

ZION NUCLEAR POWER STATION
2003 RADIOACTIVE EFFLUENT RELEASE REPORT
UNIT 1 & 2 (DOCKET Numbers 50-295 & 50-304)

EXECUTIVE SUMMARY

A review of 2003 effluent data versus previous years' data showed there were no abnormally high amounts of radioactivity released during 2003. In 2003, there was no radioactive iodine released. The release of noble gas and particulates continued to trend downward. This trend can be attributed to the shutdown of both units. Unit 1 discharge vent was mechanically closed.

Airborne

	Yearly Dose Limit per Reactor Unit	Dose to Maximally Exposed Receptor (Adult) from Unit 1	Dose to Maximally Exposed Receptor (Adult) from Unit 2
Gamma Air	10 mrad	0 mrad	0 mrad
Beta Air	20 mrad	0 mrad	0 mrad
Total Body	5 mrem	7.64e-5mrem	7.54e-5 mrem
Skin	15 mrem	0 mrem	0 mrem
Organ	15 mrem	8.55e-5 mrem	8.75E-5 mrem

Aquatic doses were low because both units are no longer operational. Aquatic doses for Unit 1 were higher than the doses for Unit 2 because there are no discharges of radioactive effluents performed using the Unit 2 Discharge Canal.

Aquatic

	Yearly Dose Limit per Reactor Unit	Dose to Maximally Exposed Receptor (Teenage) from Unit 1	Dose to Maximally Exposed Receptor from Unit 2
Total Body	3 mrem	2.48e-2 mrem	0 mrem
Organ	10 mrem	3.93e-2 mrem	0 mrem

The doses to the public, from all Zion Station effluent paths during 2003, were extremely low and far below all regulatory limits.

Attachment 2:

To the Zion Nuclear Power Station, Units 1 and 2, 2003 Radioactive Effluent Release Report.

The following identifies those actions committed to by Exelon Nuclear in this document. Any other actions discussed in this submittal represent intended or planned actions by Exelon Nuclear. They are described to the NRC for the NRC's information, and are not Regulatory Commitments.

Commitment:

None

ZION STATION
Unit 2
10CFR20 Compliance Assessment

1. 10CFR 20.1301 (a) (1) Compliance

Total Effective Dose Equivalent, mrem/year 1.56e-3

10 CFR 20.1301 (a) (1) limit mrem/yr 100

% of the limit 0.002

2. Compliance Summary 10CFR20

	1 st Qtr.	2 nd Qtr.	3 rd Qtr.	4 th Qtr	% of Limit
TEDE	0	1.02e-4	0	5.85e-5	0.002%

ZION STATION
Unit 1
10CFR20 Compliance Assessment

1. 10CFR 20.1301 (a) (1) Compliance

Total Effective Dose Equivalent,	<u>mrem/year</u>	<u>6.29e-2</u>
10 CFR 20.1301 (a) (1) limit	<u>mrem/yr</u>	<u>100</u>
% of the limit		<u>0.06</u>

2. Compliance Summary 10CFR20

	1 st Qtr.	2 nd Qtr.	3 rd Qtr.	4 th Qtr	% of Limit
TEDE	0	1.01e-4	4.14e-2	2.12e-2	0.06%

40CFR190 URANIUM FUEL CYCLE DOSE REPORT

GASEOUS DOSE SUMMARY

Report for: 2003

Unit Range - From: 1 To: 2

=== I&P DOSE LIMIT ANALYSIS ===== QUARTER 1 =====

Quartr - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Qtr 1 - Admin. Any Organ			0.00E+00	1.00E+01	0.00E+00
Qtr 1 - Admin. Total Body			0.00E+00	1.00E+01	0.00E+00

Qtr 1 - T.Spc. Any Organ			0.00E+00	1.00E+01	0.00E+00
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Receptor: 5 Composite Crit. Receptor - IP

Distance: 0.00 (meters) Compass Point: NA

Critical Pathway:

Major Contributors (0% or greater to total)

Nuclide Percentage

Qtr 1 - T.Spc. Total Body			0.00E+00	1.00E+01	0.00E+00
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Receptor: 5 Composite Crit. Receptor - IP

Distance: 0.00 (meters) Compass Point: NA

Critical Pathway:

Major Contributors (0% or greater to total)

Nuclide Percentage

40CFR190 URANIUM FUEL CYCLE DOSE REPORT

GASEOUS DOSE SUMMARY

Report for: 2003

Unit Range - From: 1 To: 2

=== NG DOSE LIMIT ANALYSIS === QUARTER 1 ===

Quartr - Limit	Dose (mrad)	Limit (mrad)	Max % of Limit
Qtr 1 - Admin. Gamma	0.00E+00	1.00E+01	0.00E+00
Qtr 1 - Admin. Beta	0.00E+00	1.00E+01	0.00E+00
Qtr 1 - T.Spc. Gamma	0.00E+00	1.00E+01	0.00E+00
Receptor: 5 Composite Crit. Receptor - IP			
Distance: 0.00 (meters) Compass Point: NA			
Nuclide	Percentage		
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Qtr 1 - T.Spc. Beta	0.00E+00	1.00E+01	0.00E+00
Receptor: 5 Composite Crit. Receptor - IP			
Distance: 0.00 (meters) Compass Point: NA			
Nuclide	Percentage		
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40CFR190 URANIUM FUEL CYCLE DOSE REPORT

GASEOUS DOSE SUMMARY

Report for: 2003

Unit Range - From: 1 To: 2

=== I&P DOSE LIMIT ANALYSIS === QUARTER 2 ===

Quartr - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Qtr 2 - Admin. Any Organ	ADULT	GILLI	1.08E-04	5.63E+00	1.92E-03
Qtr 2 - Admin. Total Body	CHILD	TBODY	9.50E-05	5.25E+00	1.81E-03

Qtr 2 - T.Spc. Any Organ	ADULT	GILLI	1.08E-04	7.50E+00	1.44E-03
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Receptor: 5 Composite Crit. Receptor - IP

Distance: 0.00 (meters) Compass Point: NA

Critical Pathway: Ground Plane Deposition (GPD)

Major Contributors (0% or greater to total)

Nuclide	Percentage
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CO-60	1.00E+02
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Qtr 2 - T.Spc. Total Body	CHILD	TBODY	9.50E-05	7.50E+00	1.27E-03
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Receptor: 5 Composite Crit. Receptor - IP

Distance: 0.00 (meters) Compass Point: NA

Critical Pathway: Ground Plane Deposition (GPD)

Major Contributors (0% or greater to total)

Nuclide	Percentage
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CO-60	1.00E+02
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40CFR190 URANIUM FUEL CYCLE DOSE REPORT

GASEOUS DOSE SUMMARY

Report for: 2003
Unit Range - From: 1 To: 2

=== NG DOSE LIMIT ANALYSIS === QUARTER 2 ===

Quartr - Limit	Dose (mrad)	Limit (mrad)	Max % of Limit
Qtr 2 - Admin. Gamma	0.00E+00	7.50E+00	0.00E+00
Qtr 2 - Admin. Beta	0.00E+00	7.50E+00	0.00E+00

Qtr 2 - T.Spc. Gamma	0.00E+00	7.50E+00	0.00E+00
Receptor: 5	Composite Crit. Receptor - IP		
Distance: 0.00 (meters)	Compass Point: NA		
Nuclide	Percentage		
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Qtr 2 - T.Spc. Beta	0.00E+00	7.50E+00	0.00E+00
Receptor: 5	Composite Crit. Receptor - IP		
Distance: 0.00 (meters)	Compass Point: NA		
Nuclide	Percentage		
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40CFR190 URANIUM FUEL CYCLE DOSE REPORT

GASEOUS DOSE SUMMARY

Report for: 2003
Unit Range - From: 1 To: 2

=== I&P DOSE LIMIT ANALYSIS === QUARTER 3 ===

Quartr - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Qtr 3 - Admin. Any Organ	ADULT	GILLI	1.11E-04	5.63E+00	1.98E-03
Qtr 3 - Admin. Total Body	CHILD	TBODY	9.82E-05	5.25E+00	1.87E-03

Qtr 3 - T.Spc. Any Organ	ADULT	GILLI	1.11E-04	7.50E+00	1.49E-03
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Receptor: 5 Composite Crit. Receptor - IP

Distance: 0.00 (meters) Compass Point: NA

Critical Pathway: Ground Plane Deposition (GPD)

Major Contributors (0% or greater to total)

Nuclide Percentage

CO-60 1.00E+02

Qtr 3 - T.Spc. Total Body	CHILD	TBODY	9.82E-05	7.50E+00	1.31E-03
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Receptor: 5 Composite Crit. Receptor - IP

Distance: 0.00 (meters) Compass Point: NA

Critical Pathway: Ground Plane Deposition (GPD)

Major Contributors (0% or greater to total)

Nuclide Percentage

CO-60 1.00E+02

40CFR190 URANIUM FUEL CYCLE DOSE REPORT

GASEOUS DOSE SUMMARY

Report for: 2003

Unit Range - From: 1 To: 2

=== NG DOSE LIMIT ANALYSIS === QUARTER 3 ===

Quartr - Limit	Dose (mrad)	Limit (mrad)	Max % of Limit
Qtr 3 - Admin. Gamma	0.00E+00	7.50E+00	0.00E+00
Qtr 3 - Admin. Beta	0.00E+00	7.50E+00	0.00E+00

Qtr 3 - T.Spc. Gamma	0.00E+00	7.50E+00	0.00E+00
Receptor: 5	Composite Crit. Receptor - IP		
Distance:	0.00 (meters)	Compass Point: NA	
Nuclide	Percentage		
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Qtr 3 - T.Spc. Beta	0.00E+00	7.50E+00	0.00E+00
Receptor: 5	Composite Crit. Receptor - IP		
Distance:	0.00 (meters)	Compass Point: NA	
Nuclide	Percentage		
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40CFR190 URANIUM FUEL CYCLE DOSE REPORT

GASEOUS DOSE SUMMARY

Report for: 2003

Unit Range - From: 1 To: 2

=== I&P DOSE LIMIT ANALYSIS === QUARTER 4 ===

Quartr - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Qtr 4 - Admin. Any Organ	ADULT	GILLI	6.32E-05	5.63E+00	1.12E-03
Qtr 4 - Admin. Total Body	CHILD	TBODY	5.57E-05	5.25E+00	1.06E-03

Qtr 4 - T.Spc. Any Organ ADULT GILLI 6.32E-05 7.50E+00 8.43E-04

Receptor: 5 Composite Crit. Receptor - IP

Distance: 0.00 (meters) Compass Point: NA

Critical Pathway: Ground Plane Deposition (GPD)

Major Contributors (0% or greater to total)

