.8896	0.4887	1.3784
			Nd-147	1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
60	Neodymium	Pr-148	2.29 m	B-	—	1.6637	0.9905	2.6542
		<i>Nd-148</i>		1.00				
		Pr-148m	2.01 m	B-	—	1.6807	0.9337	2.6144
		<i>Nd-148</i>		1.00				
		Nd-134	8.5 m	ECB+	—	0.1728	0.5421	0.7149
		Pr-134m		1.00				
		Nd-135	12.4 m	ECB+	—	1.0551	1.2617	2.3168
		Pr-135		1.00				
		Nd-136	50.65 m	ECB+	—	0.0805	0.2793	0.3598
		Pr-136		1.00				
		Nd-137	38.5 m	ECB+	—	0.3247	1.1789	1.5036
		Pr-137		1.00				
		Nd-138	5.04 h	EC	—	0.0082	0.0438	0.0520
		Pr-138		1.00				
		Nd-139	29.7 m	ECB+	—	0.2084	0.4431	0.6515
		Pr-139		1.00				
		Nd-139m	5.50 h	ECB+IT	—	0.0795	1.5852	1.6647
		Pr-139		8.8200E-01				
		Nd-139		1.1800E-01				
		Nd-140	3.37 d	EC	—	0.0069	0.0287	0.0357
		Pr-140		1.00				
61	Promethium	Nd-141	2.49 h	ECB+	—	0.0165	0.0765	0.0930
		<i>Pr-141</i>		1.00				
		Nd-141m	62.0 s	ITECB+	—	0.0622	0.6947	0.7569
		Nd-141		9.9968E-01				
		<i>Pr-141</i>		3.2000E-04				
		Nd-144	2.29E+15 y	A	1.9052	—	—	1.9052
		<i>Ce-140</i>		1.00				
		Nd-147	10.98 d	B-	—	0.2702	0.1408	0.4109
		Pm-147		1.00				
		Nd-149	1.728 h	B-	—	0.5042	0.3713	0.8756
		Pm-149		1.00				
		Nd-151	12.44 m	B-	—	0.6195	0.8518	1.4712
		Pm-151		1.00				
		Nd-152	11.4 m	B-	—	0.3314	0.1644	0.4957
		Pm-152		1.00				
		Pm-136	107 s	ECB+	—	2.1436	2.7178	4.8614
		Nd-136		1.00				
		Pm-137m	2.4 m	ECB+	—	1.1120	1.7835	2.8955
		Nd-137		1.00				
		Pm-139	4.15 m	ECB+	—	1.0416	0.9390	1.9807
		Nd-139		1.00				
		Pm-140	9.2 s	ECB+	—	2.0432	1.0506	3.0937
		Nd-140		1.00				
		Pm-140m	5.95 m	ECB+	—	0.9932	3.0324	4.0256
		Nd-140		1.00				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
62	Samarium	Pm-141	20.90 m	ECB+	—	0.6054	0.7349	1.3403
		Nd-141		9.9833E-01				
		Nd-141m		1.6651E-03				
		Pm-142	40.5 s	ECB+	—	1.3122	0.8561	2.1683
		Nd-142		1.00				
		Pm-143	265 d	EC	—	0.0083	0.3157	0.3240
		Nd-143		1.00				
		Pm-144	363 d	EC	—	0.0171	1.5631	1.5802
		Nd-144		1.00				
		Pm-145	17.7 y	ECA	<E-04	0.0126	0.0315	0.0441
		Nd-145		1.00				
		Pr-141		2.8000E-09				
		Pm-146	5.53 y	ECB-	—	0.0941	0.7512	0.8453
		Sm-146		3.4000E-01				
		Nd-146		6.6000E-01				
		Pm-147	2.6234 y	B-	—	0.0619	<E-04	0.0619
		Sm-147		1.00				
		Pm-148	5.368 d	B-	—	0.7284	0.5743	1.3028
		Sm-148		1.00				
		Pm-148m	41.29 d	B-IT	—	0.1699	1.9916	2.1615
		Sm-148		9.5800E-01				
		Pm-148		4.2000E-02				
		Pm-149	53.08 h	B-	—	0.3650	0.0119	0.3769
		Sm-149		1.00				
		Pm-150	2.68 h	B-	—	0.8101	1.4705	2.2806
		Sm-150		1.00				
		Pm-151	28.40 h	B-	—	0.3048	0.3289	0.6337
		Sm-151		1.00				
		Pm-152	4.12 m	B-	—	1.3283	0.2866	1.6149
		Sm-152		1.00				
		Pm-152m	7.52 m	B-	—	0.9055	1.5189	2.4244
		Sm-152		1.00				
		Pm-153	5.25 m	B-	—	0.6881	0.0764	0.7645
		Sm-153		1.00				
		Pm-154	1.73 m	B-	—	0.8706	1.7933	2.6638
		Sm-154		1.00				
		Pm-154m	2.68 m	B-	—	0.9492	1.7996	2.7488
		Sm-154		1.00				
		Sm-139	2.57 m	ECB+	—	1.0871	1.4540	2.5410
		Pm-139		1.00				
		Sm-140	14.82 m	ECB+	—	0.1710	0.5677	0.7387
		Pm-140		1.00				
		Sm-141	10.2 m	ECB+	—	0.7126	1.4089	2.1215
		Pm-141		1.00				
		Sm-141m	22.6 m	ECB+IT	—	0.3995	1.9494	2.3489
		Pm-141		9.9690E-01				
		Sm-141		3.1000E-03				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
63	Europium	Sm-142	72.49 m	ECB+	—	0.0446	0.1105	0.1551
		Pm-142	1.00					
		Sm-143	8.75 m	ECB+	—	0.4978	0.5289	1.0267
		Pm-143	1.00					
		Sm-143m	66 s	ITECB+	—	0.0720	0.6844	0.7564
		Sm-143	9.9760E-01					
		Pm-143	2.4000E-03					
		Sm-145	340 d	EC	—	0.0307	0.0642	0.0950
		Pm-145	1.00					
		Sm-146	1.03E+8 y	A	2.5290	—	—	2.5290
		Nd-142	1.00					
		Sm-147	1.060E11 y	A	2.3105	—	—	2.3105
		Nd-143	1.00					
		Sm-148	7E+15 y	A	1.9860	—	—	1.9860
		Nd-144	1.00					
		Sm-151	90 y	B-	—	0.0200	<E-04	0.0200
		Eu-151	1.00					
		Sm-153	46.50 h	B-	—	0.2699	0.0643	0.3341
		Eu-153	1.00					
		Sm-155	22.3 m	B-	—	0.5674	0.1029	0.6703
		Eu-155	1.00					
		Sm-156	9.4 h	B-	—	0.2093	0.1150	0.3242
		Eu-156	1.00					
		Sm-157	8.03 m	B-	—	0.8750	0.4142	1.2892
		Eu-157	1.00					
		Eu-142	2.34 s	ECB+	—	2.7670	1.1970	3.9641
		Sm-142	1.00					
		Eu-142m	1.223 m	ECB+	—	1.7683	3.4305	5.1987
		Sm-142	1.00					
		Eu-143	2.59 m	ECB+	—	1.3676	1.1227	2.4903
		Sm-143	9.9879E-01					
		Sm-143m	1.2069E-03					
		Eu-144	10.2 s	ECB+	—	2.0761	1.0917	3.1678
		Sm-144	1.00					
		Eu-145	5.93 d	ECB+	—	0.0254	1.2798	1.3052
		Sm-145	1.00					
		Eu-146	4.61 d	ECB+	—	0.0455	2.4007	2.4462
		Sm-146	1.00					
		Eu-147	24.1 d	ECB+A	<E-04	0.0431	0.4721	0.5152
		Sm-147	9.9998E-01					
		Pm-143	2.2000E-05					
		Eu-148	54.5 d	ECB+A	<E-04	0.0224	2.2287	2.2511
		Sm-148	1.00					
		Pm-144	9.4000E-09					
		Eu-149	93.1 d	EC	—	0.0241	0.0661	0.0902
		Sm-149	1.00					
		Eu-150	36.9 y	ECB+	—	0.0285	1.5554	1.5839
		Sm-150	1.00					

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
64	Gadolinium	Eu-150m	12.8 h	B-ECB+	—	0.3122	0.0494	0.3615
		Gd-150		8.9000E-01				
		Sm-150		1.1000E-01				
		Eu-152	13.537 y	ECB+B-	—	0.1286	1.1759	1.3045
		Gd-152		2.7900E-01				
		Sm-152		7.2100E-01				
		Eu-152m	9.3116 h	B-ECB+	—	0.5060	0.2963	0.8023
		Gd-152		7.2000E-01				
		Sm-152		2.8000E-01				
		Eu-152n	96 m	IT	—	0.0666	0.0753	0.1419
		Eu-152		1.00				
		Eu-154	8.593 y	B-EC	—	0.2730	1.2493	1.5223
		Gd-154		9.9980E-01				
		Sm-154		2.0000E-04				
		Eu-154m	46.0 m	IT	—	0.0745	0.0706	0.1451
		Eu-154		1.00				
		Eu-155	4.7611 y	B-	—	0.0647	0.0612	0.1259
		Gd-155		1.00				
		Eu-156	15.19 d	B-	—	0.4579	1.2342	1.6920
		Gd-156		1.00				
		Eu-157	15.18 h	B-	—	0.3961	0.2930	0.6891
		Gd-157		1.00				
		Eu-158	45.9 m	B-	—	0.8920	1.2978	2.1898
		Gd-158		1.00				
		Eu-159	18.1 m	B-	—	0.8923	0.3032	1.1954
		Gd-159		1.00				
		Gd-142	70.2 s	ECB+	—	0.7390	1.0432	1.7822
		Eu-142		1.00				
		Gd-143m	110.0 s	ECB+	—	1.2854	2.1211	3.4065
		Eu-143		1.00				
		Gd-144	4.47 m	ECB+	—	0.5858	0.9086	1.4944
		Eu-144		1.00				
		Gd-145	23.0 m	ECB+	—	0.3456	2.4236	2.7692
		Eu-145		1.00				
		Gd-145m	85 s	ITECB+	—	0.1927	0.6814	0.8741
		Gd-145		9.4300E-01				
		Eu-145		5.7000E-02				
		Gd-146	48.27 d	EC	—	0.1274	0.2526	0.3800
		Eu-146		1.00				
		Gd-147	38.1 h	ECB+	—	0.0617	1.4030	1.4647
		Eu-147		1.00				
		Gd-148	74.6 y	A	3.2712	—	—	3.2712
		Sm-144		1.00				
		Gd-149	9.28 d	ECB+	—	0.0686	0.5292	0.5978
