



**Westinghouse**

Government Services Group

WASTE ISOLATION DIVISION

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Pages (including cover sheet):

11

Date:

12-12-00

Re:

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Comments:

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Westinghouse

234-7113

P. 1

Visual examination (VE) is used to provide a quality control check on radiography. Digital radiography and computed tomography (DR/CT) is a technological advancement over real-time radiography (RTR) that allows the operator to discern more detail about the waste composition. A comparison of the results of Waste Inspection Tomography (WIT) DR/CT to the results of VE for drums at the Nevada Test Site (NTS) and the drums assessed during the Rapid Commercialization Initiative (RCI) program shows that there is a 100% agreement in confirming the physical waste form and the absence of prohibited items.

The 100% agreement for physical waste form is based on the comparison of the material parameters that were identified using DR/CT and those identified during VE. The results of both techniques demonstrated that the contents of the drums (i.e., the waste material parameter weights) that were estimated were consistent with the waste matrix codes and the waste stream for all of the drums. This waste matrix code is important because the waste matrix codes are used to determine the types of waste characterization that must be performed on the container (i.e., solid sampling). The waste stream designation is important because the listed hazardous waste codes are assigned based on the original waste generation process and therefore the waste stream.

The 100% agreement for the absence of prohibited items is based on the fact that neither the DR/CT nor the VE process identified any prohibited items (e.g., compressed gases, sealed containers greater than 4 liters). This is important because the prohibited items are not authorized for disposal under the treatment, storage, and disposal facility waste acceptance .

Attached please find both a summary of those findings as well as the raw data for one of the containers which have undergone visual examination and computed tomography at the NTS facility. Additional data will be forthcoming as more of these containers undergo VE. The results do, however, show that the value of CT as an alternate to VE are comparable.

Finally, I have included two tables which show the equivalencies between VE and CT (Table 1) as well as a table showing the equivalencies between VE and RTR (Table 2).

Drum Number 980286

Material	WIT (kg)	WIT (lbs)	NTS	DIFFERENCE
IRON	0.5	1.1	4.2	3.1
ALUM	6.8	14.96	0.3	-14.66
OTHER METAL	0.5	1.1	0	-1.1
OTHER INORGANIC	0	0	0	0
Cellulosics	0	0	3.8	3.8
RUBBER	0	0	2.6	2.6
Plastic	12.4	27.28	23.3	-3.98
organic	0	0	9.4	9.4
Inorganic	0	0	0	0
soils	0	0	0	0
<b>TOTAL</b>	<b>20.2</b>	<b>44.44</b>	<b>43.6</b>	<b>-0.84</b>

**Table 1**  
**VE and DR/CT Equivalencies**

REQUIREMENT	VE			DR/CT		
	SOLIDS	SOILS/ GRAVELS	DEBRIS	SOLIDS	SOILS/ GRAVELS	DEBRIS
<b>Describe all contents</b>	Cannot View	Can View	Can View Non-Opaque	Viewable		
<b>Opaque Inner Bags</b>	Cannot View	Open or Estimate	Open or Estimate	Viewable		
<b>Lead Lined Drum</b>	Potential Exposure Hazards During VE since the contents cannot be viewed with RTR			Viewable		
<b>Material Parameter Weights</b>	Estimate or Weigh			Estimate		
<b>Identify Packaging</b>	Can distinguish between materials			Can distinguish based on density		
<b>Identify Residuals</b>	Cannot View	Can View	Can View	Viewable		
<b>Identify Waste Materials</b>	Non-Opaque Only			Viewable		
<b>Record</b>	Audio/Video			Computer File with Digital Audio		
<b>Procedures</b>	Equivalent					

**Table 2**  
**VE and RTR Equivalencies**

REQUIREMENT	VE			RTR		
	SOLIDS	SOILS/ GRAVELS	DEBRIS	SOLIDS	SOILS/ GRAVELS	DEBRIS
<b>Describe all contents</b>	Cannot View	Can View	Can View Non-Opaque	Cannot View	Can View depending on density	Can View depending on density
<b>Opaque Inner Bags</b>	Cannot View	Open or Estimate	Open or Estimate	Viewable		
<b>Lead Lined Drum</b>	Potential Exposure Hazards During VE since the contents cannot be viewed with RTR			Cannot View	Can View depending on density and lead thickness	Can View depending on lead thickness
<b>Material Parameter Weights</b>	Estimate or Weigh			Estimate		
<b>Identify Packaging</b>	Can distinguish between materials			Can distinguish based on density		
<b>Identify Residuals</b>	Cannot View	Can View	Can View	Viewable		
<b>Identify Waste Materials</b>	Non-Opaque Only			Cannot View	Can View depending on density	Can View depending on density
<b>Record</b>	Audio/Video Tape			Audio/Video Tape		
<b>Procedures</b>	Equivalent					