Nuclide Percentage

CO-60 1.00E+02

Qtr 4 - T.Spc. Total Body CHILD TBODY 5.57E-05 7.50E+00 7.43E-04

Receptor: 5 Composite Crit. Receptor - IP

Distance: 0.00 (meters) Compass Point: NA

Critical Pathway: Ground Plane Deposition (GPD)

Major Contributors (0% or greater to total)

Nuclide Percentage

CO-60 1.00E+02

40CFR190 URANIUM FUEL CYCLE DOSE REPORT

GASEOUS DOSE SUMMARY

Report for: 2003
Unit Range - From: 1 To: 2

=== NG DOSE LIMIT ANALYSIS === QUARTER 4 ===

Quartr - Limit	Dose (mrad)	Limit (mrad)	Max % of Limit
Qtr 4 - Admin. Gamma	0.00E+00	7.50E+00	0.00E+00
Qtr 4 - Admin. Beta	0.00E+00	7.50E+00	0.00E+00

Qtr 4 - T.Spc. Gamma	0.00E+00	7.50E+00	0.00E+00
Receptor: 5 Composite Crit. Receptor - IP			
Distance: 0.00 (meters)		Compass Point: NA	
Nuclide	Percentage		
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Qtr 4 - T.Spc. Beta	0.00E+00	7.50E+00	0.00E+00
Receptor: 5 Composite Crit. Receptor - IP			
Distance: 0.00 (meters)		Compass Point: NA	
Nuclide	Percentage		
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40CFR190 URANIUM FUEL CYCLE DOSE REPORT

GASEOUS DOSE SUMMARY

1

Report for: 2003

Unit Range - From: 1 To: 2

=== I&P DOSE LIMIT ANALYSIS ===== ANNUAL 2003 =====

Annual - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
2003 - Admin. Any Organ	ADULT	GILLI	2.82E-04	1.13E+01	2.51E-03
2003 - Admin. Total Body	CHILD	TBODY	2.49E-04	1.05E+01	2.37E-03

2003 - T.Spc. Any Organ ADULT GILLI 2.82E-04 1.50E+01 1.88E-03

Receptor: 5 Composite Crit. Receptor - IP

Distance: 0.00 (meters) Compass Point: NA

Critical Pathway: Ground Plane Deposition (GPD)

Major Contributors (0% or greater to total)

Nuclide Percentage

CO-60 1.00E+02

2003 - T.Spc. Total Body CHILD TBODY 2.49E-04 1.50E+01 1.66E-03

Receptor: 5 Composite Crit. Receptor - IP

Distance: 0.00 (meters) Compass Point: NA

Critical Pathway: Ground Plane Deposition (GPD)

Major Contributors (0% or greater to total)

Nuclide Percentage

CO-60 1.00E+02

40CFR190 URANIUM FUEL CYCLE DOSE REPORT

GASEOUS DOSE SUMMARY

Report for: 2003

Unit Range - From: 1 To: 2

=== NG DOSE LIMIT ANALYSIS ===== ANNUAL 2003 =====

Annual - Limit	Dose (mrad)	Limit (mrad)	Max % of Limit
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2003 - Admin. Gamma	0.00E+00	1.50E+01	0.00E+00
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2003 - Admin. Beta	0.00E+00	1.50E+01	0.00E+00
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2003 - T.Spc. Gamma	0.00E+00	1.50E+01	0.00E+00
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Receptor: 5 Composite Crit. Receptor - IP

Distance: 0.00 (meters) Compass Point: NA

Nuclide Percentage

2003 - T.Spc. Beta	0.00E+00	1.50E+01	0.00E+00
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Receptor: 5 Composite Crit. Receptor - IP

Distance: 0.00 (meters) Compass Point: NA

Nuclide Percentage

40CFR190 URANIUM FUEL CYCLE DOSE REPORT

Report for: 2003

Unit Range - From: 1 To: 2

=== MAXIMUM DOSE ANALYSIS === ANNUAL 2003 ===

Dose Type	Age Group	Organ	Dose (mrem)
Any Organ	TEEN	LIVER	3.72E+00
Liquid Receptor: 0	Liquid Receptor		
Gaseous Receptor: 5	Composite Crit. Receptor - IP		
Distance: 0.00 (meters)	Compass Point: NA		

Liquid Dose: 3.72E+00 % of Total: 1.00E+02
Critical Pathway: Fresh Water Fish - Sport (FFSP)
Major Contributors (0% or greater to total)
Nuclide Percentage

H-3 4.89E-04
CO-60 2.19E-02
CS-134 1.29E+00
CS-137 9.87E+01

Gaseous Dose: 2.38E-04 % of Total: 6.40E-03
Critical Pathway: Ground Plane Deposition (GPD)
Major Contributors (0% or greater to total)
Nuclide Percentage

CO-60 1.00E+02

=== MAXIMUM DOSE ANALYSIS === ANNUAL 2003 ===

Dose Type	Age Group	Organ	Dose (mrem)
Total Body	ADULT	TBODY	2.35E+00
Liquid Receptor: 0	Liquid Receptor		
Gaseous Receptor: 5	Composite Crit. Receptor - IP		
Distance: 0.00 (meters)	Compass Point: NA		

Liquid Dose: 2.35E+00 % of Total: 1.00E+02
Critical Pathway: Fresh Water Fish - Sport (FFSP)
Major Contributors (0% or greater to total)
Nuclide Percentage

H-3 1.05E-03
CO-60 7.66E-02
CS-134 1.65E+00
CS-137 9.83E+01

40CFR190 URANIUM FUEL CYCLE DOSE REPORT

Gaseous Dose: 2.40E-04 % of Total: 1.02E-02
 Critical Pathway: Ground Plane Deposition (GPD)
 Major Contributors (0% or greater to total)
 Nuclide Percentage

 CO-60 1.00E+02

40CFR190 URANIUM FUEL CYCLE DOSE REPORT

LIQUID DOSE SUMMARY

Report for: 2003

Unit Range - From: 1 To: 2

Liquid Receptor

=== PERIOD DOSE BY ORGAN AND AGE GROUP (mrem) === QUARTER 1 ===

Agegrp	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	Skin	TB

=== SITE DOSE LIMIT ANALYSIS === QUARTER 1 ===

Quartr - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Qtr 1 - Admin. Any Organ			0.00E+00	1.50E+01	0.00E+00
Qtr 1 - Admin. Total Body	ADULT	TBODY	0.00E+00	1.13E+00	0.00E+00

Qtr 1 - T.Spc. Any Organ 0.00E+00 3.75E+00 0.00E+00

Critical Pathway:

Major Contributors (0% or greater to total)

Nuclide	Percentage
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Qtr 1 - T.Spc. Total Body ADULT TBODY 0.00E+00 1.50E+00 0.00E+00

Critical Pathway: Potable Water (PWtr)

Major Contributors (0% or greater to total)

Nuclide	Percentage
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40CFR190 URANIUM FUEL CYCLE DOSE REPORT

LIQUID DOSE SUMMARY

Report for: 2003

Unit Range - From: 1 To: 2

Liquid Receptor

=== PERIOD DOSE BY ORGAN AND AGE GROUP (mrem) === QUARTER 2 ===
 Agegrp Bone Liver Thyroid Kidney Lung GI-LLI Skin TB

=== SITE DOSE LIMIT ANALYSIS === QUARTER 2 ===

Quartr - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Qtr 2 - Admin. Any Organ			0.00E+00	5.00E+00	0.00E+00
Qtr 2 - Admin. Total Body	ADULT	TBODY	0.00E+00	1.13E+00	0.00E+00

Qtr 2 - T.Spc. Any Organ			0.00E+00	3.75E+00	0.00E+00
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Critical Pathway:

Major Contributors (0% or greater to total)

Nuclide	Percentage
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Qtr 2 - T.Spc. Total Body	ADULT	TBODY	0.00E+00	1.50E+00	0.00E+00
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Critical Pathway: Potable Water (PWtr)

Major Contributors (0% or greater to total)

Nuclide	Percentage
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40CFR190 URANIUM FUEL CYCLE DOSE REPORT

LIQUID DOSE SUMMARY

Report for: 2003

Unit Range - From: 1 To: 2

Agegrp	PERIOD DOSE BY ORGAN AND AGE GROUP (mrem)						Liquid Receptor	
	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	Skin	TB
ADULT	7.10E-01	9.78E-01	7.14E-06	3.32E-01	1.10E-01	2.31E-02	0.00E+00	6.43E-01
TEEN	7.60E-01	1.02E+00	5.25E-06	3.46E-01	1.34E-01	1.74E-02	0.00E+00	3.57E-01
CHILD	9.57E-01	9.22E-01	7.19E-06	3.00E-01	1.08E-01	6.80E-03	0.00E+00	1.37E-01
INFANT	1.01E-03	1.21E-03	4.91E-06	3.25E-04	1.34E-04	3.17E-05	0.00E+00	1.13E-04

=== SITE DOSE LIMIT ANALYSIS === QUARTER 3 ===

Quartr - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Qtr 3 - Admin. Any Organ	TEEN	LIVER	1.02E+00	3.75E+00	2.71E+01
Qtr 3 - Admin. Total Body	ADULT	TBODY	6.43E-01	1.13E+00	5.72E+01

Quartr - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Qtr 3 - T.Spc. Any Organ	TEEN	LIVER	1.02E+00	5.00E+00	2.04E+01

Critical Pathway: Fresh Water Fish - Sport (FFSP)

Major Contributors (0% or greater to total)

Nuclide	Percentage
H-3	5.16E-04
CO-60	2.20E-02
CS-134	1.41E+00
CS-137	9.86E+01

H-3

5.16E-04

CO-60

2.20E-02

CS-134

1.41E+00

CS-137

9.86E+01

Quartr - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Qtr 3 - T.Spc. Total Body	ADULT	TBODY	6.43E-01	1.50E+00	4.29E+01

Critical Pathway: Fresh Water Fish - Sport (FFSP)

Major Contributors (0% or greater to total)

Nuclide	Percentage
H-3	1.11E-03
CO-60	7.70E-02
CS-134	1.80E+00
CS-137	9.81E+01

H-3

1.11E-03

CO-60

7.70E-02

CS-134

1.80E+00

CS-137

9.81E+01

40CFR190 URANIUM FUEL CYCLE DOSE REPORT

LIQUID DOSE SUMMARY

Report for: 2003

Unit Range - From: 1 To: 2

Agegrp	PERIOD DOSE BY ORGAN AND AGE GROUP (mrem)						Liquid Receptor	
	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	Skin	TB
ADULT	7.83E-01	1.08E+00	6.67E-06	3.65E-01	1.21E-01	2.54E-02	0.00E+00	7.08E-01
TEEN	8.39E-01	1.12E+00	4.90E-06	3.81E-01	1.48E-01	1.91E-02	0.00E+00	3.92E-01
CHILD	1.06E+00	1.02E+00	6.71E-06	3.31E-01	1.19E-01	7.47E-03	0.00E+00	1.51E-01
INFANT	1.12E-03	1.33E-03	4.58E-06	3.57E-04	1.47E-04	3.37E-05	0.00E+00	1.23E-04