		Eu-149		1.00				
		Gd-150	1.79E+6 y	A	2.8090	—	—	2.8090
		Sm-146		1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
65	Terbium	Gd-151	124 d	ECA	<E-04	0.0394	0.0708	0.1102
		Sm-147		1.0000E-08				
		Eu-151		1.0000E+00				
		Gd-152	1.08E+14 y	A	2.2046	—	—	2.2046
		Sm-148		1.00				
		Gd-153	240.4 d	EC	—	0.0438	0.1057	0.1494
		Eu-153		1.00				
		Gd-159	18.479 h	B-	—	0.3096	0.0539	0.3635
		Tb-159		1.00				
		Gd-162	8.4 m	B-	—	0.3387	0.4170	0.7557
		Tb-162		1.00				
		Tb-146	23 s	ECB+	—	1.4644	3.6256	5.0900
		Gd-146		1.00				
		Tb-147	1.64 h	ECB+	—	0.2810	2.1845	2.4655
		Gd-147		1.00				
		Tb-147m	1.87 m	ECB+	—	0.3196	1.9116	2.2312
		Gd-147		1.00				
		Tb-148	60 m	ECB+	—	0.8411	2.3590	3.2001
		Gd-148		1.00				
		Tb-148m	2.20 m	ECB+	—	0.3106	3.1390	3.4495
		Gd-148		1.00				
		Tb-149	4.118 h	ECB+A	0.6810	0.0871	1.3612	2.1292
		Gd-149		8.3300E-01				
		Eu-145		1.6700E-01				
		Tb-149m	4.16 m	ECB+A	0.0009	0.2091	1.3748	1.5847
		Gd-149		9.9978E-01				
		Eu-145		2.2000E-04				
		Tb-150	3.48 h	ECB+A	<E-04	0.2890	2.4403	2.7293
		Gd-150		1.00				
		Eu-146		7.0000E-06				
		Tb-150m	5.8 m	ECB+	—	0.1267	2.5202	2.6470
		Gd-150		1.00				
		Tb-151	17.609 h	ECB+A	0.0003	0.0800	0.9941	1.0744
		Gd-151		1.00				
		Eu-147		9.5000E-05				
		Tb-151m	25 s	ITECB+	—	0.0793	0.0808	0.1601
		Tb-151		9.3400E-01				
		Gd-151		6.6000E-02				
		Tb-152	17.5 h	ECB+	—	0.2503	1.4932	1.7436
		Gd-152		1.00				
		Tb-152m	4.2 m	ITECB+	—	0.1520	0.7619	0.9139
		Tb-152		7.8800E-01				
		Gd-152		2.1200E-01				
		Tb-153	2.34 d	ECB+	—	0.0481	0.3318	0.3800
		Gd-153		1.00				
		Tb-154	21.5 h	ECB+	—	0.0681	2.2831	2.3512
		Gd-154		1.00				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
66	Dysprosium	Tb-155	5.32 d	EC	—	0.0434	0.1777	0.2211
		<i>Gd-155</i>		1.00				
		Tb-156	5.35 d	EC	—	0.0835	1.9371	2.0206
		<i>Gd-156</i>		1.00				
		Tb-156m	24.4 h	IT	—	0.0171	0.0370	0.0540
		Tb-156		1.00				
		Tb-156n	5.3 h	IT	—	0.0874	0.0048	0.0922
		Tb-156		1.00				
		Tb-157	71 y	EC	—	0.0057	0.0057	0.0114
		<i>Gd-157</i>		1.00				
		Tb-158	180 y	ECB-	—	0.1117	0.8048	0.9165
		<i>Gd-158</i>		8.3400E-01				
		<i>Dy-158</i>		1.6600E-01				
		Tb-160	72.3 d	B-	—	0.2593	1.1264	1.3856
		<i>Dy-160</i>		1.00				
		Tb-161	6.906 d	B-	—	0.2025	0.0365	0.2390
		<i>Dy-161</i>		1.00				
		Tb-162	7.60 m	B-	—	0.5327	1.1066	1.6393
		<i>Dy-162</i>		1.00				
		Tb-163	19.5 m	B-	—	0.3597	0.7887	1.1484
		<i>Dy-163</i>		1.00				
		Tb-164	3.0 m	B-	—	0.8249	2.4455	3.2704
		<i>Dy-164</i>		1.00				
		Tb-165	2.11 m	B-	—	0.8966	0.8363	1.7330
		<i>Dy-165m</i>		8.9028E-01				
		<i>Dy-165</i>		1.0972E-01				
		Dy-148	3.3 m	ECB+	—	0.0278	0.7170	0.7448
		Tb-148		1.00				
		Dy-149	4.20 m	ECB+	—	0.1120	1.6222	1.7342
		Tb-149		5.6682E-01				
		Tb-149m		4.3318E-01				
		Dy-150	7.17 m	ECB+A	1.5664	0.0070	0.2785	1.8519
		Tb-150		6.4000E-01				
		<i>Gd-146</i>		3.6000E-01				
		Dy-151	17.9 m	ECB+A	0.2341	0.0653	1.3723	1.6717
		Tb-151		5.3377E-01				
		Tb-151m		4.1023E-01				
		<i>Gd-147</i>		5.6000E-02				
		Dy-152	2.38 h	ECA	0.0037	0.0130	0.2867	0.3034
		Tb-152		9.9900E-01				
		<i>Gd-148</i>		1.0000E-03				
		Dy-153	6.4 h	ECB+A	0.0003	0.0901	0.8746	0.9651
		Tb-153		1.00				
		<i>Gd-149</i>		9.4000E-05				
		Dy-154	3.0E+6 y	A	2.9470	—	—	2.9470
		<i>Gd-150</i>		1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
67	Holmium	Dy-155	9.9 h	ECB+	—	0.0272	0.6687	0.6959
		Tb-155	1.00					
		Dy-157	8.14 h	EC	—	0.0138	0.3472	0.3610
		Tb-157	1.00					
		Dy-159	144.4 d	EC	—	0.0131	0.0456	0.0587
		Tb-159	1.00					
		Dy-165	2.334 h	B-	—	0.4473	0.0267	0.4740
		Ho-165	1.00					
		Dy-165m	1.257 m	ITB-	—	0.1049	0.0192	0.1240
		Dy-165	9.7760E-01					
		Ho-165	2.2400E-02					
		Dy-166	81.6 h	B-	—	0.1667	0.0433	0.2100
		Ho-166	1.00					
		Dy-167	6.20 m	B-	—	0.7262	0.5326	1.2589
		Ho-167	1.00					
		Dy-168	8.7 m	B-	—	0.4332	0.3948	0.8280
		Ho-168	1.00					
		Ho-150	76.8 s	ECB+	—	1.9857	1.8843	3.8701
		Dy-150	1.00					
		Ho-153	2.01 m	ECB+A	0.0020	0.5387	1.0281	1.5689
		Dy-153	9.9949E-01					
		Tb-149m	5.1000E-04					
		Ho-153m	9.3 m	ECB+A	0.0074	0.6952	1.0618	1.7644
		Dy-153	9.9820E-01					
		Tb-149	1.8000E-03					
		Ho-154	11.76 m	ECB+A	0.0008	1.0927	1.8817	2.9752
		Dy-154	9.9981E-01					
		Tb-150	1.9000E-04					
		Ho-154m	3.10 m	ECB+A	<E-04	0.5434	2.4367	2.9801
		Dy-154	1.00					
		Tb-150m	1.0000E-05					
		Ho-155	48 m	ECB+	—	0.2176	0.6142	0.8318
		Dy-155	1.00					
		Ho-156	56 m	ECB+	—	0.6655	2.1064	2.7719
		Dy-156	1.00					
		Ho-157	12.6 m	ECB+	—	0.0929	0.5835	0.6764
		Dy-157	1.00					
		Ho-159	33.05 m	ECB+	—	0.0576	0.3857	0.4433
		Dy-159	1.00					
		Ho-160	25.6 m	ECB+	—	0.0703	1.6950	1.7653
		Dy-160	1.00					
		Ho-161	2.48 h	EC	—	0.0336	0.0582	0.0918
		Dy-161	1.00					
		Ho-162	15.0 m	ECB+	—	0.0598	0.1640	0.2239
		Dy-162	1.00					
		Ho-162m	67.0 m	ITECB+	—	0.0739	0.5614	0.6353
		Ho-162	6.2000E-01					
		Dy-162	3.8000E-01					

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
68	Erbium	Ho-163	4570 y	EC	—	0.0005	<E-04	0.0006
		<i>Dy-163</i>		1.00				
		Ho-164	29 m	ECB-	—	0.1470	0.0297	0.1768
		<i>Dy-164</i>		6.0000E-01				
		<i>Er-164</i>		4.0000E-01				
		Ho-164m	38.0 m	IT	—	0.0926	0.0472	0.1399
		Ho-164		1.00				
		Ho-166	26.80 h	B-	—	0.6963	0.0301	0.7264
		<i>Er-166</i>		1.00				
		Ho-166m	1.20E+3 y	B-	—	0.1497	1.6249	1.7746
		<i>Er-166</i>		1.00				
		Ho-167	3.1 h	B-	—	0.2329	0.3661	0.5990
		<i>Er-167</i>		1.00				
		Ho-168	2.99 m	B-	—	0.8138	0.8762	1.6901
		<i>Er-168</i>		1.00				
		Ho-168m	132 s	IT	—	0.0518	0.0073	0.0590
		Ho-168		1.00				
		Ho-170	2.76 m	B-	—	0.8366	1.7041	2.5407
		<i>Er-170</i>		1.00				
		Er-154	3.73 m	ECB+A	0.0201	0.0376	0.0759	0.1336
		Ho-154		9.9530E-01				
		<i>Dy-150</i>		4.7000E-03				
		Er-156	19.5 m	EC	—	0.0943	0.0678	0.1621
		Ho-156		1.00				
		Er-159	36 m	ECB+	—	0.0738	0.9635	1.0373
		Ho-159		1.00				
		Er-161	3.21 h	ECB+	—	0.0522	0.9905	1.0427
		Ho-161		1.00				
		Er-163	75.0 m	ECB+	—	0.0081	0.0403	0.0484
		Ho-163		1.00				
		Er-165	10.36 h	EC	—	0.0080	0.0379	0.0459
		<i>Ho-165</i>		1.00				
		Er-167m	2.269 s	IT	—	0.1111	0.0967	0.2078
		<i>Er-167</i>		1.00				
		Er-169	9.40 d	B-	—	0.1035	<E-04	0.1035
		<i>Tm-169</i>		1.00				