NOV 22 '00 12:48PM WASTE CONTROL ERTDD

P. 1/1

Site Name	NTS	Source: NTS	NTS
		Swipe Tested Clean(y/n)	y
Date of WIT NDE Exam:	9/16/98	Source: NTS	NTS
		Contact Handleable(y/n)	y
Drum Size	55 gal	Surface Rust Visible(y/n)	n
Drum Vented (y/n):	n	Drum Perforated(y/n)	n

Drum Identification Number	NT980286 <i>NT29 406 Y</i>	ID Bar /Code for WIT Computer File Number	NT980286
Drum Bar Code Number	NT980286 <i>Blk UNK</i>	(Replicate y/n) Batch Number:	n W981117E (1)
Source: NTS		Shipping Category/ TRUCON content Code:	III,1A2NT225A
Item Description Code(IDC)	993		

Quantity	0	Quantity PM	0
Description	n/a	Description PM	n/a

Liner ( Yes/No )	Yes	Iron based Metals /Alloys (kgs)	0.5
Liner Type	90 mil polyliner	Aluminum based Metals / Alloys (kgs)	6.8
Liner Vented (y/n)	n	Other Metals (kgs)	0.5
Packaging:bag closure method	horsetail	Other Inorganic Materials (kgs)	0.0
No. of confinement layers	2	Cellulosics (kgs)	0.0
Matrix Parameter Category:	S5480	Rubber (kgs)	0.0
Fill Height (mm)	695 <i>510</i>	Plastics Waste material (kgs)	12.4
MPC Description:	Unknown/other heterogenous debris	Organic Matrix (kgs)	0.0
		Inorganic Matrix (kgs)	0.0

Volume .ml.	0.0	Soils (kgs)	0.0
Location	n/a	Total Material Weight	20.2
Container Description	n/a		

Quantity	0	Steel (kgs)	25.6
Description	n/a	Plastics (kgs)	11.1
		Total Packaging Weight(kgs)	36.7

Quantity	0	Measured and Certified Gross (source NTS)	58.9
Description	n/a		

Operations performed for WIT NDE DR, CT, VR	DR y CT y VR n		
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Operator Signature/Date: *James R. Martin 12/3/98*

Approval Signature/Date: *J. Vecchi 12/3/98*

**Bechtel Nevada**

**Waste Management Program**

**Bechtel Nevada**

**Package Inventory Report**

**Prepared on: 27-NOV-2000**

**Page 1 Of 2**

Payload Container: NT000860 Waste Type: MTRU Container Type: 55 GAL DRUM /30 MIL OPEN LINER  
 Location Row: Tier: Sequence: Waste Stream # NTLNLO419-5540 TID: 400436 WAC Revision: 5  
 TRUCON Code: NT125B Description: TRU COMBUSTIBLE AND NONCOMBUSTIBLE WASTE Fill Factor: 70 %  
 Matrix Parameter Category: HETEROGENEOUS DEBRIS Camera Checked? Y Video Tape ID: 141  
 Liner Puncture: Y Liner Type: 30 MIL OPEN TOP Layers of Packing: 1  
 Scale ID: 998859 Scale in Tol: Y Cal. Due Date: 02-OCT-2001 Dup. Unit in Tol: Y

Net: 4.360E+01 (lbs) Tare: 5.160E+01 (lbs) Gross: 1.000E+02 (lbs) Gross Uncert: 8.000E+00 (lbs)

Source Container NT284064

Comments:

NO PROHIBITED ITEMS PRESENT. WASTE DRUM NT284064 (NT980286) IS BEING REPACKED TO PERFORM VISUAL EXAMINATION TO CONFIRM RADIOGRAPHY. AN REVIEW CONSISTED OF VIEWING THE 1986 RTR AND THE 1995 GENERATED DATABASE. PU-219 CONTENT AS REPORTED IN THE 1995 GENERATED DATABASE IS .0257 GRAMS.  
 NO PROHIBITED ITEMS FOUND IN WASTE DRUM NT284064. NO PYROPHORIC MATERIAL FOUND IN WASTE DRUM NT284064. THREE LAYERS OF CONFINEMENT AND A 90 MIL LINER NOTED IN WASTE DRUM NT284064.  
 TARE WEIGHT OF PAYLOAD CONTAINER NT000860 IS 51.6 POUNDS.  
 GROSS WEIGHT OF PAYLOAD CONTAINER NT000860 IS 100.0 POUNDS.  
 TARE WEIGHT OF WASTE DRUM NT284064 IS 89.0 POUNDS.