SITE DOSE LIMIT ANALYSIS QUARTER 4

Quartr - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Qtr 4 - Admin. Any Organ	TEEN	LIVER	1.12E+00	3.75E+00	2.99E+01
Qtr 4 - Admin. Total Body	ADULT	TBODY	7.08E-01	1.13E+00	6.29E+01

Qtr 4 - T.Spc. Any Organ	TEEN	LIVER	1.12E+00	5.00E+00	2.24E+01
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Critical Pathway: Fresh Water Fish - Sport (FFSP)

Major Contributors (0% or greater to total)

Nuclide	Percentage
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H-3	4.37E-04
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CO-60	2.17E-02
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CS-134	1.07E+00
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CS-137	9.89E+01
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Qtr 4 - T.Spc. Total Body	ADULT	TBODY	7.08E-01	1.50E+00	4.72E+01
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Critical Pathway: Fresh Water Fish - Sport (FFSP)

Major Contributors (0% or greater to total)

Nuclide	Percentage
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H-3	9.42E-04
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CO-60	7.58E-02
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CS-134	1.37E+00
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CS-137	9.86E+01
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40CFR190 URANIUM FUEL CYCLE DOSE REPORT

LIQUID DOSE SUMMARY

Report for: 2003

Unit Range - From: 1 To: 2

Agegrp	PERIOD DOSE BY ORGAN AND AGE GROUP (mrem)						Liquid Receptor	
	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI	Skin	TB
ADULT	2.60E+00	3.58E+00	2.48E-05	1.21E+00	4.03E-01	8.45E-02	0.00E+00	2.35E+00
TEEN	2.78E+00	3.72E+00	1.82E-05	1.27E+00	4.92E-01	6.35E-02	0.00E+00	1.30E+00
CHILD	3.50E+00	3.37E+00	2.50E-05	1.10E+00	3.95E-01	2.48E-02	0.00E+00	5.02E-01
INFANT	3.71E-03	4.42E-03	1.70E-05	1.19E-03	4.91E-04	1.15E-04	0.00E+00	4.11E-04

SITE DOSE LIMIT ANALYSIS				ANNUAL 2003		
Annual - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit	
2003 - Admin. Any Organ	TEEN	LIVER	3.72E+00	7.50E+00	4.97E+01	
2003 - Admin. Total Body	ADULT	TBODY	2.35E+00	2.25E+00	1.05E+02	

2003 - T.Spc. Any Organ	TEEN	LIVER	3.72E+00	1.00E+01	3.72E+01
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Critical Pathway: Fresh Water Fish - Sport (FFSP)

Major Contributors (0% or greater to total)

Nuclide	Percentage
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H-3	4.89E-04
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CO-60	2.19E-02
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CS-134	1.29E+00
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CS-137	9.87E+01
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2003 - T.Spc. Total Body	ADULT	TBODY	2.35E+00	3.00E+00	7.84E+01
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Critical Pathway: Fresh Water Fish - Sport (FFSP)

Major Contributors (0% or greater to total)

Nuclide	Percentage
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H-3	1.05E-03
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CO-60	7.66E-02
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CS-134	1.65E+00
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CS-137	9.83E+01
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ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
DOSE TO PUBLIC
UNIT 1 (Docket Number 50-295)

INFANT RECEPTOR

Maximum Quarterly Dose (mrad, mrem)				
Qtrly Obj	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr

Yearly Limit	Maximum Annual Dose (mrad, mrem)	% of Yearly Dose Limit
10CFR50 Appendix I		

A. Airborne

Gamma Air	5.0 mrad	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beta Air	10.0 mrad	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Body	2.5 mrem	0.00E+00	4.53E-05	0.00E+00	2.65E-05
Skin	7.5 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Organ	7.5 mrem	0.00E+00	4.68E-05	0.00E+00	2.75E-05
Critical Organ			Lung		Lung

10.0 mrad	0.00E+00	0.00%
20.0 mrad	0.00E+00	0.00%
5.0 mrem	7.18E-05	0.00%
15.0 mrem	0.00E+00	0.00%
15.0 mrem	7.43E-05	0.00%
	Lung	

B. Aquatic

Total Body	1.5 mrem	0.00E+00	0.00E+00	2.88E-06	1.46E-06
Internal Organ	5.0 mrem	0.00E+00	0.00E+00	3.09E-05	1.58E-05
Critical Organ				Liver	Liver

3.0 mrem	4.34E-06	0.00%
10.0 mrem	4.67E-05	0.00%
	Liver	

Total body doses to individuals and populations in unrestricted areas from direct radiation from Zion Station are judged to be negligible in comparison with 10CFR20 annual limit of 100 mrem TEDE and 40CFR190 annual limits of 25 mrem DDE whole body, 75 mrem CDE thyroid, and 25 mrem CDE other organs.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
DOSE TO PUBLIC
UNIT 1 (Docket Number 50-295)

CHILD RECEPTOR

Maximum Quarterly Dose (mrad, mrem)				
Qtrly Obj	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr

Yearly Limit	Maximum Annual Dose (mrad, mrem)	% of Yearly Dose Limit
10CFR50 Appendix I		

A. Airborne

Gamma Air	5.0 mrad	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beta Air	10.0 mrad	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Body	2.5 mrem	0.00E+00	4.75E-05	0.00E+00	2.79E-05
Skin	7.5 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Organ	7.5 mrem	0.00E+00	4.99E-05	0.00E+00	2.93E-05
Critical Organ			Gi-Lli		Gi-Lli

10.0 mrad	0.00E+00	0.00%
20.0 mrad	0.00E+00	0.00%
5.0 mrem	7.54E-05	0.00%
15.0 mrem	0.00E+00	0.00%
15.0 mrem	7.92E-05	0.00%
	Gi-Lli	

B. Aquatic

Total Body	1.5 mrem	0.00E+00	0.00E+00	3.51E-03	1.80E-03
Internal Organ	5.0 mrem	0.00E+00	0.00E+00	2.45E-02	1.26E-02
Critical Organ				bone	bone

3.0 mrem	5.31E-03	0.18%
10.0 mrem	3.71E-02	0.37%
	bone	

Total body doses to individuals and populations in unrestricted areas from direct radiation from Zion Station are judged to be negligible in comparison with 10CFR20 annual limit of 100 mrem TEDE and 40CFR190 annual limits of 25 mrem DDE whole body, 75 mrem CDE thyroid, and 25 mrem CDE other organs.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
DOSE TO PUBLIC
UNIT 1 (Docket Number 50-295)

TEENAGE RECEPTOR

Maximum Quarterly Dose (mrad, mrem)					
Qtrly Obj	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	

A. Airborne

Gamma Air	5.0 mrad	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beta Air	10.0 mrad	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Body	2.5 mrem	0.00E+00	4.62E-05	0.00E+00	2.71E-05
Skin	7.5 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Organ	7.5 mrem	0.00E+00	5.30E-05	0.00E+00	3.11E-05
Critical Organ			Gi-Lli		Gi-Lli

Yearly Limit	Maximum Annual Dose (mrad, mrem)	% of Yearly Dose Limit
10CFR50 Appendix I		

10.0 mrad	0.00E+00	0.00%
20.0 mrad	0.00E+00	0.00%
5.0 mrem	7.33E-05	0.00%
15.0 mrem	0.00E+00	0.00%
15.0 mrem	8.41E-05	0.00%
	Gi-Lli	

B. Aquatic

Total Body	1.5 mrem	0.00E+00	0.00E+00	9.11E-03	4.66E-03
Internal Organ	5.0 mrem	0.00E+00	0.00E+00	2.60E-02	1.33E-02
Critical Organ				liver	liver

3.0 mrem	1.38E-02	0.46%
10.0 mrem	3.93E-02	0.39%
	liver	

Total body doses to individuals and populations in unrestricted areas from direct radiation from Zion Station are judged to be negligible in comparison with 10CFR20 annual limit of 100 mrem TEDE and 40CFR190 annual limits of 25 mrem DDE whole body, 75 mrem CDE thyroid, and 25 mrem CDE other organs.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
DOSE TO PUBLIC
UNIT 1 (Docket Number 50-295)

ADULT RECEPTOR

Maximum Quarterly Dose (mrad, mrem)				
Qtrly Obj	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr

Yearly Limit	Maximum Annual Dose (mrad, mrem)	% of Yearly Dose Limit
10CFR50 Appendix I		

A. Airborne

Gamma Air	5.0 mrad	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beta Air	10.0 mrad	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Body	2.5 mrem	0.00E+00	4.95E-05	0.00E+00	2.69E-05
Skin	7.5 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Organ	7.5 mrem	0.00E+00	5.39E-05	0.00E+00	3.16E-05
Critical Organ			Gi-Lli		Gi-Lli

10.0 mrad	0.00E+00	0.00%
20.0 mrad	0.00E+00	0.00%
5.0 mrem	7.64E-05	0.00%
15.0 mrem	0.00E+00	0.00%
15.0 mrem	8.55E-05	0.00%
	Gi-Lli	

B. Aquatic

Total Body	1.5 mrem	0.00E+00	0.00E+00	1.64E-02	8.41E-03
Internal Organ	5.0 mrem	0.00E+00	0.00E+00	2.50E-02	1.28E-02
Critical Organ				liver	liver

3.0 mrem	2.48E-02	0.83%
10.0 mrem	3.78E-02	0.38%
	liver	

Total body doses to individuals and populations in unrestricted areas from direct radiation from Zion Station are judged to be negligible in comparison with 10CFR20 annual limit of 100 mrem TEDE and 40CFR190 annual limits of 25 mrem DDE whole body, 75 mrem CDE thyroid, and 25 mrem CDE other organs.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
DOSE TO PUBLIC
UNIT 2 (Docket Number 50-304)

INFANT RECEPTOR

Maximum Quarterly Dose (mrad, mrem)				
Qtrly Obj	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr

Yearly Limit	Maximum Annual Dose (mrad, mrem)	% of Yearly Dose Limit
10CFR50 Appendix I		

A. Airborne

Gamma Air	5.0 mrad	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beta Air	10.0 mrad	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Body	2.5 mrem	0.00E+00	4.53E-05	0.00E+00	2.65E-05
Skin	7.5 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Organ	7.5 mrem	0.00E+00	4.68E-05	0.00E+00	2.75E-05
Critical Organ			Lung		Lung

10.0 mrad	0.00E+00	0.00%
20.0 mrad	0.00E+00	0.00%
5.0 mrem	7.18E-05	0.00%
15.0 mrem	0.00E+00	0.00%
15.0 mrem	7.43E-05	0.00%
	Lung	