		Er-171	7.516 h	B-	—	0.4205	0.3731	0.7936
		<i>Tm-171</i>		1.00				
		Er-172	49.3 h	B-	—	0.1387	0.5166	0.6552
		<i>Tm-172</i>		1.00				
		Er-173	1.434 m	B-	—	0.7213	0.8313	1.5526
		<i>Tm-173</i>		1.00				
69	Thulium	Tm-161	30.2 m	ECB+	—	0.2308	1.2992	1.5300
		<i>Er-161</i>		1.00				
		Tm-162	21.70 m	ECB+	—	0.5648	1.9155	2.4803
		<i>Er-162</i>		1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
70	Ytterbium	Tm-163	1.810 h	ECB+	—	0.0716	1.3200	1.3916
		Er-163	1.00					
		Tm-164	2.0 m	ECB+	—	0.5994	0.7760	1.3754
		Er-164	1.00					
		Tm-165	30.06 h	ECB+	—	0.0637	0.5625	0.6262
		Er-165	1.00					
		Tm-166	7.70 h	ECB+	—	0.0892	1.9768	2.0660
		Er-166	1.00					
		Tm-167	9.25 d	EC	—	0.1332	0.1482	0.2814
		Er-167	1.00					
		Tm-168	93.1 d	ECB+B-	—	0.0847	1.2432	1.3279
		Er-168	9.9990E-01					
		Yb-168	1.0000E-04					
		Tm-170	128.6 d	B-EC	—	0.3280	0.0041	0.3321
		Yb-170	9.9869E-01					
		Er-170	1.3100E-03					
		Tm-171	1.92 y	B-	—	0.0255	0.0006	0.0261
		Yb-171	1.00					
		Tm-172	63.6 h	B-	—	0.5327	0.4744	1.0072
		Yb-172	1.00					
		Tm-173	8.24 h	B-	—	0.3103	0.3885	0.6988
		Yb-173	1.00					
		Tm-174	5.4 m	B-	—	0.5129	1.7787	2.2915
		Yb-174	1.00					
		Tm-175	15.2 m	B-	—	0.5196	1.0848	1.6044
		Yb-175	1.00					
		Tm-176	1.85 m	B-	—	0.9972	1.9682	2.9654
		Yb-176	1.00					
		Yb-162	18.87 m	ECB+	—	0.0374	0.2519	0.2893
		Tm-162	1.00					
		Yb-163	11.05 m	ECB+	—	0.2718	0.7277	0.9996
		Tm-163	1.00					
		Yb-164	75.8 m	EC	—	0.0095	0.0542	0.0637
		Tm-164	1.00					
		Yb-165	9.9 m	ECB+	—	0.1518	0.3390	0.4908
		Tm-165	1.00					
		Yb-166	56.7 h	EC	—	0.0417	0.0868	0.1285
		Tm-166	1.00					
		Yb-167	17.5 m	ECB+	—	0.0952	0.2696	0.3648
		Tm-167	1.00					
		Yb-169	32.026 d	EC	—	0.1471	0.3302	0.4773
		Tm-169	1.00					
		Yb-175	4.185 d	B-	—	0.1308	0.0391	0.1699
		Lu-175	1.00					
		Yb-177	1.911 h	B-	—	0.4358	0.1952	0.6309
		Lu-177	1.00					
		Yb-178	74 m	B-	—	0.1925	0.0381	0.2306
		Lu-178	1.00					

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
71	Lutetium	Yb-179	8.0 m	B-	—	0.7093	0.9743	1.6836
		Lu-179		1.00				
		Lu-165	10.74 m	ECB+	—	0.3751	1.1102	1.4853
		Yb-165		1.00				
		Lu-167	51.5 m	ECB+	—	0.1109	1.6920	1.8030
		Yb-167		1.00				
		Lu-169	34.06 h	ECB+	—	0.0477	1.3166	1.3643
		Yb-169		1.00				
		Lu-169m	160 s	IT	—	0.0274	0.0017	0.0290
		Lu-169		1.00				
		Lu-170	2.012 d	ECB+	—	0.0585	2.5636	2.6220
		Yb-170		1.00				
		Lu-171	8.24 d	ECB+	—	0.0928	0.6503	0.7431
		Yb-171		1.00				
		Lu-171m	79 s	IT	—	0.0691	0.0021	0.0711
		Lu-171		1.00				
		Lu-172	6.70 d	ECB+	—	0.1154	1.9565	2.0718
		Yb-172		1.00				
		Lu-172m	3.7 m	IT	—	0.0404	0.0015	0.0419
		Lu-172		1.00				
		Lu-173	1.37 y	EC	—	0.0526	0.1834	0.2360
		Yb-173		1.00				
		Lu-174	3.31 y	ECB+	—	0.0458	0.1163	0.1621
		Yb-174		1.00				
		Lu-174m	142 d	ITEC	—	0.1188	0.0626	0.1814
		Lu-174		9.9380E-01				
		Yb-174		6.2000E-03				
		Lu-176	3.85E+10 y	B-	—	0.3026	0.4799	0.7825
		Hf-176		1.00				
		Lu-176m	3.635 h	B-EC	—	0.4783	0.0146	0.4929
		Hf-176		9.9905E-01				
		Yb-176		9.5000E-04				
		Lu-177	6.647 d	B-	—	0.1479	0.0351	0.1830
		Hf-177		1.00				
		Lu-177m	160.4 d	B-IT	—	0.2687	1.0005	1.2692
		Lu-177		2.1700E-01				
		Hf-177		7.8300E-01				
		Lu-178	28.4 m	B-	—	0.7561	0.1256	0.8817
		Hf-178		1.00				
		Lu-178m	23.1 m	B-	—	0.4907	1.0481	1.5389
		Hf-178		1.00				
		Lu-179	4.59 h	B-	—	0.4869	0.0298	0.5167
		Hf-179		1.00				
		Lu-180	5.7 m	B-	—	0.6352	1.5148	2.1499
		Hf-180		1.00				
		Lu-181	3.5 m	B-	—	0.8512	0.5740	1.4252
		Hf-181		1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
72	Hafnium	Hf-167	2.05 m	ECB+	—	0.4952	0.6171	1.1123
			Lu-167	1.00				
		Hf-169	3.24 m	ECB+	—	0.1309	0.6416	0.7725
			Lu-169	9.6904E-01				
			Lu-169m	3.0960E-02				
		Hf-170	16.01 h	EC	—	0.0687	0.4403	0.5090
			Lu-170	1.00				
		Hf-172	1.87 y	EC	—	0.0828	0.1062	0.1890
			Lu-172m	1.00				
		Hf-173	23.6 h	ECB+	—	0.0524	0.3970	0.4494
			Lu-173	1.00				
		Hf-174	2.0E+15 y	A	2.4948	—	—	2.4948
			<i>Yb-170</i>	1.00				
		Hf-175	70 d	EC	—	0.0450	0.3534	0.3984
			<i>Lu-175</i>	1.00				
		Hf-177m	51.4 m	IT	—	0.5078	2.2864	2.7941
			<i>Hf-177</i>	1.00				
		Hf-178m	31 y	IT	—	0.2113	2.2383	2.4496
			<i>Hf-178</i>	1.00				
		Hf-179m	25.05 d	IT	—	0.1897	0.9207	1.1104
			<i>Hf-179</i>	1.00				
		Hf-180m	5.5 h	ITB-	—	0.1437	0.9884	1.1321
			<i>Hf-180</i>	9.9700E-01				
			<i>Ta-180m</i>	3.0000E-03				
		Hf-181	42.39 d	B-	—	0.2052	0.5324	0.7377
			<i>Ta-181</i>	1.00				
		Hf-182	9E+6 y	B-	—	0.0632	0.2397	0.3030
			Ta-182	1.00				
		Hf-182m	61.5 m	B-IT	—	0.2441	0.9135	1.1575
			Ta-182	4.9070E-01				
			Hf-182	4.2000E-01				
			Ta-182m	8.9280E-02				
		Hf-183	1.067 h	B-	—	0.4478	0.7749	1.2227
			Ta-183	1.00				
		Hf-184	4.12 h	B-	—	0.4787	0.2387	0.7174
			Ta-184	1.00				
73	Tantalum	Ta-170	6.76 m	ECB+	—	1.6049	1.0602	2.6652
			Hf-170	1.00				
		Ta-172	36.8 m	ECB+	—	0.5513	1.6967	2.2480
			Hf-172	1.00				
		Ta-173	3.14 h	ECB+	—	0.1686	0.5824	0.7510
			Hf-173	1.00				
		Ta-174	1.14 h	ECB+	—	0.4670	0.9767	1.4438
			Hf-174	1.00				
		Ta-175	10.5 h	ECB+	—	0.0663	1.1126	1.1790
			Hf-175	1.00				
		Ta-176	8.09 h	ECB+	—	0.0849	2.2322	2.3171
			<i>Hf-176</i>	1.00				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
74	Tungsten	Ta-177	56.56 h	EC	—	0.0240	0.0678	0.0917
			<i>Hf-177</i>	1.00				
		Ta-178	9.31 m	ECB+	—	0.0391	0.1218	0.1609
			<i>Hf-178</i>	1.00				
		Ta-178m	2.36 h	EC	—	0.1616	1.1558	1.3174
			<i>Hf-178</i>	1.00				
		Ta-179	1.82 y	EC	—	0.0078	0.0256	0.0334
			<i>Hf-179</i>	1.00				
		Ta-180	8.152 h	ECB-	—	0.0565	0.0482	0.1048
			<i>Hf-180</i>	8.6000E-01				
			<i>W-180</i>	1.4000E-01				
		Ta-182	114.43 d	B-	—	0.2105	1.2918	1.5023
			<i>W-182</i>	1.00				
		Ta-182m	15.84 m	IT	—	0.2665	0.2659	0.5324
			Ta-182	1.00				
		Ta-183	5.1 d	B-	—	0.3537	0.2963	0.6499
			<i>W-183</i>	1.00				
		Ta-184	8.7 h	B-	—	0.5426	1.5727	2.1152
			<i>W-184</i>	1.00				
		Ta-185	49.4 m	B-	—	0.7416	0.1547	0.8963
			<i>W-185</i>	1.00				
		Ta-186	10.5 m	B-	—	1.0710	1.4202	2.4912
			<i>W-186</i>	1.00				
		W-177	132 m	ECB+	—	0.0970	0.9185	1.0155
			Ta-177	1.00				
		W-178	21.6 d	EC	—	0.0075	0.0164	0.0239
			Ta-178	1.00				
		W-179	37.05 m	EC	—	0.0326	0.0554	0.0880
			Ta-179	1.00				
		W-179m	6.40 m	ITEC	—	0.1661	0.0561	0.2221