SURVEY DATA:

1.00 MILLIREM PER HOUR GAMMA @ CONTACT  
 0.40 MILLIREM PER HOUR GAMMA @ 30 CM  
 0.05 MILLIREM PER HOUR GAMMA @ 2 METERS  
 0 MILLIREM PER HOUR NEUTRON @ CONTACT  
 0 MILLIREM PER HOUR NEUTRON @ 30 CM  
 0 MILLIREM PER HOUR NEUTRON @ 2 METERS  
 2 DPM PER 100 CM2 ALPHA  
 0 DPM PER 100 CM2 BETA  
 REFERENCE SURVEY FORM WEF-112200

Waste Handler Signature: \_\_\_\_\_

Waste Handler Signature: \_\_\_\_\_

Visual Examination Expert: GREGORLB

Signature: \_\_\_\_\_

Closure Date: 22-NOV-2000

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Waste Material Parameters	Weight (lbs)	Weight (%)
ALUMINUM BASED METALS/ALLOYS	3.000E-01	.6881
CELLULOSICS	3.800E+00	8.716
IRON BASED METALS/ALLOYS	4.200E+00	9.633
ORGANIC MATRIX	9.400E+00	21.56
OTHER INORGANIC MATERIALS	.000E+00	0
OTHER METALS	.000E+00	0
PLASTICS (WASTE MATERIALS)	2.330E+01	53.44
RUBBER	2.600E-00	5.963

Waste Handler Signature: \_\_\_\_\_

Waste Handler Signature: \_\_\_\_\_

Visual Examination Expert: GREGORLB

Signature: \_\_\_\_\_

Closure Date: 22-NOV-2000

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**Bechtel Nevada**

**Waste Management Program  
Payload Unit Information**

**Bechtel Nevada**

Prepared On 27-NOV-2000

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Payload Container Id: NT000860

Unit Count:	1	Type	REPACK	Unit Id: 6416
Unit Date	22-NOV-2000	Waste Material Parameter	PLASTICS (WASTE MATERIALS)	Weight (lbs) 8.400E+00
Unit Date	22-NOV-2000	Waste Material Parameter	CELLULOSICS	Weight (lbs) 1.000E-01
Unit Total Weight				8.500E+00

Comments: UNIT 1. PLASTIC BAGS, PLASTIC BAGS WITH PLASTIC TAPE ATTACHED, PLASTIC BAGS WITH PLASTIC TAPE STUB PIGTAIL ENDS, NTS STUB, PLASTIC SAMPLE CONTAINERS, PLASTIC BAGS STUBBED ON EACH END CUT OPEN IN THE MIDDLE, PLASTIC BAGS WITH PAPER SACK INSIDE,

Unit Count:	2	Type	REPACK	Unit Id: 6417
Unit Date	22-NOV-2000	Waste Material Parameter	PLASTICS (WASTE MATERIALS)	Weight (lbs) 1.460E+01
Unit Date	22-NOV-2000	Waste Material Parameter	CELLULOSICS	Weight (lbs) 2.000E-01
Unit Date	22-NOV-2000	Waste Material Parameter	IRON BASED METALS/ALLOYS	Weight (lbs) 2.000E-01
Unit Date	22-NOV-2000	Waste Material Parameter	ALUMINUM BASED METALS/ALLOYS	Weight (lbs) 2.000E-01
Unit Total Weight				1.520E+01

Comments: UNIT 2. PLASTIC BAGS, PLASTIC BAGS WITH PLASTIC TAPE ATTACHED, PLASTIC BAGS WITH CELLULOSICS ATTACHED, PLASTIC BAGS WITH PLASTIC TAPE STUB PIGTAIL ENDS, PLASTIC BAG WITH PLASTIC TAPE AND LINE CUTTING TOOL ATTACHED, PLASTIC SAMPLE CONTAINERS, PLASTIC CAPS, NTS STUB, ALUMINUM FOIL PIECE, PLASTIC TUBING.

Unit Count:	3	Type	REPACK	Unit Id: 6418
Unit Date	22-NOV-2000	Waste Material Parameter	IRON BASED METALS/ALLOYS	Weight (lbs) 3.900E+00
Unit Date	22-NOV-2000	Waste Material Parameter	PLASTICS (WASTE MATERIALS)	Weight (lbs) 1.000E-01
Unit Date	22-NOV-2000	Waste Material Parameter	CELLULOSICS	Weight (lbs) .000E+00
Unit Total Weight				4.000E+00

Comments: UNIT 3. IRON BASED METAL CANS, IRON BASED METAL CANS WITH PLASTIC LABELS, IRON BASED METAL CAN WITH KIMWIPE INSIDE, IRON BASED METAL CLAMPS, IRON BASED METAL PIPE CUTTING TOOL WITH PLASTIC HANDLE, IRON BASED METAL LIDS.