B. Aquatic

Total Body	1.5 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Internal Organ	5.0 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Critical Organ		N/A	N/A	N/A	N/A

3.0 mrem	0.00E+00	0.00%
10.0 mrem	0.00E+00	0.00%
	N/A	

Total body doses to individuals and populations in unrestricted areas from direct radiation from Zion Station are judged to be negligible in comparison with 10CFR20 annual limit of 100 mrem TEDE and 40CFR190 annual limits of 25 mrem DDE whole body, 75 mrem CDE thyroid, and 25 mrem CDE other organs.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
DOSE TO PUBLIC
UNIT 2 (Docket Number 50-304)

CHILD RECEPTOR

Maximum Quarterly Dose (mrad, mrem)				
Qtrly Obj	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr

Yearly Limit	Maximum Annual Dose (mrad, mrem)	% of Yearly Dose Limit
10CFR50 Appendix I		

A. Airborne

Gamma Air	5.0 mrad	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beta Air	10.0 mrad	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Body	2.5 mrem	0.00E+00	4.75E-05	0.00E+00	2.79E-05
Skin	7.5 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Organ	7.5 mrem	0.00E+00	4.99E-05	0.00E+00	2.93E-05
Critical Organ			Gi-Lli		Gi-Lli

10.0 mrad	0.00E+00	0.00%
20.0 mrad	0.00E+00	0.00%
5.0 mrem	7.54E-05	0.00%
15.0 mrem	0.00E+00	0.00%
15.0 mrem	7.92E-05	0.00%
	Gi-Lli	

B. Aquatic

Total Body	1.5 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Internal Organ	5.0 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Critical Organ		N/A	N/A	N/A	N/A

3.0 mrem	0.00E+00	0.00%
10.0 mrem	0.00E+00	0.00%
	N/A	

Total body doses to individuals and populations in unrestricted areas from direct radiation from Zion Station are judged to be negligible in comparison with 10CFR20 annual limit of 100 mrem TEDE and 40CFR190 annual limits of 25 mrem DDE whole body, 75 mrem CDE thyroid, and 25 mrem CDE other organs.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
DOSE TO PUBLIC
UNIT 2 (Docket Number 50-304)

TEENAGE RECEPTOR

Maximum Quarterly Dose (mrad, mrem)				
Qtrly Obj	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr

Yearly Limit	Maximum Annual Dose (mrad, mrem)	% of Yearly Dose Limit
10CFR50 Appendix I		

A. Airborne

Gamma Air	5.0 mrad	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beta Air	10.0 mrad	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Body	2.5 mrem	0.00E+00	4.62E-05	0.00E+00	2.71E-05
Skin	7.5 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Organ	7.5 mrem	0.00E+00	5.30E-05	0.00E+00	3.11E-05
Critical Organ			Gi-Lli		Gi-Lli

10.0 mrad	0.00E+00	0.00%
20.0 mrad	0.00E+00	0.00%
5.0 mrem	7.33E-05	0.00%
15.0 mrem	0.00E+00	0.00%
15.0 mrem	8.41E-05	0.00%
	Gi-Lli	

B. Aquatic

Total Body	1.5 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Internal Organ	5.0 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Critical Organ		N/A	N/A	N/A	N/A

3.0 mrem	0.00E+00	0.00%
10.0 mrem	0.00E+00	0.00%
	N/A	

Total body doses to individuals and populations in unrestricted areas from direct radiation from Zion Station are judged to be negligible in comparison with 10CFR20 annual limit of 100 mrem TEDE and 40CFR190 annual limits of 25 mrem DDE whole body, 75 mrem CDE thyroid, and 25 mrem CDE other organs.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
DOSE TO PUBLIC
UNIT 2 (Docket Number 50-304)

ADULT RECEPTOR

Maximum Quarterly Dose (mrad, mrem)				
Qtrly Obj	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr

Yearly Limit	Maximum Annual Dose (mrad, mrem)	% of Yearly Dose Limit
10CFR50 Appendix I		

A. Airborne

Gamma Air	5.0 mrad	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Beta Air	10.0 mrad	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total Body	2.5 mrem	0.00E+00	4.59E-05	0.00E+00	2.69E-05
Skin	7.5 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Organ	7.5 mrem	0.00E+00	5.59E-05	0.00E+00	3.16E-05
Critical Organ			Gi-Lli		Gi-Lli

10.0 mrad	0.00E+00	0.00%
20.0 mrad	0.00E+00	0.00%
5.0 mrem	7.28E-05	0.00%
15.0 mrem	0.00E+00	0.00%
15.0 mrem	8.75E-05	0.00%
	Gi-Lli	

B. Aquatic

Total Body	1.5 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Internal Organ	5.0 mrem	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Critical Organ		N/A	N/A	N/A	N/A

3.0 mrem	0.00E+00	0.00%
10.0 mrem	0.00E+00	0.00%
	N/A	

Total body doses to individuals and populations in unrestricted areas from direct radiation from Zion Station are judged to be negligible in comparison with 10CFR20 annual limit of 100 mrem TEDE and 40CFR190 annual limits of 25 mrem DDE whole body, 75 mrem CDE thyroid, and 25 mrem CDE other organs.

LIQUID ANNUAL DOSE SUMMARY REPORT
 ----- (PERIOD BASIS) -----

Report for: 2003

Release ID: 1 All Liquid Release Types

						Liquid Receptor	
=== PERIOD DOSE BY ORGAN AND AGE GROUP (mrem) ===						QUARTER 1 ===	
Bone	Liver	Thyroid	Kidney	Lung	GI-Lli	Skin	TB

=== SITE DOSE LIMIT ANALYSIS =====

Period - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit

Qtr 1 - Admin. Any Organ			0.00E+00	3.75E+00	0.00E+00
Qtr 1 - Admin. Total Body	ADULT	TBODY	0.00E+00	1.13E+00	0.00E+00
Qtr 1 - T.Spec Any Organ			0.00E+00	1.50E+00	0.00E+00
Critical Pathway: Potable Water (PWtr)					
Major Contributors (0% or greater to total)					
Nuclide	Percentage				

Qtr 1 - T.Spec Total Body	ADULT	TBODY	0.00E+00	1.50E+00	0.00E+00
Critical Pathway: Potable Water (PWtr)					
Major Contributors (0% or greater to total)					
Nuclide	Percentage				

LIQUID ANNUAL DOSE SUMMARY REPORT
 ----- (PERIOD BASIS) -----

Report for: 2003

Release ID: 1 All Liquid Release Types

Liquid Receptor

=== PERIOD DOSE BY ORGAN AND AGE GROUP (mrem) ===== QUARTER 2 =====

Bone	Liver	Thyroid	Kidney	Lung	GI-Lli	Skin	TB
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=== SITE DOSE LIMIT ANALYSIS =====

Period - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Qtr 2 - Admin. Any Organ			0.00E+00	1.13E+00	0.00E+00
Qtr 2 - Admin. Total Body	ADULT	TBODY	0.00E+00	1.13E+00	0.00E+00
Qtr 2 - T.Spec Any Organ			0.00E+00	1.50E+00	0.00E+00
Critical Pathway: Potable Water (PWtr)					
Major Contributors (0% or greater to total)					
Nuclide	Percentage				
-----	-----				
Qtr 2 - T.Spec Total Body	ADULT	TBODY	0.00E+00	1.50E+00	0.00E+00
Critical Pathway: Potable Water (PWtr)					
Major Contributors (0% or greater to total)					
Nuclide	Percentage				
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LIQUID ANNUAL DOSE SUMMARY REPORT
----- (PERIOD BASIS) -----

Report for: 2003

Release ID: 1 All Liquid Release Types

							Liquid Receptor	
	Bone	Liver	Thyroid	Kidney	Lung	GI-Lli	Skin	TB
ADULT	1.82E-02	2.50E-02	1.83E-07	8.48E-03	2.82E-03	5.91E-04	0.00E+00	1.64E-02
TEEN	1.94E-02	2.60E-02	1.34E-07	8.84E-03	3.44E-03	4.44E-04	0.00E+00	9.11E-03
CHILD	2.45E-02	2.36E-02	1.84E-07	7.67E-03	2.76E-03	1.74E-04	0.00E+00	3.51E-03
INFANT	2.59E-05	3.09E-05	1.26E-07	8.30E-06	3.44E-06	8.10E-07	0.00E+00	2.88E-06

=== SITE DOSE LIMIT ANALYSIS ===

Period - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Qtr 3 - Admin. Any Organ	TEEN	LIVER	2.60E-02	3.75E+00	6.94E-01
Qtr 3 - Admin. Total Body	ADULT	TBODY	1.64E-02	1.13E+00	1.46E+00
Qtr 3 - T.Spec Any Organ	TEEN	LIVER	2.60E-02	5.00E+00	5.20E-01
Critical Pathway: Fresh Water Fish - Sport (FFSP)					
Major Contributors (0% or greater to total)					
Nuclide	Percentage				
H-3	5.16E-04				
CO-60	2.20E-02				
CS-134	1.41E+00				
CS-137	9.86E+01				

Qtr 3 - T.Spec Total Body	ADULT	TBODY	1.64E-02	1.50E+00	1.10E+00
Critical Pathway: Fresh Water Fish - Sport (FFSP)					
Major Contributors (0% or greater to total)					
Nuclide	Percentage				
H-3	1.11E-03				
CO-60	7.70E-02				
CS-134	1.80E+00				
CS-137	9.81E+01				

LIQUID ANNUAL DOSE SUMMARY REPORT
 ----- (PERIOD BASIS) -----

Report for: 2003

Release ID: 1 All Liquid Release Types

	Liquid Receptor							
=== PERIOD DOSE BY ORGAN AND AGE GROUP (mrem) ===	===== QUARTER 4 =====							
	Bone	Liver	Thyroid	Kidney	Lung	GI-Lli	Skin	TB
ADULT	9.31E-03	1.28E-02	7.93E-08	4.34E-03	1.44E-03	3.02E-04	0.00E+00	8.41E-03
TEEN	9.97E-03	1.33E-02	5.83E-08	4.53E-03	1.76E-03	2.27E-04	0.00E+00	4.66E-03
CHILD	1.26E-02	1.21E-02	7.98E-08	3.93E-03	1.41E-03	8.88E-05	0.00E+00	1.80E-03
INFANT	1.33E-05	1.58E-05	5.45E-08	4.25E-06	1.75E-06	4.01E-07	0.00E+00	1.46E-06

=== SITE DOSE LIMIT ANALYSIS =====

Period - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Qtr 4 - Admin. Any Organ	TEEN	LIVER	1.33E-02	3.75E+00	3.55E-01
Qtr 4 - Admin. Total Body	ADULT	TBODY	8.41E-03	1.13E+00	7.48E-01
Qtr 4 - T.Spec Any Organ	TEEN	LIVER	1.33E-02	5.00E+00	2.67E-01