			<i>W-179</i>	9.9720E-01				
			Ta-179	2.8000E-03				
		W-181	121.2 d	EC	—	0.0129	0.0404	0.0533
			<i>Ta-181</i>	1.00				
		W-185	75.1 d	B-	—	0.1270	<E-04	0.1270
			<i>Re-185</i>	1.00				
		W-185m	1.597 m	IT	—	0.1738	0.0287	0.2025
			<i>W-185</i>	1.00				
		W-187	23.72 h	B-	—	0.2995	0.4483	0.7478
			<i>Re-187</i>	1.00				
		W-188	69.78 d	B-	—	0.0997	0.0019	0.1016
			<i>Re-188</i>	1.00				
		W-190	30.0 m	B-	—	0.4771	0.1511	0.6282
			<i>Re-190</i>	1.00				
75	Rhenium	Re-178	13.2 m	ECB+	—	0.6192	1.7085	2.3277
			<i>W-178</i>	1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
76	Osmium	Re-179	19.5 m	ECB+	—	0.0668	1.0841	1.1509
		W-179		7.6079E-01				
		W-179m		2.3921E-01				
		Re-180	2.44 m	ECB+	—	0.1720	1.2028	1.3748
		W-180		1.00				
		Re-181	19.9 h	ECB+	—	0.1360	0.8044	0.9404
		W-181		1.00				
		Re-182	64.0 h	EC	—	0.2045	1.7982	2.0027
		W-182		1.00				
		Re-182m	12.7 h	ECB+	—	0.0922	1.2214	1.3136
		W-182		1.00				
		Re-183	70.0 d	EC	—	0.1093	0.1575	0.2667
		W-183		1.00				
		Re-184	38.0 d	ECB+	—	0.0562	0.8919	0.9481
		W-184		1.00				
		Re-184m	169 d	IT/EC	—	0.1413	0.3836	0.5249
		Re-184		7.5400E-01				
		W-184		2.4600E-01				
		Re-186	3.7183 d	B-EC	—	0.3362	0.0208	0.3570
		Os-186		9.2530E-01				
		W-186		7.4700E-02				
		Re-186m	2.00E+5 y	IT	—	0.1267	0.0207	0.1474
		Re-186		1.00				
		Re-187	4.12E+10 y	B-	—	0.0006	—	0.0006
		Os-187		1.00				
		Re-188	17.0040 h	B-	—	0.7793	0.0613	0.8406
		Os-188		1.00				
		Re-188m	18.59 m	IT	—	0.0976	0.0715	0.1692
		Re-188		1.00				
		Re-189	24.3 h	B-	—	0.3260	0.0556	0.3816
		Os-189m		1.2211E-01				
		Os-189		8.7789E-01				
		Re-190	3.1 m	B-	—	0.6863	1.3376	2.0239
		Os-190		1.00				
		Re-190m	3.2 h	B-IT	—	0.4456	0.9257	1.3714
		Re-190		4.5600E-01				
		Os-190		5.4400E-01				
		Os-180	21.5 m	ECB+	—	0.0298	0.1265	0.1564
		Re-180		1.00				
		Os-181	105 m	ECB+	—	0.0918	1.3835	1.4753
		Re-181		1.00				
		Os-182	22.10 h	EC	—	0.0565	0.4317	0.4882
		Re-182m		1.00				
		Os-183	13.0 h	ECB+	—	0.0792	0.6288	0.7081
		Re-183		1.00				
		Os-183m	9.9 h	ECB+IT	—	0.0416	1.0062	1.0478
		Re-183		8.5000E-01				
		Os-183		1.5000E-01				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
77	Iridium	Os-185	93.6 d	EC	—	0.0184	0.6917	0.7101
			<i>Re-185</i>	1.00				
		Os-186	2.0E+15 y	A	2.8220	—	—	2.8220
			<i>W-182</i>	1.00				
		Os-189m	5.8 h	IT	—	0.0286	0.0023	0.0309
			<i>Os-189</i>	1.00				
		Os-190m	9.9 m	IT	—	0.1166	1.5894	1.7059
			<i>Os-190</i>	1.00				
		Os-191	15.4 d	B-	—	0.1372	0.0843	0.2215
			<i>Ir-191</i>	1.00				
		Os-191m	13.10 h	IT	—	0.0664	0.0080	0.0744
			<i>Os-191</i>	1.00				
		Os-193	30.11 h	B-	—	0.3797	0.0674	0.4471
			<i>Ir-193m</i>	3.4757E-03				
			<i>Ir-193</i>	9.9652E-01				
		Os-194	6.0 y	B-	—	0.0453	0.0045	0.0498
			<i>Ir-194</i>	1.00				
		Os-196	34.9 m	B-	—	0.3807	0.0805	0.4612
			<i>Ir-196</i>	1.00				
		Ir-180	1.5 m	ECB+	—	1.2439	1.5955	2.8394
			<i>Os-180</i>	1.00				
		Ir-182	15 m	ECB+	—	1.0474	1.4121	2.4595
			<i>Os-182</i>	1.00				
		Ir-183	58 m	ECB+	—	0.1516	1.1889	1.3404
			<i>Os-183m</i>	7.0972E-01				
			<i>Os-183</i>	2.9028E-01				
		Ir-184	3.09 h	ECB+	—	0.3194	1.9644	2.2838
			<i>Os-184</i>	1.00				
		Ir-185	14.4 h	ECB+	—	0.1228	0.8581	0.9809
			<i>Os-185</i>	1.00				
		Ir-186	16.64 h	ECB+	—	0.1453	1.6651	1.8104
			<i>Os-186</i>	1.00				
		Ir-186m	1.92 h	ECB+IT	—	0.1103	1.2523	1.3626
			<i>Os-186</i>	7.5000E-01				
			<i>Ir-186</i>	2.5000E-01				
		Ir-187	10.5 h	ECB+	—	0.0568	0.3325	0.3892
			<i>Os-187</i>	1.00				
		Ir-188	41.5 h	ECB+	—	0.0508	2.0974	2.1483
			<i>Os-188</i>	1.00				
		Ir-189	13.2 d	EC	—	0.0458	0.0793	0.1251
			<i>Os-189m</i>	7.4264E-02				
			<i>Os-189</i>	9.2574E-01				
		Ir-190	11.78 d	EC	—	0.0746	1.4768	1.5514
			<i>Os-190</i>	1.00				
		Ir-190m	1.120 h	IT	—	0.0240	0.0024	0.0264
			<i>Ir-190</i>	1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
78	Platinum	Ir-190n	3.087 h	ECIT	—	0.0289	0.0577	0.0867
		Os-190m		9.1400E-01				
		Ir-190		8.6000E-02				
		Ir-191m	4.94 s	IT	—	0.0971	0.0764	0.1735
		<i>Ir-191</i>		1.00				
		Ir-192	73.827 d	B-EC	—	0.2177	0.8165	1.0342
		<i>Pt-192</i>		9.5130E-01				
		<i>Os-192</i>		4.8700E-02				
		Ir-192m	1.45 m	ITB-	—	0.0540	0.0029	0.0569
		Ir-192		9.9983E-01				
		<i>Pt-192</i>		1.7500E-04				
		Ir-192n	241 y	IT	—	0.1617	0.0066	0.1682
		Ir-192		1.00				
		Ir-193m	10.53 d	IT	—	0.0776	0.0027	0.0803
		<i>Ir-193</i>		1.00				
		Ir-194	19.28 h	B-	—	0.8105	0.0911	0.9015
		<i>Pt-194</i>		1.00				
		Ir-194m	171 d	B-	—	0.1422	2.3339	2.4761
		<i>Pt-194</i>		1.00				
		Ir-195	2.5 h	B-	—	0.3803	0.0593	0.4397
		<i>Pt-195</i>		1.00				
		Ir-195m	3.8 h	B-IT	—	0.2606	0.3766	0.6372
		<i>Pt-195m</i>		4.3692E-01				
		Ir-195		5.0000E-02				
		<i>Pt-195</i>		5.1308E-01				
		Ir-196	52 s	B-	—	1.1738	0.2322	1.4060
		<i>Pt-196</i>		1.00				
		Ir-196m	1.40 h	B-	—	0.3844	2.4677	2.8522
		<i>Pt-196</i>		1.00				
		Pt-184	17.3 m	ECB+A	<E-04	0.2004	0.7266	0.9271
		Ir-184		1.00				
		Os-180		1.7000E-05				
		Pt-186	2.08 h	ECA	<E-04	0.0451	0.6844	0.7296
		Ir-186m		8.1942E-01				
		Ir-186		1.8058E-01				
		Os-182		1.0000E-06				
		Pt-187	2.35 h	ECB+	—	0.1549	0.6183	0.7732
		Ir-187		1.00				
		Pt-188	10.2 d	ECA	<E-04	0.0823	0.2055	0.2878
		Ir-188		1.00				
		<i>Os-184</i>		2.9000E-07				
		Pt-189	10.87 h	ECB+	—	0.0996	0.4870	0.5867
		Ir-189		1.00				
		Pt-190	6.50E+11 y	A	3.2490	—	—	3.2490
		Os-186		1.00				
		Pt-191	2.802 d	EC	—	0.0749	0.2960	0.3709
		<i>Ir-191</i>		1.00				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
79	Gold	Pt-193	50 y	EC	—	0.0071	0.0026	0.0097
		<i>Ir-193</i>		1.00				
		Pt-193m	4.33 d	IT	—	0.1377	0.0132	0.1510
		Pt-193		1.00				
		Pt-195m	4.02 d	IT	—	0.1845	0.0772	0.2617
		<i>Pt-195</i>		1.00				
		Pt-197	19.8915 h	B-	—	0.2552	0.0256	0.2809
		<i>Au-197</i>		1.00				
		Pt-197m	95.41 m	ITB-	—	0.3250	0.0839	0.4089
		Pt-197		9.6700E-01				
		<i>Au-197</i>		3.3000E-02				
		Pt-199	30.80 m	B-	—	0.5455	0.1995	0.7450
		<i>Au-199</i>		1.00				
		Pt-200	12.5 h	B-	—	0.2321	0.0605	0.2926
		<i>Au-200</i>		1.00				
		Pt-202	44 h	B-	—	0.6537	—	0.6537
		<i>Au-202</i>		1.00				
		Au-186	10.7 m	ECB+	—	1.0751	1.4983	2.5735
		Pt-186		1.00				
		Au-187	8.4 m	ECB+A	0.0001	0.1360	1.0652	1.2014