Unit Count:	4	Type	REPACK	Unit Id: 6419
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**Waste Management Program  
Payload Unit Information**

**Bechtel Nevada**

**Prepared On 27-NOV-2000**

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Unit Count: 4 Type REPACK Unit Id: 6419

Unit Date	Waste Material Parameter	Weight (lbs)
22-NOV-2000	ORGANIC MATRIX	1.500E+00

Unit Total Weight 1.500E+00

Comments: UNIT 4. DUPLICATE WEIGHT UNIT. GRAPHITE MOLD PIECE.

Unit Count: 5 Type REPACK Unit Id: 6420

Unit Date	Waste Material Parameter	Weight (lbs)
22-NOV-2000	ORGANIC MATRIX	7.900E+00

22-NOV-2000	PLASTICS (WASTE MATERIALS)	1.000E-01
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Unit Total Weight 8.000E+00

Comments: UNIT 5. GRAPHITE MOLD PIECES, GRAPHITE MOLD WITH PLASTIC TAPE ATTACHED.

Unit Count: 6 Type REPACK Unit Id: 6421

Unit Date	Waste Material Parameter	Weight (lbs)
22-NOV-2000	CELLULOSICS	3.400E+00

22-NOV-2000	IRON BASED METALS/ALLOYS	.000E+00
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22-NOV-2000	PLASTICS (WASTE MATERIALS)	.000E+00
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Unit Total Weight 3.400E+00

Comments: UNIT 6. BROWN GROCERY TYPE PAPER SACKS, BROWN GROCERY TYPE PAPER SACK PIECES, KIMWIPES, ICE CREAM TYPE SAMPLE CONTAINERS, ICE CREAM TYPE SAMPLE CONTAINER PIECES, COTTON CAUZE, PLASTIC TAPE PIECES, BROWN GROCERY TYPE PAPER SACK WITH LIVERMORE CUTTING TOOL ATTACHED.

Unit Count: 7 Type REPACK Unit Id: 6422

Unit Date	Waste Material Parameter	Weight (lbs)
22-NOV-2000	RUBBER	2.500E+00

22-NOV-2000	CELLULOSICS	.000E+00
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Unit Total Weight 2.500E+00

Comments: UNIT 7. RUBBER SHOE COVERS, CELLULSOIC MATERIAL, RUBBER GLOVES.

Unit Count: 8 Type REPACK Unit Id: 6423

Unit Date	Waste Material Parameter	Weight (lbs)
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**Bechtel Nevada**Waste Management Program  
Payload Unit Information**Bechtel Nevada**

Prepared On 27-NOV-2000

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Unit Count:	8	Type	REPACK	Unit Id: 6423
	22-NOV-2000	PLASTICS (WASTE MATERIALS)		1.000E-01
	22-NOV-2000	CELLULOSICS		1.000E-01
	22-NOV-2000	IRON BASED METALS/ALLOYS		1.000E-01
	22-NOV-2000	ALUMINUM BASED METALS/ALLOYS		1.000E-01
	22-NOV-2000	OTHER METALS		.000E+00
	22-NOV-2000	ORGANIC MATRIX		.000E+00
	22-NOV-2000	OTHER INORGANIC MATERIALS		.000E+00
	22-NOV-2000	RUBBER		1.000E-01

Unit Total Weight      5.000E-01

Comments: UNIT 8. BROWN GROCERY TYPE PAPER SACK PIECES, ALUMINUM FOIL PIECES, PLASTIC TAPE PIECES, LLNL CUTTING TOOLS, RUBBER GLOVE PIECES, COTTON MATERIAL, PLASTIC CAPS, BRASS FITTINGS, RUBBER O-RING, IRON BASED METAL LID, LLNL CUTTING TOOL COVERS, PLASTIC SAMPLE CONTAINER, CELLULOSIC DEBRIS, GRAPHITE RESIDUE, BRASS PLUG, IRON BASED METAL SCREW, RUBBER PLUG WITH COPPER PIPE RUBBING THROUGH, GLASS LIGHTBULB FILAMENT WITH OTHER METAL ATTACHED, GRAPHITE PLUG, RESIN PLUG, PLASTIC PIPETTE.

Payload Container Total Weight:      4.360E+01