Critical Pathway: Fresh Water Fish - Sport (FFSP)

Major Contributors (0% or greater to total)

Nuclide	Percentage
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H-3	4.37E-04
CO-60	2.17E-02
CS-134	1.07E+00
CS-137	9.89E+01

Qtr 4 - T.Spec Total Body	ADULT	TBODY	8.41E-03	1.50E+00	5.61E-01
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Critical Pathway: Fresh Water Fish - Sport (FFSP)

Major Contributors (0% or greater to total)

Nuclide	Percentage
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H-3	9.42E-04
CO-60	7.58E-02
CS-134	1.37E+00
CS-137	9.86E+01

LIQUID ANNUAL DOSE SUMMARY REPORT
 ----- (PERIOD BASIS) -----

Report for: 2003

Release ID: 1 All Liquid Release Types

	Liquid Receptor						
=== PERIOD DOSE BY ORGAN AND AGE GROUP (mrem) =====	ANNUAL 2003 =====						
	Bone	Liver	Thyroid	Kidney	Lung	GI-Lli	Skin TB
ADULT	2.75E-02	3.78E-02	2.62E-07	1.28E-02	4.26E-03	8.93E-04	0.00E+00 2.49E-02
TEEN	2.94E-02	3.93E-02	1.92E-07	1.34E-02	5.20E-03	6.71E-04	0.00E+00 1.38E-02
CHILD	3.70E-02	3.56E-02	2.64E-07	1.16E-02	4.17E-03	2.63E-04	0.00E+00 5.31E-03
INFANT	3.92E-05	4.67E-05	1.80E-07	1.25E-05	5.19E-06	1.21E-06	0.00E+00 4.34E-06

=== SITE DOSE LIMIT ANALYSIS =====

Period - Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
2003 - Admin. Any Organ	TEEN	LIVER	3.93E-02	7.50E+00	5.25E-01
2003 - Admin. Total Body	ADULT	TBODY	2.49E-02	2.25E+00	1.10E+00
2003 - T.Spec Any Organ	TEEN	LIVER	3.93E-02	1.00E+01	3.93E-01

Critical Pathway: Fresh Water Fish - Sport (FFSP)

Major Contributors (0% or greater to total)

Nuclide	Percentage
H-3	4.89E-04
CO-60	2.19E-02
CS-134	1.29E+00
CS-137	9.87E+01

2003 - T.Spec Total Body	ADULT	TBODY	2.49E-02	3.00E+00	8.28E-01
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Critical Pathway: Fresh Water Fish - Sport (FFSP)

Major Contributors (0% or greater to total)

Nuclide	Percentage
H-3	1.05E-03
CO-60	7.66E-02
CS-134	1.65E+00
CS-137	9.83E+01

GASEOUS ANNUAL DOSE SUMMARY REPORT
-- (Composite Critical Receptor) ---

Release ID: 1 All Gas Releases

Coefficient Type: Historical

=== I&P DOSE LIMIT ANALYSIS === QUARTER 1 ===

Period-Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q1 - Admin. Any Organ			0.00E+00	5.63E+00	0.00E+00
Q1 - Admin. Total Body			0.00E+00	5.25E+00	0.00E+00
Q1 - T.Spec Any Organ			0.00E+00	7.50E+00	0.00E+00

Receptor: 0

Distance: 0.00E+00 (meters)

Compass Point:

Critical Pathway:

Major Contributors (0% or greater to total)

Nuclide	Percentage
---------	------------

Q1 - T.Spec Total Body

0.00E+00 7.50E+00 0.00E+00

Receptor: 0

Distance: 0.00E+00 (meters)

Compass Point:

Critical Pathway:

Major Contributors (0% or greater to total)

Nuclide	Percentage
---------	------------

GASEOUS ANNUAL DOSE SUMMARY REPORT
-- (Composite Critical Receptor) ---

Release ID: 1 All Gas Releases

Coefficient Type: Historical

=== NG DOSE LIMIT ANALYSIS === QUARTER 1 ===

Period-Limit	Dose (mrad)	Limit (mrad)	% of Limit
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Q1 - Admin. Gamma	0.00E+00	3.75E+00	0.00E+00
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Q1 - Admin. Beta	0.00E+00	7.50E+00	0.00E+00
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Q1 - T.Spec Gamma	0.00E+00	5.00E+00	0.00E+00
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Receptor: 0

Major Contributors (0% or greater to total)

Nuclide	Percentage
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Q1 - T.Spec Beta	0.00E+00	1.00E+01	0.00E+00
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Receptor: 0

Major Contributors (0% or greater to total)

Nuclide	Percentage
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GASEOUS ANNUAL DOSE SUMMARY REPORT
 -- (Composite Critical Receptor) ---

Release ID: 1 All Gas Releases

Coefficient Type: Historical

=== I&P DOSE LIMIT ANALYSIS ===== QUARTER 2 =====

Period-Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q2 - Admin. Any Organ	ADULT	GILLI	1.08E-04	5.63E+00	1.92E-03
Q2 - Admin. Total Body	CHILD		9.50E-05	5.25E+00	1.81E-03
Q2 - T.Spec Any Organ	ADULT	GILLI	1.08E-04	7.50E+00	1.44E-03

Receptor: 5 Composite Crit. Receptor - IP
 Distance: 0.00E+00 (meters) Compass Point:NA
 Critical Pathway: Ground Plane Deposition (GPD)
 Major Contributors (0% or greater to total)
 Nuclide Percentage

 CO-60 1.00E+02

Q2 - T.Spec Total Body CHILD 9.50E-05 7.50E+00 1.27E-03
 Receptor: 5 Composite Crit. Receptor - IP
 Distance: 0.00E+00 (meters) Compass Point:NA
 Critical Pathway: Ground Plane Deposition (GPD)
 Major Contributors (0% or greater to total)
 Nuclide Percentage

 CO-60 1.00E+02

GASEOUS ANNUAL DOSE SUMMARY REPORT
 -- (Composite Critical Receptor) ---

Release ID: 1 All Gas Releases

Coefficient Type: Historical

=== NG DOSE LIMIT ANALYSIS === QUARTER 2 ===

Period-Limit	Dose (mrad)	Limit (mrad)	% of Limit
Q2 - Admin. Gamma	0.00E+00	3.75E+00	0.00E+00
Q2 - Admin. Beta	0.00E+00	7.50E+00	0.00E+00
Q2 - T.Spec Gamma	0.00E+00	5.00E+00	0.00E+00
Receptor: 5 Composite Crit. Receptor - IP			
Major Contributors (0% or greater to total)			
Nuclide	Percentage		
-----	-----		

Q2 - T.Spec Beta	0.00E+00	1.00E+01	0.00E+00
Receptor: 5 Composite Crit. Receptor - IP			
Major Contributors (0% or greater to total)			
Nuclide	Percentage		
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GASEOUS ANNUAL DOSE SUMMARY REPORT
 -- (Composite Critical Receptor) ---

Release ID: 1 All Gas Releases

Coefficient Type: Historical

=== I&P DOSE LIMIT ANALYSIS === QUARTER 3 ===

Period-Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
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Q3 - Admin. Any Organ	ADULT	GILLI	1.11E-04	5.63E+00	1.98E-03
Q3 - Admin. Total Body	CHILD		9.82E-05	5.25E+00	1.87E-03
Q3 - T.Spec Any Organ	ADULT	GILLI	1.11E-04	7.50E+00	1.49E-03

Receptor: 5 Composite Crit. Receptor - IP

Distance: 0.00E+00 (meters) Compass Point:NA

Critical Pathway: Ground Plane Deposition (GPD)

Major Contributors (0% or greater to total)

Nuclide	Percentage
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CO-60	1.00E+02
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Q3 - T.Spec Total Body	CHILD	9.82E-05	7.50E+00	1.31E-03
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Receptor: 5 Composite Crit. Receptor - IP

Distance: 0.00E+00 (meters) Compass Point:NA

Critical Pathway: Ground Plane Deposition (GPD)

Major Contributors (0% or greater to total)

Nuclide	Percentage
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CO-60	1.00E+02
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GASEOUS ANNUAL DOSE SUMMARY REPORT
-- (Composite Critical Receptor) ---

Release ID: 1 All Gas Releases

Coefficient Type: Historical

=== NG DOSE LIMIT ANALYSIS === QUARTER 3 ===

Period-Limit	Dose (mrad)	Limit (mrad)	% of Limit
Q3 - Admin. Gamma	0.00E+00	3.75E+00	0.00E+00
Q3 - Admin. Beta	0.00E+00	7.50E+00	0.00E+00
Q3 - T.Spec Gamma	0.00E+00	5.00E+00	0.00E+00

Receptor: 5 Composite Crit. Receptor - IP
Major Contributors (0% or greater to total)
Nuclide Percentage

Q3 - T.Spec Beta	0.00E+00	1.00E+01	0.00E+00
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Receptor: 5 Composite Crit. Receptor - IP
Major Contributors (0% or greater to total)
Nuclide Percentage

GASEOUS ANNUAL DOSE SUMMARY REPORT
-- (Composite Critical Receptor) --

Release ID: 1 All Gas Releases

Coefficient Type: Historical

=== I&P DOSE LIMIT ANALYSIS ===== QUARTER 4 =====

Period-Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
Q4 - Admin. Any Organ	ADULT	GILLI	6.32E-05	5.63E+00	1.12E-03
Q4 - Admin. Total Body	CHILD		5.57E-05	5.25E+00	1.06E-03
Q4 - T.Spec Any Organ	ADULT	GILLI	6.32E-05	7.50E+00	8.43E-04

Receptor: 5 Composite Crit. Receptor - IP

Distance: 0.00E+00 (meters) Compass Point: NA

Critical Pathway: Ground Plane Deposition (GPD)

Major Contributors (0% or greater to total)

Nuclide	Percentage
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CO-60	1.00E+02
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Q4 - T.Spec Total Body	CHILD	5.57E-05	7.50E+00	7.43E-04
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Receptor: 5 Composite Crit. Receptor - IP

Distance: 0.00E+00 (meters) Compass Point: NA

Critical Pathway: Ground Plane Deposition (GPD)

Major Contributors (0% or greater to total)

Nuclide	Percentage
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CO-60	1.00E+02
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GASEOUS ANNUAL DOSE SUMMARY REPORT
 --(Composite Critical Receptor)---

Release ID: 1 All Gas Releases

Coefficient Type: Historical

=== NG DOSE LIMIT ANALYSIS === QUARTER 4 ===

Period-Limit	Dose (mrad)	Limit (mrad)	% of Limit
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Q4 - Admin. Gamma	0.00E+00	3.75E+00	0.00E+00
Q4 - Admin. Beta	0.00E+00	7.50E+00	0.00E+00
Q4 - T.Spec Gamma	0.00E+00	5.00E+00	0.00E+00