		Pt-187		1.00				
		<i>Ir-183</i>		3.0000E-05				
		Au-190	42.8 m	ECB+	—	0.2129	2.3807	2.5936
		Pt-190		1.00				
		Au-191	3.18 h	ECB+	—	0.0865	0.5946	0.6811
		Pt-191		1.00				
		Au-192	4.94 h	ECB+	—	0.0904	1.9392	2.0296
		<i>Pt-192</i>		1.00				
		Au-193	17.65 h	EC	—	0.0575	0.1673	0.2249
		Pt-193		1.00				
		Au-193m	3.9 s	ITEC	—	0.0904	0.1979	0.2883
		<i>Au-193</i>		9.9970E-01				
		Pt-193m		3.0000E-04				
		Au-194	38.02 h	ECB+	—	0.0421	1.0386	1.0806
		<i>Pt-194</i>		1.00				
		Au-195	186.098 d	EC	—	0.0520	0.0839	0.1359
		<i>Pt-195</i>		1.00				
		Au-195m	30.5 s	IT	—	0.1172	0.2014	0.3186
		<i>Au-195</i>		1.00				
		Au-196	6.183 d	ECB-	—	0.0372	0.4734	0.5105
		<i>Pt-196</i>		9.2800E-01				
		<i>Hg-196</i>		7.2000E-02				
		Au-196m	9.6 h	IT	—	0.3760	0.2473	0.6233
		<i>Au-196</i>		1.00				
		Au-198	2.69517 d	B-	—	0.3277	0.4029	0.7306
		<i>Hg-198</i>		1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
80	Mercury	Au-198m	2.27 d	IT	—	0.2748	0.5332	0.8080
		Au-198	1.00					
		Au-199	3.139 d	B-	—	0.1451	0.0961	0.2412
		Hg-199	1.00					
		Au-200	48.4 m	B-	—	0.7303	0.2737	1.0041
		Hg-200	1.00					
		Au-200m	18.7 h	B-IT	—	0.2433	1.9843	2.2276
		Au-200	1.8000E-01					
		Hg-200	8.2000E-01					
		Au-201	26 m	B-	—	0.4259	0.0346	0.4605
		Hg-201	1.00					
		Au-202	28.8 s	B-	—	1.0749	0.1720	1.2469
		Hg-202	1.00					
		Hg-190	20.0 m	ECB+	—	0.0539	0.2018	0.2557
		Au-190	1.00					
		Hg-191m	50.8 m	ECB+	—	0.1378	1.4895	1.6273
		Au-191	1.00					
		Hg-192	4.85 h	EC	—	0.0636	0.2749	0.3385
		Au-192	1.00					
		Hg-193	3.80 h	ECB+	—	0.0740	0.8377	0.9117
		Au-193	9.6459E-01					
		Au-193m	3.5408E-02					
		Hg-193m	11.8 h	ECB+IT	—	0.0470	1.0239	1.0709
		Au-193m	8.9197E-01					
		Hg-193	7.1000E-02					
		Au-193	3.7027E-02					
		Hg-194	440 y	EC	—	0.0078	0.0027	0.0106
		Au-194	1.00					
		Hg-195	10.53 h	ECB+	—	0.0650	0.2008	0.2658
		Au-195	1.00					
		Hg-195m	41.6 h	ITECB+	—	0.1480	0.2047	0.3527
		Hg-195	5.4200E-01					
		Au-195	4.5800E-01					
		Hg-197	64.94 h	EC	—	0.0702	0.0740	0.1442
		Au-197	1.00					
		Hg-197m	23.8 h	ITEC	—	0.2170	0.0977	0.3148
		Hg-197	9.1400E-01					
		Au-197	8.6000E-02					
		Hg-199m	42.66 m	IT	—	0.3487	0.1836	0.5323
		Hg-199	1.00					
		Hg-203	46.612 d	B-	—	0.0990	0.2380	0.3370
		Tl-203	1.00					
		Hg-205	5.2 m	B-	—	0.5390	0.0053	0.5444
		Tl-205	1.00					
		Hg-206	8.15 m	B-	—	0.4211	0.1215	0.5426
		Tl-206	1.00					
		Hg-207	2.9 m	B-	—	0.8262	2.6614	3.4876
		Tl-207	1.00					

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
81	Thallium	Tl-190	2.6 m	ECB+	—	1.5288	1.2914	2.8202
		Hg-190	1.00					
		Tl-190m	3.7 m	ECB+	—	0.7985	2.4550	3.2535
		Hg-190	1.00					
		Tl-194	33.0 m	ECB+	—	0.5972	0.9143	1.5115
		Hg-194	1.00					
		Tl-194m	32.8 m	ECB+	—	0.3037	2.5218	2.8255
		Hg-194	1.00					
		Tl-195	1.16 h	ECB+	—	0.0740	1.2250	1.2991
		Hg-195	9.9656E-01					
		Hg-195m	3.4358E-03					
		Tl-196	1.84 h	ECB+	—	0.1782	1.8734	2.0516
		Hg-196	1.00					
		Tl-197	2.84 h	ECB+	—	0.0544	0.4587	0.5130
		Hg-197	1.00					
		Tl-198	5.3 h	ECB+	—	0.0414	2.0108	2.0522
		Hg-198	1.00					
		Tl-198m	1.87 h	ECB+IT	—	0.2006	1.2168	1.4175
		Tl-198	4.6000E-01					
		Hg-198	5.4000E-01					
		Tl-199	7.42 h	ECB+	—	0.0600	0.2520	0.3120
		Hg-199	1.00					
		Tl-200	26.1 h	ECB+	—	0.0408	1.3106	1.3514
		Hg-200	1.00					
		Tl-201	72.912 h	EC	—	0.0447	0.0938	0.1385
		Hg-201	1.00					
		Tl-202	12.23 d	EC	—	0.0233	0.4658	0.4891
		Hg-202	1.00					
		Tl-204	3.78 y	B-EC	—	0.2372	0.0013	0.2385
		Pb-204	9.7100E-01					
		Hg-204	2.9000E-02					
		Tl-206	4.200 m	B-	—	0.5398	0.0001	0.5399
		Pb-206	1.00					
		Tl-206m	3.74 m	IT	—	0.2003	2.4192	2.6195
		Tl-206	1.00					
		Tl-207	4.77 m	B-	—	0.4952	0.0024	0.4975
		Pb-207	1.00					
		Tl-208	3.053 m	B-	—	0.6113	3.3603	3.9716
		Pb-208	1.00					
		Tl-209	2.161 m	B-	—	0.6875	2.1426	2.8302
		Pb-209	1.00					
		Tl-210	1.30 m	B-	—	1.2699	2.7632	4.0331
		Pb-210	1.00					
82	Lead	Pb-194	12.0 m	ECB+A	<E-04	0.0844	1.0832	1.1677
		Tl-194	1.00					
		Hg-190	7.3000E-08					

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
83	Bismuth	Pb-195m	15 m	ECB+	—	0.3167	1.6547	1.9714
			Tl-195	1.00				
		Pb-196	37 m	ECB+	—	0.0969	0.4940	0.5909
			Tl-196	1.00				
		Pb-197	8 m	ECB+	—	0.0818	1.5319	1.6137
			Tl-197	1.00				
		Pb-197m	43 m	ECB+IT	—	0.2477	1.1732	1.4209
			Tl-197	8.1000E-01				
			Pb-197	1.9000E-01				
		Pb-198	2.4 h	EC	—	0.0781	0.4385	0.5166
			Tl-198	1.00				
		Pb-199	90 m	ECB+	—	0.0584	1.0394	1.0978
			Tl-199	1.00				
		Pb-200	21.5 h	EC	—	0.0997	0.2086	0.3083
			Tl-200	1.00				
		Pb-201	9.33 h	ECB+	—	0.0594	0.7562	0.8156
			Tl-201	1.00				
		Pb-201m	61 s	IT	—	0.2633	0.3658	0.6291
			Pb-201	1.00				
		Pb-202	5.25E+4 y	ECA	0.0260	0.0061	0.0025	0.0346
			Tl-202	9.9000E-01				
			Hg-198	1.0000E-02				
		Pb-202m	3.53 h	ITEC	—	0.1321	1.9925	2.1246
			Pb-202	9.0500E-01				
			Tl-202	9.5000E-02				
		Pb-203	51.873 h	EC	—	0.0530	0.3143	0.3672
			Tl-203	1.00				
		Pb-204m	67.2 m	IT	—	0.1030	2.0634	2.1664
			Pb-204	1.00				
		Pb-205	1.53E+7 y	EC	—	0.0062	0.0025	0.0087
			Tl-205	1.00				
		Pb-209	3.253 h	B-	—	0.1974	—	0.1974
			Bi-209	1.00				
		Pb-210	22.20 y	B-A	<E-04	0.0404	0.0053	0.0457
			Bi-210	1.00				
			Hg-206	1.9000E-08				
		Pb-211	36.1 m	B-	—	0.4543	0.0644	0.5187
			Bi-211	1.00				
		Pb-212	10.64 h	B-	—	0.1766	0.1450	0.3217
			Bi-212	1.00				
		Pb-214	26.8 m	B-	—	0.2948	0.2533	0.5481
			Bi-214	1.00				
		Bi-197	9.3 m	ECB+	—	0.2887	1.6992	1.9879
			Pb-197	5.6103E-01				
			Pb-197m	4.3897E-01				
		Bi-200	36.4 m	ECB+	—	0.2469	2.4355	2.6825
			Pb-200	1.00				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
		Bi-201	108 m	ECB+	—	0.0612	1.7304	1.7916
		Pb-201		5.4833E-01				
		Pb-201m		4.5167E-01				
		Bi-202	1.72 h	ECB+	—	0.1515	2.7561	2.9076
		Pb-202		1.00				
		Bi-203	11.76 h	ECB+	—	0.0809	2.3850	2.4659
		Pb-203		1.00				
		Bi-204	11.22 h	ECB+	—	0.0807	2.9162	2.9968
		Pb-204m		9.8525E-02				
		Pb-204		9.0148E-01				
		Bi-205	15.31 d	ECB+	—	0.0346	1.6913	1.7259
		Pb-205		1.00				
		Bi-206	6.243 d	ECB+	—	0.1379	3.2796	3.4175
		Pb-206		1.00				
		Bi-207	32.9 y	ECB+	—	0.1193	1.5370	1.6563
		Pb-207		1.00				
		Bi-208	3.68E+5 y	EC	—	0.0144	2.6460	2.6604
		Pb-208		1.00				
		Bi-210	5.013 d	B-A	<E-04	0.3889	<E-04	0.3889
		Po-210		1.00				
		Tl-206		1.3200E-06				
		Bi-210m	3.04E+6 y	A	5.0064	0.0475	0.2607	5.3146
		Tl-206		1.00				
		Bi-211	2.14 m	A B-	6.6757	0.0100	0.0473	6.7330
		Tl-207		9.9724E-01				
		Po-211		2.7600E-03				
		Bi-212	60.55 m	B-A	2.2164	0.5046	0.1038	2.8247
		Po-212		6.4060E-01				
		Tl-208		3.5940E-01				
		Bi-212n	7.0 m	B-	—	0.5351	—	0.5351
		Po-212m		1.00				
		Bi-213	45.59 m	B-A	0.1245	0.4440	0.1277	0.6963
		Po-213		9.7910E-01				
		Tl-209		2.0900E-02				
		Bi-214	19.9 m	B-A	0.0012	0.6631	1.4793	2.1436
		Po-214		9.9979E-01				
		Tl-210		2.1000E-04				
		Bi-215	7.6 m	B-	—	0.6694	0.2534	0.9228
		Po-215		1.00				
		Bi-216	2.17 m	B-	—	1.3295	0.7385	2.0680
		Po-216		1.00				
84	Polonium	Po-203	36.7 m	ECB+A	0.0060	0.1672	1.6348	1.8080
		Bi-203		9.9890E-01				
		Pb-199		1.1000E-03				
		Po-204	3.53 h	ECA	0.0362	0.1839	1.1650	1.3850
		Bi-204		9.9340E-01				
		Pb-200		6.6000E-03				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
85	Astatine	Po-205	1.66 h	ECB+A	0.0021	0.0660	1.5846	1.6527
		Bi-205		9.9900E-01				
		Pb-201		4.0000E-04				
		Po-206	8.8 d	ECA	0.2903	0.1655	1.1928	1.6486
		Bi-206		9.4550E-01				
		Pb-202		5.4500E-02				
		Po-207	5.80 h	ECB+A	0.0011	0.0490	1.2847	1.3347
		Bi-207		9.9979E-01				
		Pb-203		2.1000E-04				
		Po-208	2.898 y	AEC	5.2154	<E-04	<E-04	5.2154
		Bi-208		2.2300E-05				
		Pb-204		9.9998E-01				
		Po-209	102 y	AEC	4.9529	0.0030	0.0063	4.9622
		Pb-205		9.9520E-01				
		Bi-209		4.8000E-03				
		Po-210	138.376 d	A	5.4075	<E-04	<E-04	5.4075
		Pb-206		1.00				
		Po-211	0.516 s	A	7.5860	0.0002	0.0082	7.5944
		Pb-207		1.00				
		Po-212	2.99E-7 s	A	8.9541	—	—	8.9541
		Pb-208		1.00				
		Po-212m	45.1 s	A	11.7755	0.0004	0.0792	11.8551
		Pb-208		9.9930E-01				
		Po-213	4.2E-6 s	A	8.5370	<E-04	<E-04	8.5370
		Pb-209		1.00				
		Po-214	1.643E-4 s	A	7.8334	<E-04	<E-04	7.8335
		Pb-210		1.00				
		Po-215	1.781E-3 s	A	7.5261	<E-04	0.0002	7.5263
		Pb-211		1.00				
		Po-216	0.145 s	A	6.9064	<E-04	<E-04	6.9064
		Pb-212		1.00				
		Po-218	3.10 m	A B-	6.1134	<E-04	—	6.1135
		Pb-214		9.9980E-01				
		At-218		2.0000E-04				
		At-204	9.2 m	ECB+A	0.2307	0.4485	2.3234	3.0025
		Po-204		9.6200E-01				
		Bi-200		3.8000E-02				
		At-205	26.2 m	ECB+A	0.6021	0.2575	1.1444	2.0039
		Po-205		9.0000E-01				
		Bi-201		1.0000E-01				
		At-206	30.6 m	ECB+A	0.0517	0.3324	2.4807	2.8647
		Po-206		9.9110E-01				
		Bi-202		8.9000E-03				
		At-207	1.80 h	ECB+A	0.5049	0.1298	2.0136	2.6483
		Po-207		9.1400E-01				
		Bi-203		8.6000E-02				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
86	Radon	At-208	1.63 h	ECB+A	0.0316	0.1598	3.0408	3.2322
		Po-208		9.9450E-01				
		Bi-204		5.5000E-03				
		At-209	5.41 h	ECB+A	0.2360	0.1172	2.2846	2.6378
		Po-209		9.5900E-01				
		Bi-205		4.1000E-02				
		At-210	8.1 h	ECB+A	0.0097	0.0796	2.9622	3.0515
		Po-210		9.9825E-01				
		Bi-206		1.7500E-03				
		At-211	7.214 h	ECA	2.4998	0.0059	0.0367	2.5424
		Po-211		5.8200E-01				
		Bi-207		4.1800E-01				
		At-215	1.00E-4 s	A	8.1778	<E-04	0.0002	8.1780
		Bi-211		1.00				
		At-216	3.00E-4 s	A	7.9407	0.0013	0.0025	7.9446
		Bi-212		1.00				
		At-217	3.23E-2 s	A	7.2008	<E-04	0.0002	7.2011
		Bi-213		9.9988E-01				
		At-218	1.5 s	A B-	6.8042	0.0011	—	6.8053
		Bi-214		9.9900E-01				
		Rn-218		1.0000E-03				
		At-219	56 s	A	6.1343	—	—	6.1343
		Bi-215		9.7000E-01				
		At-220	3.71 m	B-A	0.4842	1.2130	0.4497	2.1469
		Rn-220		9.2000E-01				
		Bi-216		8.0000E-02				
		Rn-207	9.25 m	ECB+A	1.3126	0.2197	0.9854	2.5177
		At-207		7.9000E-01				
		Po-203		2.1000E-01				
		Rn-209	28.5 m	ECB+A	1.0466	0.1167	1.1953	2.3586
		At-209		8.3000E-01				
		Po-205		1.7000E-01				
		Rn-210	2.4 h	AEC	5.9121	0.0091	0.0610	5.9821
		Po-206		9.6000E-01				
		At-210		4.0000E-02				
		Rn-211	14.6 h	ECB+A	1.6205	0.0663	1.8727	3.5595
		At-211		7.2600E-01				
		Po-207		2.7400E-01				
		Rn-212	23.9 m	A	6.3847	<E-04	0.0003	6.3850
		Po-208		1.00				
		Rn-215	2.30 us	A	8.8390	—	—	8.8390
		Po-211		1.00				
		Rn-216	4.5E-5 s	A	8.2000	—	—	8.2000
		Po-212		1.00				
		Rn-217	5.40E-4 s	A	7.8856	—	—	7.8856
		Po-213		1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
87	Francium	Rn-218	3.5E-2 s	A	7.2618	<E-04	0.0008	7.2626
		Po-214	1.00					
		Rn-219	3.96 s	A	6.8801	0.0068	0.0586	6.9456
		Po-215	1.00					
		Rn-220	55.6 s	A	6.4040	<E-04	0.0006	6.4047
		Po-216	1.00					
		Rn-222	3.8235 d	A	5.5899	<E-04	0.0004	5.5903
		Po-218	1.00					
		Rn-223	24.3 m	B-	—	0.6282	0.3444	0.9726
		Fr-223	1.00					
		Fr-212	20.0 m	ECB+A	2.7731	0.1294	1.1415	4.0440
		Rn-212	5.7000E-01					
		At-208	4.3000E-01					
		Fr-219	2.0E-2 s	A	7.4437	0.0004	0.0036	7.4477
		At-215	1.00					
		Fr-220	27.4 s	A B-	6.7413	0.0163	0.0105	6.7680
		At-216	9.9650E-01					
		Ra-220	3.5000E-03					
		Fr-221	4.9 m	A	6.4199	0.0089	0.0294	6.4582
		At-217	1.00					
		Fr-222	14.2 m	B-	—	0.7145	0.1806	0.8951
		Ra-222	1.00					
		Fr-223	22.00 m	B-A	0.0003	0.3829	0.0583	0.4415
		Ra-223	1.00					
		At-219	6.0000E-05					
88	Radium	Fr-224	3.33 m	B-	—	0.8751	0.5523	1.4274
		Ra-224	1.00					
		Fr-227	2.47 m	B-	—	0.7967	0.4499	1.2466
		Ra-227	1.00					
		Ra-219	10 ms	A	7.9071	0.0600	0.1702	8.1372
		Rn-215	1.00					
		Ra-220	1.79E-2 s	A	7.5904	0.0002	0.0047	7.5952
		Rn-216	1.00					
		Ra-221	28 s	A	6.7915	0.0690	0.0390	6.8995
		Rn-217	1.00					
		Ra-222	38.0 s	A	6.6710	0.0009	0.0092	6.6811
		Rn-218	1.00					
		Ra-223	11.43 d	A	5.7702	0.0781	0.1413	5.9895
		Rn-219	1.00					
		Ra-224	3.66 d	A	5.7766	0.0023	0.0104	5.7893
		Rn-220	1.00					
		Ra-225	14.9 d	B-	—	0.1050	0.0145	0.1194
		Ac-225	1.00					
		Ra-226	1600 y	A	4.8603	0.0039	0.0074	4.8716
		Rn-222	1.00					
		Ra-227	42.2 m	B-	—	0.4511	0.1508	0.6019
		Ac-227	1.00					

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
89	Actinium	Ra-228	5.75 y	B-	—	0.0132	0.0031	0.0163
		Ac-228	1.00	1.00	—	0.0132	0.0031	0.0163
		Ra-230	93 m	B-	—	0.2201	0.0794	0.2995
		Ac-230	1.00	1.00	—	0.2201	0.0794	0.2995
		Ac-223	2.10 m	A	6.6721	0.0254	0.0190	6.7165
		Fr-219	9.9000E-01	9.9000E-01	6.6721	0.0254	0.0190	6.7165
		Ac-224	2.78 h	ECA	0.5662	0.0490	0.2325	0.8477
		Ra-224	9.0900E-01	9.0900E-01	0.5662	0.0490	0.2325	0.8477
		Fr-220	9.1000E-02	9.1000E-02	0.5662	0.0490	0.2325	0.8477