Receptor: 5 Composite Crit. Receptor - IP
 Major Contributors (0% or greater to total)
 Nuclide Percentage

Q4 - T.Spec Beta	0.00E+00	1.00E+01	0.00E+00
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Receptor: 5 Composite Crit. Receptor - IP
 Major Contributors (0% or greater to total)
 Nuclide Percentage

GASEOUS ANNUAL DOSE SUMMARY REPORT
 -- (Composite Critical Receptor) ---

Release ID: 1 All Gas Releases

Coefficient Type: Historical

=== I&P DOSE LIMIT ANALYSIS ===== ANNUAL 2003 =====

Period-Limit	Age Group	Organ	Dose (mrem)	Limit (mrem)	Max % of Limit
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2003 - Admin. Any Organ	ADULT	GILLI	2.82E-04	1.13E+01	2.51E-03
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2003 - Admin. Total Body	CHILD		2.49E-04	1.05E+01	2.37E-03
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2003 - T.Spec Any Organ	ADULT	GILLI	2.82E-04	1.50E+01	1.88E-03
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Receptor: 5 Composite Crit. Receptor - IP

Distance: 0.00E+00 (meters) Compass Point:NA

Critical Pathway: Ground Plane Deposition (GPD)

Major Contributors (0% or greater to total)

Nuclide	Percentage
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CO-60	1.00E+02
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2003 - T.Spec Total Body	CHILD		2.49E-04	1.50E+01	1.66E-03
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Receptor: 5 Composite Crit. Receptor - IP

Distance: 0.00E+00 (meters) Compass Point:NA

Critical Pathway: Ground Plane Deposition (GPD)

Major Contributors (0% or greater to total)

Nuclide	Percentage
---------	------------

CO-60	1.00E+02
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GASEOUS ANNUAL DOSE SUMMARY REPORT
-- (Composite Critical Receptor) ---

Release ID: 1 All Gas Releases

Coefficient Type: Historical

=== NG DOSE LIMIT ANALYSIS ===== ANNUAL 2003 =====

Period-Limit	Dose (mrad)	Limit (mrad)	% of Limit
2003 - Admin. Gamma	0.00E+00	7.50E+00	0.00E+00
2003 - Admin. Beta	0.00E+00	1.50E+01	0.00E+00
2003 - T.Spec Gamma	0.00E+00	1.00E+01	0.00E+00

Receptor: 5 Composite Crit. Receptor - IP
Major Contributors (0% or greater to total)
Nuclide Percentage

2003 - T.Spec Beta	0.00E+00	2.00E+01	0.00E+00
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Receptor: 5 Composite Crit. Receptor - IP
Major Contributors (0% or greater to total)
Nuclide Percentage

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
UNIT 1 (Docket Number 50-295)

GASEOUS EFFLUENTS
SUPPLEMENTAL INFORMATION

1. Regulatory Limits

See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

2. Maximum Permissible Concentrations

See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

3. Average Energy

See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

4. Measurements and Approximations of Total Radioactivity

See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

5. Batch Releases	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	2003
a. Total Number of Batch Releases	0	0	0	0	0
b. Total Time Period for Batch Releases (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
c. Maximum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
d. Average Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
e. Minimum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

6. Abnormal Releases

a. Number of Releases	0	0	0	0	0
b. Total Activity Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
UNIT 2 (Docket Number 50-304)

GASEOUS EFFLUENTS
SUPPLEMENTAL INFORMATION

1. Regulatory Limits

See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

2. Maximum Permissible Concentrations

See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

3. Average Energy

See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

4. Measurements and Approximations of Total Radioactivity

See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

5. Batch Releases	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	2003
a. Total Number of Batch Releases	0	0	0	0	0
b. Total Time Period for Batch Releases (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
c. Maximum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
d. Average Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
e. Minimum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

6. Abnormal Releases

a. Number of Releases	0	0	0	0	0
b. Total Activity Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

GASEOUS EFFLUENTS
SUPPLEMENTAL INFORMATION

1. Regulatory Limits

The calculated annual total quantity of all radioactive material above background released from each unit at Zion Station to the atmosphere is limited by off-site dose restrictions stated in the station technical specifications, Off-site Dose Calculation Manual (ODCM), and 10CFR50 Appendix I. The off-site dose limits per reactor unit are listed below.

	Quarterly (mrem)	Yearly (mrem)
Gamma Air	5	10
Beta Air	10	20
Total Body	2.5	5
Skin	7.5	15
Organ	7.5	15

2. Maximum Permissible Concentrations

Zion Station gaseous effluent release-rate limits were not calculated using maximum permissible concentrations of activity. Gaseous effluent activity release rates are limited by off-site dose-rate restrictions stated in station technical specifications and the ODCM. The release-rate limits were determined by using the ODCM computer code to calculate release rates which would produce a specified instantaneous dose rate at the site boundary. The off-site dose-rate limits are listed below.

Noble Gases	500	mrem/year Total Body
Noble Gases	3000	mrem/year Skin
I-131, I-133, H-3, and particulates with half-lives greater than 8 days	1500	mrem/year Organ

3. Average Energy

There were no measurable noble gas releases during 2003. Due to permanent cessation of operation and radioactive decay, the only gas available for release is Kr-85 present in spent fuel rods.

Isotope	Percent of Effluent
Kr-85	100

Average Gamma Energy per Decay of the Mixture (keV)	5.0
Average Beta Energy per Decay of the Mixture (keV)	269.0

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

GASEOUS EFFLUENTS
SUPPLEMENTAL INFORMATION

4. Measurements and Approximations of Total Radioactivity

- | | |
|---------------------------------|--|
| a. Fission and Activation Gases | Gamma Spectroscopy |
| b. Iodines | Gamma Spectroscopy |
| c. Particulates | Gamma Spectroscopy, Liquid Scintillation
Gas Flow Proportional Counting |
| d. Tritium | Liquid Scintillation |

Composite sample analyses for gross alpha, Sr-89, and Sr-90 are performed by off-site vendor.

5. Batch Releases	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	2003
a. Total Number of Batch Releases	0	0	0	0	0
b. Total Time Period for Batch Releases (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
c. Maximum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
d. Average Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
e. Minimum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
6. Abnormal Releases					
a. Number of Releases	0	0	0	0	0
b. Total Activity Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
GASEOUS EFFLUENTS - ALL RELEASES ARE AT GROUND LEVEL
UNIT 1 (Docket Number 50-295)
SUMMATION OF ALL RELEASES

Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
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A. Fission and Activation Gases

1. Total Release Activity	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00

B. Iodine

1. Total I-131 Activity	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00

C. Particulates (half-lives > 8 days)

1. Total Release Activity†	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	1.53E-06	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	5.95E-07	<LLD	5.95E-07	2.12E-06
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	<LLD	<LLD	5.71E-07	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	2.30E-07	<LLD	7.48E-08	6.72E-09
3. Gross Alpha Activity†	Ci				<LLD				<LLD				<LLD				<LLD	<LLD

D. Tritium

1. Total Release Activity	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00

E. Sum of Iodine, Particulate (half-lives > 8 days), and Tritium Releases.

1. Total Release Activity	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-06	0.00E+00	1.53E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.95E-07	0.00E+00	5.95E-07	2.13E-06
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† Gross Alpha, Sr-89, and Sr-90 Activities are quantified by quarterly composite analyses. The difference between the quarterly Particulates total and the sum of the totals of the three corresponding months equals the total quarterly activities of Sr-89 and Sr-90. The cells for monthly activity values of Gross Alpha on this page and Sr-89 and Sr-90 on the Batch and Continuous Mode data sheets are blank because monthly values are not applicable.

Lower limit of detection (LLD) values are presented in the Gaseous Effluents LLD Values for Gaseous Releases section. The abbreviation "<LLD" indicates the activity concentration of the radionuclide for each individual sample analyzed during the applicable period was less than the LLD value for that nuclide. If the abbreviation "<LLD" is listed for a group of radionuclides, the activity concentration of each radionuclide for each sample during the period was less than the LLD value for the respective radionuclide.

Percent of technical specification limit information is presented in the Gaseous Effluents Supplemental Information and Dose to Public sections of this report.

The abbreviation "No Rel" indicates that no batch releases were performed during the applicable period.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
GASEOUS EFFLUENTS - ALL RELEASES ARE AT GROUND LEVEL
UNIT 1 (Docket Number 50-295)
BATCH MODE

Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
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A. Fission and Activation Gases

Ar-41	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Kr-85	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Kr-85m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Kr-87	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Kr-88	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-131	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-131m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-133	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-133m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-135	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-135m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-138	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD

B. Iodines

Br-82	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
I-131	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
I-132	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
I-133	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
I-134	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
I-135	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD

C. Particulates

Na-24	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Cr-51*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Mn-54*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Co-57*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Co-58*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Co-60*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Zn-65*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Se-75*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Rb-88	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Sr-89*	Ci				No Rel				No Rel				No Rel				No Rel	No Rel
Sr-90*	Ci				No Rel				No Rel				No Rel				No Rel	No Rel
Zr-95*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Nb-95*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Mo-99	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Tc-99m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Ru-103*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Ag-110m*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Cs-134*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Cs-136*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Cs-137*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Cs-138	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Ba-140*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
La-140	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Ce-144*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Pr-144	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
W-187	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel

D. Tritium

1 Total Release Activity	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
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* Particulate isotope with half-life greater than 8 days.

CONTINUOUS MODE

A. Fission and Activation Gases

B. Iodines

C. Particulates

D. Tritium

* Particulate isotope with half-life greater than 8 days.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
GASEOUS EFFLUENTS - ALL RELEASES ARE AT GROUND LEVEL
UNIT 2 (Docket Number 50-304)
SUMMATION OF ALL RELEASES

Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
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A. Fission and Activation Gases

1. Total Release Activity	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00

B. Iodine

1. Total I-131 Activity	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00

C. Particulates (half-lives > 8 days)

1. Total Release Activity†	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	1.53E-06	<LLD	1.53E-06	<LLD	<LLD	<LLD	<LLD	<LLD	5.95E-07	<LLD	5.95E-07	2.13E-06
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	<LLD	<LLD	5.71E-07	<LLD	1.95E-08	<LLD	<LLD	<LLD	<LLD	<LLD	2.30E-07	<LLD	7.49E-09	6.75E-09
3. Gross Alpha Activity†	Ci				<LLD				<LLD				<LLD				<LLD	<LLD

D. Tritium

1. Total Release Activity	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00

E. Sum of Iodine, Particulate (half-lives > 8 days), and Tritium Releases.

1. Total Release Activity	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E-06	0.00E+00	1.53E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.95E-07	0.00E+00	5.95E-07	2.13E-06
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† Gross Alpha, Sr-89, and Sr-90 Activities are quantified by quarterly composite analyses. The difference between the quarterly Particulates total and the sum of the totals of the three corresponding months equals the total quarterly activities of Sr-89 and Sr-90. The cells for monthly activity values of Gross Alpha on this page and Sr-89 and Sr-90 on the Batch and Continuous Mode data sheets are blank because monthly values are not applicable.

Lower limit of detection (LLD) values are presented in the Gaseous Effluents LLD Values for Gaseous Releases section. The abbreviation "<LLD" indicates the activity concentration of the radionuclide for each individual sample analyzed during the applicable period was less than the LLD value for that nuclide. If the abbreviation "<LLD" is listed for a group of radionuclides, the activity concentration of each radionuclide for each sample during the period was less than the LLD value for the respective radionuclide.

Percent of technical specification limit information is presented in the Gaseous Effluents Supplemental Information and Dose to Public sections of this report.

The abbreviation "No Rel" indicates that no batch releases were performed during the applicable period.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
GASEOUS EFFLUENTS - ALL RELEASES ARE AT GROUND LEVEL
UNIT 2 (Docket Number 50-304)
BATCH MODE

Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
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A. Fission and Activation Gases

Ar-41	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Kr-85	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Kr-85m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Kr-87	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Kr-88	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-131	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-131m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-133	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-133m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-135	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-135m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Xe-138	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD

B. Iodines

Br-82	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
I-131	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
I-132	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
I-133	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
I-134	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
I-135	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD

C. Particulates

Na-24	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Cr-51*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Mn-54*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Co-57*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Co-58*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Co-60*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Zn-65*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Se-75*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Rb-88	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Sr-89*	Ci				No Rel				No Rel				No Rel				No Rel	<LLD
Sr-90*	Ci				No Rel				No Rel				No Rel				No Rel	<LLD
Zr-95*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Nb-95*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Mo-99	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Tc-99m	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Ru-103*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Ag-110m*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Cs-134*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Cs-136*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Cs-137*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Cs-138	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Ba-140*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
La-140	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Ce-144*	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
Pr-144	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
W-187	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD

D. Tritium

1 Total Release Activity	Ci	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	<LLD
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* Particulate isotope with half-life greater than 8 days.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
GASEOUS EFFLUENTS - ALL RELEASES ARE AT GROUND LEVEL
UNIT 2 (Docket Number 50-304)
CONTINUOUS MODE

Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
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A. Fission and Activation Gases

Ar-41	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-85	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-85m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-87	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-88	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-131	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-131m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-133	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-133m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-135m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-138	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

B. Iodines

Br-82	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-131	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-132	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-133	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-134	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

C. Particulates

Na-24	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cr-51*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mn-54*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-57*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-58*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-60*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	1.53E-06	<LLD	1.53E-06	<LLD	<LLD	<LLD	<LLD	<LLD	5.95E-07	<LLD	1.19E-06 2.72E-06
Zn-65*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Se-75*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Rb-88	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Sr-89*	Ci				<LLD				<LLD				<LLD			<LLD	<LLD
Sr-90*	Ci				<LLD				<LLD				<LLD			<LLD	<LLD
Zr-95*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Nb-95*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Tc-99m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ru-103*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ag-110m*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-134*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-136*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-137*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-138	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ba-140*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ia-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-144*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Pr-144	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
W-187	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

D. Tritium

1 Total Release Activity	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
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* Particulate isotope with half-life greater than 8 days.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
GASEOUS EFFLUENTS - ALL RELEASES ARE AT GROUND LEVEL
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)
SUMMATION OF ALL RELEASES

Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
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A. Fission and Activation Gases

1. Total Release Activity	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00

B. Iodine

1. Total I-131 Activity	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00

C. Particulates (half-life > 8 days)

1. Total Release Activity†	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	2.02E-06	<LLD	2.02E-06	<LLD	<LLD	<LLD	<LLD	<LLD	1.19E-06	<LLD	1.19E-06	3.21E-06
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	<LLD	<LLD	7.54E-07	<LLD	2.57E-08	<LLD	<LLD	<LLD	<LLD	<LLD	4.59E-07	<LLD	1.50E-08	1.02E-08
3. Gross Alpha Activity†	Ci				<LLD				<LLD				<LLD				<LLD	<LLD

D. Tritium

1. Total Release Activity	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
2. Average Release Rate	uCi/sec	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00

E. Sum of Iodine, Particulate (half-lives > 8 days), and Tritium Releases.

1. Total Release Activity	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.02E-06	0.00E+00	2.02E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.19E-06	0.00E+00	1.19E-06	3.21E-06
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† Gross Alpha, Sr-89, and Sr-90 Activities are quantified by quarterly composite analyses. The difference between the quarterly Particulates total and the sum of the totals of the three corresponding months equals the total quarterly activities of Sr-89 and Sr-90. The cells for monthly activity values of Gross Alpha on this page and Sr-89 and Sr-90 on the Batch and Continuous Mode data sheets are blank because monthly values are not applicable.

Lower limit of detection (LLD) values are presented in the Gaseous Effluents LLD Values for Gaseous Releases section. The abbreviation "<LLD" indicates the activity concentration of the radionuclide for each individual sample analyzed during the applicable period was less than the LLD value for that nuclide. If the abbreviation "<LLD" is listed for a group of radionuclides, the activity concentration of each radionuclide for each sample during the period was less than the LLD value for the respective radionuclide.

Percent of technical specification limit information is presented in the Gaseous Effluents Supplemental Information and Dose to Public sections of this report.

The abbreviation "No Rel" indicates that no batch releases were performed during the applicable period.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
GASEOUS EFFLUENTS - ALL RELEASES ARE AT GROUND LEVEL
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)
BATCH MODE

Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
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A. Fission and Activation Gases

Ar-41	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Kr-85	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Kr-85m	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Kr-87	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Kr-88	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Xe-131	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Xe-131m	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Xe-133	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Xe-133m	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Xe-135	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Xe-135m	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Xe-138	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel

B. Iodines

Br-82	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
I-131	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
I-132	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
I-133	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
I-134	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
I-135	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel

C. Particulates

Na-24	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Cr-51*	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Mn-54*	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Co-57*	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Co-58*	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Co-60*	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Zn-65*	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Se-75*	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Rb-88	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Sr-89*	Cl				No Rel				No Rel				No Rel			No Rel	No Rel
Sr-90*	Cl				No Rel				No Rel				No Rel			No Rel	No Rel
Zr-95*	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Nb-95*	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Mo-99	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Tc-99m	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Ru-103*	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Ag-110m*	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Cs-134*	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Cs-136*	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Cs-137*	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Cs-138	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Ba-140*	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
La-140	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Ce-144*	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
Pr-144	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
W-187	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel

D. Tritium

1 Total Release Activity	Cl	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel	No Rel
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* Particulate isotope with half-life greater than 8 days.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
GASEOUS EFFLUENTS - ALL RELEASES ARE AT GROUND LEVEL
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)
CONTINUOUS MODE

Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
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A. Fission and Activation Gases

Ar-41	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-85	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-85m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-87	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Kr-88	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-131	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-131m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-133	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-133m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-135m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Xe-138	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

B. Iodines

Br-82	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-131	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-132	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-133	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-134	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
I-135	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

C. Particulates

Na-24	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cr-51*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mn-54*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-57*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-58*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Co-60*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	2.02E-06	<LLD	2.02E-06	<LLD	<LLD	<LLD	<LLD	<LLD	1.19E-06	<LLD	1.19E-06
Zn-65*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	3.21E-06
Se-75*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Rb-88	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Sr-89*	Ci				<LLD				<LLD				<LLD		<LLD		<LLD
Sr-90*	Ci				<LLD				<LLD				<LLD				<LLD
Zr-95*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Nb-95*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Tc-99m	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ru-103*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ag-110m*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-134*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-136*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-137*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Cs-138	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ba-140*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
La-140	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Ce-144*	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
Pr-144	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
W-187	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

D. Tritium

1 Total Release Activity	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
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* Particulate isotope with half-life greater than 8 days.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
UNIT 1 (Docket Number 50-295)

GASEOUS EFFLUENTS
SUPPLEMENTAL INFORMATION

1. Regulatory Limits

See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

2. Maximum Permissible Concentrations

See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

3. Average Energy

See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

4. Measurements and Approximations of Total Radioactivity

See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

5. Batch Releases	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	2003
a. Total Number of Batch Releases	0	0	0	0	0
b. Total Time Period for Batch Releases (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
c. Maximum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
d. Average Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
e. Minimum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
6. Abnormal Releases					
a. Number of Releases	0	0	0	0	0
b. Total Activity Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
UNIT 2 (Docket Number 50-304)

GASEOUS EFFLUENTS
SUPPLEMENTAL INFORMATION

1. Regulatory Limits

See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

2. Maximum Permissible Concentrations

See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

3. Average Energy

See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

4. Measurements and Approximations of Total Radioactivity

See "Unit 1 & 2 GASEOUS EFFLUENTS SUPPLEMENTAL INFORMATION"

5. Batch Releases	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	2003
a. Total Number of Batch Releases	0	0	0	0	0
b. Total Time Period for Batch Releases (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
c. Maximum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
d. Average Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
e. Minimum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

6. Abnormal Releases

a. Number of Releases	0	0	0	0	0
b. Total Activity Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

GASEOUS EFFLUENTS
SUPPLEMENTAL INFORMATION

1. Regulatory Limits

The calculated annual total quantity of all radioactive material above background released from each unit at Zion Station to the atmosphere is limited by off-site dose restrictions stated in the station technical specifications, Off-site Dose Calculation Manual (ODCM), and 10CFR50 Appendix I. The off-site dose limits per reactor unit are listed below.

	Quarterly (mrem)	Yearly (mrem)
Gamma Air	5	10
Beta Air	10	20
Total Body	2.5	5
Skin	7.5	15
Organ	7.5	15

2. Maximum Permissible Concentrations

Zion Station gaseous effluent release-rate limits were not calculated using maximum permissible concentrations of activity. Gaseous effluent activity release rates are limited by off-site dose-rate restrictions stated in station technical specifications and the ODCM. The release-rate limits were determined by using the ODCM computer code to calculate release rates which would produce a specified instantaneous dose rate at the site boundary. The off-site dose-rate limits are listed below.

Noble Gases	500	mrem/year Total Body
Noble Gases	3000	mrem/year Skin
I-131, I-133, H-3, and particulates with half-lives greater than 8 days	1500	mrem/year Organ

3. Average Energy

There were no measurable noble gas releases during 2003. Due to permanent cessation of operation and radioactive decay, the only gas available for release is Kr-85 present in spent fuel rods.