		Ac-225	10.0 d	A	5.8920	0.0248	0.0171	5.9338
		Fr-221	1.00	1.00	5.8920	0.0248	0.0171	5.9338
		Ac-226	29.37 h	B-ECA	0.0003	0.2914	0.1327	0.4245
		Th-226	8.3000E-01	8.3000E-01	0.0003	0.2914	0.1327	0.4245
		Ra-226	1.7000E-01	1.7000E-01	0.0003	0.2914	0.1327	0.4245
		Fr-222	6.0000E-05	6.0000E-05	0.0003	0.2914	0.1327	0.4245
		Ac-227	21.772 y	B-A	0.0693	0.0150	0.0011	0.0853
		Th-227	9.8620E-01	9.8620E-01	0.0693	0.0150	0.0011	0.0853
		Fr-223	1.3800E-02	1.3800E-02	0.0693	0.0150	0.0011	0.0853
		Ac-228	6.15 h	B-	—	0.4495	0.8671	1.3166
		Th-228	1.00	1.00	—	0.4495	0.8671	1.3166
		Ac-230	122 s	B-	—	0.9229	0.5440	1.4668
		Th-230	1.00	1.00	—	0.9229	0.5440	1.4668
		Ac-231	7.5 m	B-	—	0.6361	0.4190	1.0550
		Th-231	1.00	1.00	—	0.6361	0.4190	1.0550
		Ac-232	119 s	B-	—	0.9707	1.1528	2.1235
		Th-232	1.00	1.00	—	0.9707	1.1528	2.1235
90	Thorium	Ac-233	145 s	B-	—	0.8355	0.4993	1.3348
		Th-233	1.00	1.00	—	0.8355	0.4993	1.3348
		Th-223	0.60 s	A	7.4134	0.0575	0.0754	7.5463
		Ra-219	1.00	1.00	7.4134	0.0575	0.0754	7.5463
		Th-224	1.05 s	A	7.2635	0.0129	0.0232	7.2996
		Ra-220	1.00	1.00	7.2635	0.0129	0.0232	7.2996
		Th-226	30.57 m	A	6.4219	0.0211	0.0089	6.4519
		Ra-222	1.00	1.00	6.4219	0.0211	0.0089	6.4519
		Th-227	18.68 d	A	5.9883	0.0755	0.1317	6.1955
		Ra-223	1.00	1.00	5.9883	0.0755	0.1317	6.1955
		Th-228	1.9116 y	A	5.4956	0.0210	0.0036	5.5202
		Ra-224	1.00	1.00	5.4956	0.0210	0.0036	5.5202
		Th-229	7.34E+3 y	A	4.9584	0.1217	0.0971	5.1772
		Ra-225	1.00	1.00	4.9584	0.1217	0.0971	5.1772
		Th-230	7.538E+4 y	A	4.7538	0.0146	0.0018	4.7702
		Ra-226	1.00	1.00	4.7538	0.0146	0.0018	4.7702
		Th-231	25.52 h	B-	—	0.1622	0.0269	0.1891
		Pa-231	1.00	1.00	—	0.1622	0.0269	0.1891
		Th-232	1.405E10 y	A	4.0688	0.0126	0.0015	4.0829
		Ra-228	1.00	1.00	4.0688	0.0126	0.0015	4.0829

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
91	Protactinium	Th-233	22.3 m	B-	—	0.4140	0.0375	0.4515
		Pa-233		1.00				
		Th-234	24.10 d	B-	—	0.0622	0.0105	0.0728
		Pa-234m		1.00				
		Th-235	7.1 m	B-	—	0.6713	0.0537	0.7251
		Pa-235		1.00				
		Th-236	37.5 m	B-	—	0.3671	0.0346	0.4017
		Pa-236		1.00				
		Pa-227	38.3 m	AEC	5.5650	0.0226	0.0234	5.6110
		Ac-223		8.5000E-01				
		Th-227		1.5000E-01				
		Pa-228	22 h	ECB+A	0.1217	0.1320	1.3694	1.6230
		Th-228		9.8000E-01				
		Ac-224		2.0000E-02				
		Pa-229	1.50 d	ECA	0.0274	0.0131	0.0666	0.1071
		Th-229		9.9520E-01				
		Ac-225		4.8000E-03				
		Pa-230	17.4 d	ECB-A	0.0002	0.0668	0.6708	0.7377
		Th-230		9.1600E-01				
		U-230		8.4000E-02				
		Ac-226		3.2000E-05				
		Pa-231	3.276E+4 y	A	5.0592	0.0538	0.0450	5.1580
		Ac-227		1.00				
		Pa-232	1.31 d	B-EC	—	0.1738	0.9393	1.1131
		U-232		1.00				
		Th-232		3.0000E-05				
		Pa-233	26.967 d	B-	—	0.2151	0.2229	0.4380
		U-233		1.00				
		Pa-234	6.70 h	B-	—	0.4037	1.4718	1.8755
		U-234		1.00				
		Pa-234m	1.17 m	B-IT	—	0.8171	0.0162	0.8334
		U-234		9.9840E-01				
		Pa-234		1.6000E-03				
		Pa-235	24.5 m	B-	—	0.4886	0.0008	0.4894
		U-235m		9.9990E-01				
		U-235		1.0109E-04				
		Pa-236	9.1 m	B-	—	0.8049	0.9148	1.7197
		U-236		1.00				
		Pa-237	8.7 m	B-	—	0.5780	0.6095	1.1875
		U-237		1.00				
92	Uranium	U-227	1.1 m	A	6.9984	0.0960	0.1199	7.2143
		Th-223		1.00				
		U-228	9.1 m	A	6.6046	0.0231	0.0056	6.6333
		Th-224		9.7500E-01				
		U-230	20.8 d	A	5.9681	0.0216	0.0032	5.9929
		Th-226		1.00				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
93	Neptunium	U-231	4.2 d	ECA	0.0002	0.0847	0.0896	0.1745
		Pa-231	1.00					
		Th-227	4.0000E-05					
		U-232	68.9 y	A	5.3948	0.0164	0.0023	5.4135
		Th-228	1.00					
		U-233	1.592E+5 y	A	4.9013	0.0059	0.0013	4.9085
		Th-229	1.00					
		U-234	2.455E+5 y	A	4.8430	0.0137	0.0020	4.8587
		Th-230	1.00					
		U-235	7.04E+8 y	A	4.4693	0.0530	0.1669	4.6891
		Th-231	1.00					
		U-235m	26 m	IT	—	<E-04	<E-04	<E-04
		U-235	1.00					
		U-236	2.342E+7 y	A	4.5592	0.0114	0.0018	4.5723
		Th-232	1.00					
		U-237	6.75 d	B-	—	0.1991	0.1442	0.3433
		Np-237	1.00					
		U-238	4.468E+9 y	ASF	4.2584	0.0092	0.0014	4.2691
		Th-234	1.00					
		SF	5.4500E-07					
		U-239	23.45 m	B-	—	0.4108	0.0519	0.4626
		Np-239	1.00					
		U-240	14.1 h	B-	—	0.1276	0.0099	0.1374
		Np-240m	1.00					
		U-242	16.8 m	B-	—	0.3859	0.0413	0.4272
		Np-242	1.00					
		Np-232	14.7 m	ECB+	—	0.1073	1.1969	1.3042
		U-232	1.00					
		Np-233	36.2 m	ECA	<E-04	0.0144	0.0911	0.1055
		U-233	1.00					
		Pa-229	1.0000E-05					
		Np-234	4.4 d	ECB+	—	0.0574	1.1086	1.1660
		U-234	1.00					
		Np-235	396.1 d	ECA	0.0001	0.0105	0.0071	0.0178
		U-235	9.9598E-01					
		U-235m	3.9933E-03					
		Pa-231	2.6000E-05					
		Np-236	1.54E+5 y	ECB-A	0.0074	0.2372	0.1594	0.4039
		U-236	8.7300E-01					
		Pu-236	1.2500E-01					
		Pa-232	1.6000E-03					
		Np-236m	22.5 h	ECB-	—	0.0880	0.0507	0.1387
		U-236	5.2000E-01					
		Pu-236	4.8000E-01					
		Np-237	2.144E+6 y	A	4.8499	0.0681	0.0350	4.9529
		Pa-233	1.00					

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
94	Plutonium	Np-238	2.117 d	B-	—	0.2519	0.5879	0.8398
		Pu-238	1.00					
		Np-239	2.3565 d	B-	—	0.2623	0.1846	0.4469
		Pu-239	1.00					
		Np-240	61.9 m	B-	—	0.5095	1.0538	1.5632
		Pu-240	1.00					
		Np-240m	7.22 m	B-IT	—	0.6779	0.3225	1.0004
		Pu-240	9.9890E-01					
		Np-240	1.1000E-03					
		Np-241	13.9 m	B-	—	0.4341	0.0395	0.4736
		Pu-241	1.00					
		Np-242	2.2 m	B-	—	0.9027	0.2654	1.1681
		Pu-242	1.00					
		Np-242m	5.5 m	B-	—	0.7551	0.9194	1.6744
		Pu-242	1.00					
		Pu-232	33.7 m	ECA	1.5402	0.0087	0.0633	1.6122
		Np-232	7.7000E-01					
		U-228	2.3000E-01					
		Pu-234	8.8 h	ECA	0.3776	0.0114	0.0693	0.4583
		Np-234	9.4000E-01					
		U-230	6.0000E-02					
		Pu-235	25.3 m	ECA	0.0002	0.0228	0.0957	0.1187
		Np-235	9.9997E-01					
		U-231	2.7000E-05					
		Pu-236	2.858 y	ASF	5.8524	0.0128	0.0022	5.8674
		U-232	1.00					
		SF	1.3700E-09					
		Pu-237	45.2 d	ECA	0.0002	0.0171	0.0537	0.0710
		Np-237	1.00					
		U-233	4.2000E-05					
		Pu-238	87.7 y	ASF	5.5803	0.0107	0.0021	5.5930
		U-234	1.00					
		SF	1.8500E-09					
		Pu-239	2.411E+4 y	A	5.2357	0.0075	0.0011	5.2442
		U-235m	9.9940E-01					
		U-235	6.0000E-04					
		Pu-240	6564 y	ASF	5.2434	0.0105	0.0019	5.2559
		U-236	1.00					
		SF	5.7500E-08					
		Pu-241	14.35 y	B-A	0.0001	0.0052	<E-04	0.0054
		Am-241	9.9998E-01					
		U-237	2.4500E-05					
		Pu-242	3.75E+5 y	ASF	4.9738	0.0090	0.0017	4.9855
		U-238	1.00					
		SF	5.5400E-06					
		Pu-243	4.956 h	B-	—	0.1729	0.0259	0.1988
		Am-243	1.00					

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
95	Americium	Pu-244	8.00E+7 y	ASF	4.6513	0.0197	0.0211	4.9094
		U-240		9.9879E-01				
		SF		1.2100E-03				
		Pu-245	10.5 h	B-	—	0.3190	0.4027	0.7217
		Am-245		1.00				
		Pu-246	10.84 d	B-	—	0.1159	0.1431	0.2590
		Am-246m		1.00				
		Am-237	73.0 m	ECA	0.0015	0.0802	0.3714	0.4531
		Pu-237		9.9975E-01				
		Np-233		2.5000E-04				
		Am-238	98 m	ECB+A	<E-04	0.0485	0.9023	0.9509
		Pu-238		1.00				
		Np-234		1.0000E-06				
		Am-239	11.9 h	ECA	0.0006	0.1709	0.2436	0.4150
		Pu-239		9.9990E-01				
		Np-235		1.0000E-04				
		Am-240	50.8 h	ECA	<E-04	0.0758	1.0355	1.1112
		Pu-240		1.00				
		Np-236		1.9000E-06				
		Am-241	432.2 y	A	5.5712	0.0373	0.0293	5.6379
		Np-237		1.00				
		Am-242	16.02 h	B-EC	—	0.1806	0.0188	0.1994
		Cm-242		8.2700E-01				
		Pu-242		1.7300E-01				
		Am-242m	141 y	ITA	0.0238	0.0439	0.0056	0.0734
		Am-242		9.9550E-01				
		Np-238		4.5000E-03				
		Am-243	7.37E+3 y	A	5.3583	0.0234	0.0585	5.4402
		Np-239		1.00				
		Am-244	10.1 h	B-	—	0.3330	0.8052	1.1382
		Cm-244		1.00				
		Am-244m	26 m	B-	—	0.5187	0.0172	0.5359
		Cm-244		9.9960E-01				
		Am-245	2.05 h	B-	—	0.2874	0.0324	0.3198
		Cm-245		1.00				
		Am-246	39 m	B-	—	0.7241	0.7498	1.4739
		Cm-246		1.00				
		Am-246m	25.0 m	B-	—	0.5033	0.9799	1.4832
		Cm-246		1.00				
		Am-247	23.0 m	B-	—	0.5683	0.1348	0.7031
		Cm-247		1.00				
96	Curium	Cm-238	2.4 h	ECA	0.2537	0.0117	0.0829	0.3482
		Am-238		9.6160E-01				
		Pu-234		3.8400E-02				
		Cm-239	2.9 h	ECB+	—	0.0291	0.2593	0.2883
		Am-239		1.00				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
97	Berkelium	Cm-240	27 d	ASF	6.3650	0.0108	0.0022	6.3781
		Pu-236		9.9700E-01				
		SF		3.9000E-08				
		Cm-241	32.8 d	ECA	0.0603	0.1342	0.5034	0.6979
		Am-241		9.9000E-01				
		Pu-237		1.0000E-02				
		Cm-242	162.8 d	ASF	6.2041	0.0096	0.0020	6.2156
		Pu-238		1.00				
		SF		6.3700E-08				
		Cm-243	29.1 y	AEC	5.8929	0.1342	0.1353	6.1624
		Pu-239		9.9760E-01				
		Am-243		2.4000E-03				
		Cm-244	18.10 y	ASF	5.8915	0.0079	0.0017	5.9014
		Pu-240		1.00				
		SF		1.3710E-06				
		Cm-245	8.5E+3 y	ASF	5.4474	0.0824	0.1084	5.6382
		Pu-241		1.00				
		SF		6.1000E-09				
		Cm-246	4.76E+3 y	ASF	5.4654	0.0085	0.0050	5.5285
		Pu-242		9.9974E-01				
		SF		2.6300E-04				
		Cm-247	1.56E+7 y	A	5.0292	0.0114	0.3138	5.3544
		Pu-243		1.00				
		Cm-248	3.48E+5 y	ASF	4.7212	0.7716	1.3127	22.5608
		Pu-244		9.1610E-01				
		SF		8.3900E-02				
		Cm-249	64.15 m	B-	—	0.2835	0.0200	0.3035
		Bk-249		1.00				
		Cm-250	8300 y	AB-SF	0.9283	8.4270	13.3167	161.287
		Pu-246		1.8000E-01				
		Bk-250		8.0000E-02				
		SF		7.4000E-01				
		Cm-251	16.8 m	B-	—	0.4545	0.1112	0.5657
		Bk-251		1.00				
		Bk-245	4.94 d	ECA	0.0075	0.1326	0.2352	0.3752
		Cm-245		9.9880E-01				
		Am-241		1.2000E-03				
		Bk-246	1.80 d	EC	—	0.0554	0.8546	0.9101
		Cm-246		1.00				
		Bk-247	1.38E+3 y	A	5.7031	0.0691	0.1468	5.9190
		Am-243		1.00				
		Bk-248m	23.7 h	B-EC	—	0.1910	0.0559	0.2470
		Cf-248		7.0000E-01				
		Cm-248		3.0000E-01				
		Bk-249	330 d	B-A	<E-04	0.0324	<E-04	0.0325
		Cf-249		1.00				
		Am-245		1.4500E-05				

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
98	Californium	Bk-250	3.212 h	B-	—	0.2949	0.8983	1.1932
		Cf-250		1.00				
		Bk-251	55.6 m	B-	—	0.3693	0.0915	0.4608
		Cf-251		1.00				
		Cf-244	19.4 m	A	7.3196	0.0075	0.0020	7.3291
		Cm-240		1.00				
		Cf-246	35.7 h	ASF	6.8527	0.0060	0.0014	6.8606
		Cm-242		1.00				
		SF		2.5000E-06				
		Cf-247	3.11 h	ECA	0.0022	0.0463	0.1050	0.1536
		Bk-247		9.9965E-01				
		Cm-243		3.5000E-04				
		Cf-248	334 d	ASF	6.3518	0.0075	0.0020	6.3670
		Cm-244		9.9997E-01				
		SF		2.9000E-05				
		Cf-249	351 y	ASF	5.9262	0.0399	0.3282	6.2944
		Cm-245		1.00				
		SF		5.0200E-09				
		Cf-250	13.08 y	ASF	6.1168	0.0103	0.0111	6.2897
		Cm-246		9.9923E-01				
		SF		7.7000E-04				
		Cf-251	900 y	A	5.8803	0.1705	0.1245	6.1754
		Cm-247		1.00				
		Cf-252	2.645 y	ASF	6.0177	0.2516	0.4572	12.8107
		Cm-248		9.6908E-01				
		SF		3.0920E-02				
99	Einsteinium	Cf-253	17.81 d	B-A	0.0188	0.0908	0.0048	0.1144
		Es-253		9.9690E-01				
		Cm-249		3.1000E-03				
		Cf-254	60.5 d	ASF	0.0183	10.0442	16.8399	222.890
		Cm-250		3.1000E-03				
		SF		9.9690E-01				
		Cf-255	85 m	B-	—	0.2178	—	0.2178
		Es-255		1.00				
		Es-249	102.2 m	ECB+A	0.0392	0.0437	0.4129	0.4958
		Cf-249		9.9430E-01				
		Bk-245		5.7000E-03				
		Es-250	8.6 h	EC	—	0.3281	1.2235	1.5516
		Cf-250		9.8500E-01				
		Es-250m	2.22 h	ECB+	—	0.0343	0.5549	0.5892
		Cf-250		1.00				
		Es-251	33 h	ECA	0.0329	0.0522	0.1016	0.1868
		Cf-251		9.9500E-01				
		Bk-247		5.0000E-03				
		Es-253	20.47 d	ASF	6.7335	0.0022	0.0008	6.7366
		Bk-249		1.00				
		SF		8.9000E-08				

(continued on next page)

Table A.1 continued

Z	Element	Nuclide	Half-life	Decay mode	Emitted energy (MeV/nt)			
					Alpha	Electron	Photon	Total
100	Fermium	Es-254	275.7 d	A B-SF	6.5244	0.0727	0.0208	6.6179
		Bk-250	1.00					
		Fm-254	1.7400E-06					
		SF	3.0000E-08					
		Es-254m	39.3 h	B-AECSF	0.0208	0.2408	0.4757	0.8269
		Fm-254	9.8000E-01					
		Bk-250	3.2000E-03					
		Cf-254	7.6000E-04					
		SF	4.5000E-04					
		Es-255	39.8 d	B-ASF	0.5117	0.0737	0.0007	0.5950
		Fm-255	9.2000E-01					
		Bk-251	8.0000E-02					
		SF	4.5000E-05					
		Es-256	25.4 m	B-	—	0.5822	0.0032	0.5854
		Fm-256	1.00					
		Fm-251	5.30 h	ECB+A	0.1252	0.0337	0.1588	0.3176
		Es-251	9.8200E-01					
		Cf-247	1.8000E-02					
		Fm-252	25.39 h	ASF	7.1449	0.0064	0.0018	7.1578
		Cf-248	9.9998E-01					
		SF	2.3000E-05					
		Fm-253	3.00 d	ECA	0.8352	0.1084	0.0713	1.0150
		Es-253	8.8000E-01					
		Cf-249	1.2000E-01					
		Fm-254	3.240 h	ASF	7.2956	0.0095	0.0086	7.4339
		Cf-250	9.9941E-01					
		SF	5.9200E-04					
		Fm-255	20.07 h	ASF	7.1292	0.0954	0.0170	7.2417
		Cf-251	1.00					
		SF	2.3000E-07					
		Fm-256	157.6 m	ASF	0.5686	6.3116	12.4371	205.496
		Cf-252	8.1000E-02					
		SF	9.1900E-01					
		Fm-257	100.5 d	ASF	6.6154	0.1471	0.1521	7.3388
		Cf-253	9.9790E-01					
		SF	2.1000E-03					