Isotope	Percent of Effluent
Kr-85	100

Average Gamma Energy per Decay of the Mixture (keV)	5.0
Average Beta Energy per Decay of the Mixture (keV)	269.0

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

GASEOUS EFFLUENTS
SUPPLEMENTAL INFORMATION

4. Measurements and Approximations of Total Radioactivity

- | | |
|---------------------------------|--|
| a. Fission and Activation Gases | Gamma Spectroscopy |
| b. Iodines | Gamma Spectroscopy |
| c. Particulates | Gamma Spectroscopy, Liquid Scintillation
Gas Flow Proportional Counting |
| d. Tritium | Liquid Scintillation |

Composite sample analyses for gross alpha, Sr-89, and Sr-90 are performed by off-site vendor.

5. Batch Releases	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	2003
a. Total Number of Batch Releases	0	0	0	0	0
b. Total Time Period for Batch Releases (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
c. Maximum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
d. Average Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
e. Minimum Time Period for a Batch Release (minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

6. Abnormal Releases

a. Number of Releases	0	0	0	0	0
b. Total Activity Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

GASEOUS EFFLUENTS
LOWER LIMIT OF DETECTION (LLD) VALUES FOR GASEOUS RELEASES

<u>Isotope</u>	<u>LLD (uCi/ml)</u>
Alpha	1.00E-11
H-3	1.00E-06
Kr-85	1.00E-06
Mn-54	1.00E-11
Co-58	1.00E-11
Co-60	1.00E-11
Zn-65	1.00E-11
Sr-89	1.00E-11
Sr-90	1.00E-11
Mo-99	1.00E-11
Cs-134	1.00E-11
Cs-137	1.00E-11
Ce-141	1.00E-11
Ce-144	1.00E-11

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

ADDENDUM

1. Offsite Dose Calculation Manual (ODCM)

Changes to the ODCM are required by Zion Station Permanently Defueled Technical Specification 5.6.1. and ODCM Section 12.6.3 to be submitted as part of, or concurrent with, the Annual Radioactive Effluent Release Report.

A summary of changes made to the ODCM during 2003 and an entire copy of the ODCM, current as of December 31, 2003.

2. Gaseous and Liquid Waste Treatment Systems and Process Control Program

Zion Station ODCM Section 12.6.4 requires major changes to the Gaseous and Liquid Waste Treatment Systems to be reported in the Annual Radioactive Effluent Release Report.

The Waste Gas Hold-up System was permanently vented. In Zion's defueled configuration this system is no longer applicable.

In Zion's defueled configuration, the charcoal iodine removal system is no longer applicable.

Due to radioactive decay and no means of production, radioactive iodine is not a concern at Zion.

3. Limiting Conditions of Operation (LCOs)

Zion Station ODCM Section 12.7.2 requires explanation as to why the inoperability of liquid or gaseous monitoring instrumentation was not corrected within the time specified in the ODCM to be submitted with the Annual Radioactive Effluent Release Report.

None

4. Liquid Holdup Tanks and Gas Storage Tanks

Zion Station ODCM Section 12.7.2 requires a description of events leading to liquid holdup tanks or gas storage tanks exceeding technical specification limits to be included in the Annual Radioactive Effluent Release Report.

There was no activity present in any gas decay tanks during 2003.

No liquid holdup tanks exceeded the limits of Permanently Defueled Technical Specifications 5.6.3. during 2003.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

ADDENDUM

5. Estimates of Total Error

The following is an estimate of the total error associated with certain total values in the Annual Radioactive Effluent Release Report. The total error is determined by calculating the square root of the sum of the squares of the individual errors.

a. Gaseous Effluents

Sampling Error	5%
Calibration Error	10%
Counting Statistics Error	17%
Sample Volume Error	10%
Total Error	23%

b. Liquid Effluents

Sampling Error	5%
Calibration Error	10%
Counting Statistics Error	16%
Sample Volume Error	2%
Total Error	20%

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
LIQUID RELEASES
UNIT 2 (Docket Numbers 50-304)
SUMMATION OF ALL RELEASES

Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
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A. Fission and Activation Products (not incl. tritium, gases, alpha)

1. Total Activity Released	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
2. Average Conc. Released	uCi/ml	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
3. % of Value (9E-7 uCi/ml)	%	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00

B. Tritium

1. Total Activity Released	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
2. Average Conc. Released	uCi/ml	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
3. % of Value (1E-3 uCi/ml)	%	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00

C. Dissolved and Entrained Gases

1. Total Activity Released	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
2. Average Conc. Released	uCi/ml	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
3. % of Value (7E-5 uCi/ml)	%	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00

D. Gross Alpha

1. Total Activity Released	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
2. Average Conc. Released	uCi/ml	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
3. % of Value (2E-9 uCi/ml)	%	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

E. Volume of Releases

1. Volume of Waste Released	liters	4.92E+06	4.42E+06	6.35E+06	1.57E+07	5.98E+06	5.47E+06	5.53E+06	1.70E+07	5.53E+06	4.94E+06	5.13E+06	1.56E+07	4.97E+06	4.84E+06	4.70E+06	1.45E+07	6.28E+07
2. Volume of Dilution Water	liters	4.46E+10	2.18E+10	2.75E+09	6.92E+10	3.49E+09	3.29E+09	3.17E+09	9.95E+09	3.28E+09	3.29E+09	3.17E+09	9.74E+09	3.29E+09	3.17E+09	3.29E+09	9.75E+09	9.86E+10

§ Fe-55, Sr-89, and Sr-90 Activities are quantified by quarterly composite analyses. Therefore, the difference between the Fission and Activation Products total quarterly activity and the sum of the total activities of the three corresponding months equals the total quarterly activities of Fe-55, Sr-89, and Sr-90. The cells for monthly activity values of Fe-55, Sr-89, and Sr-90 on the Batch and Continuous Mode data sheets are blank because monthly values are not applicable.

‡ These data include only information for batch releases from Lake Discharge Tanks.

Lower limit of detection (LLD) values are presented in the Liquid Effluents LLD Values for Liquid Releases section. The abbreviation "<LLD" indicates the activity concentration of the radionuclide for each individual sample analyzed during the applicable period was less than the LLD value for that nuclide. If the abbreviation "<LLD" is listed for a group of radionuclides, the activity concentration of each radionuclide for each sample during the period was less than the LLD value for the respective radionuclide.

The abbreviation "No Re" indicates that no releases were performed during the applicable period.

"% of Value" means percent of concentration values in Appendix B, Table 2, Column 2 to 10CFR20. The % of Value for Fission and Activation Products and Dissolved and Entrained Gases provides a comparison of the total concentration of the group to the lowest isotopic concentration value of the particular group. The concentration of Fission and Activation Products and Dissolved and Entrained Gases are compared to the concentration limits for Cs-134 (9E-7 uCi/ml) and Ar-41 (7E-5 uCi/ml), respectively. Concentration limits for Dissolved and Entrained Gases are listed in ODCM Table 12.3-1.

ZION NUCLEAR POWER STATION

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003

LIQUID RELEASES

UNIT 2 (Docket Numbers 50-304)

BATCH MODE

Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
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A. Fission and Activation Products

[illegible]

B. Iodines

[illegible]

C. Tritium

[illegible]

D. Dissolved and Entrained Gases

[illegible]

CONTINUOUS MODE

Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
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A. Fission and Activation Products

[illegible]

B. Iodines

[illegible]

C. Tritium

[illegible]

D. Dissolved and Entrained Gases

[illegible]

ZION NUCLEAR POWER STATION

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003

LIQUID RELEASES

UNIT 1 (Docket Numbers 50-295)

BATCH MODE

Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
-------	-----	-----	-----	---------	-----	-----	-----	---------	-----	-----	-----	---------	-----	-----	-----	---------	-------

A. Fission and Activation Products

[illegible]

B. Iodines

[illegible]

C. Tritium

1. Total Release Activity	Ci	<LLD	<LLD	<LLD	No Rel	<LLD	<LLD	<LLD	No Rel	<LLD	4.47E-04	1.18E-04	6.65E-04	2.35E-04	<LLD	<LLD	2.35E-04	8.00E-04
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D. Dissolved and Entrained Gases

[illegible]

**ZION NUCLEAR POWER STATION
ACTIVE EFFLUENT RELEASE REPORT FOR 2003
LIQUID RELEASES
UNIT 1 (Docket Numbers 50-295)
CONTINUOUS MODE**

Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
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A. Fission and Activation Products

[illegible]

B. Iodines

[illegible]

C. Tritium

[illegible]

D. Dissolved and Entrained Gases

[illegible]

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
LIQUID RELEASES
UNIT 2 (Docket Numbers 50-304)
SUMMATION OF ALL RELEASES

Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
-------	-----	-----	-----	---------	-----	-----	-----	---------	-----	-----	-----	---------	-----	-----	-----	---------	-------

A. Fission and Activation Products (not incl. tritium, gases, alpha)

1. Total Activity Released §	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
2. Average Conc. Released	uCi/ml	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
3. % of Value (9E-7 uCi/ml)	%	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00

B. Tritium

1. Total Activity Released	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
2. Average Conc. Released	uCi/ml	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
3. % of Value (1E-3 uCi/ml)	%	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00

C. Dissolved and Entrained Gases

1. Total Activity Released	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
2. Average Conc. Released	uCi/ml	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00
3. % of Value (7E-5 uCi/ml)	%	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	0.00E+00

D. Gross Alpha

1. Total Activity Released	Ci	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
2. Average Conc. Released	uCi/ml	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD
3. % of Value (2E-9 uCi/ml)	%	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD	<LLD

E. Volume of Releases

1. Volume of Waste Released ‡	liters	4.92E+06	4.42E+06	6.35E+06	1.57E+07	5.98E+06	5.47E+06	5.53E+06	1.70E+07	5.53E+06	4.94E+06	5.13E+06	1.56E+07	4.97E+06	4.84E+06	4.70E+06	1.45E+07	6.28E+07
2. Volume of Dilution Water ‡	liters	4.46E+10	2.18E+10	2.75E+09	6.92E+10	3.49E+09	3.29E+09	3.17E+09	9.95E+09	3.28E+09	3.29E+09	3.17E+09	9.74E+09	3.29E+09	3.17E+09	3.29E+09	9.75E+09	9.86E+10

§ Fe-55, Sr-89, and Sr-90 Activities are quantified by quarterly composite analyses. Therefore, the difference between the Fission and Activation Products total quarterly activity and the sum of the total activities of the three corresponding months equals the total quarterly activities of Fe-55, Sr-89, and Sr-90. The cells for monthly activity values of Fe-55, Sr-89, and Sr-90 on the Batch and Continuous Mode data sheets are blank because monthly values are not applicable.

‡ These data include only information for batch releases from Lake Discharge Tanks.

Lower limit of detection (LLD) values are presented in the Liquid Effluents LLD Values for Liquid Releases section. The abbreviation "<LLD" indicates the activity concentration of the radionuclide for each individual sample analyzed during the applicable period was less than the LLD value for that nuclide. If the abbreviation "<LLD" is listed for a group of radionuclides, the activity concentration of each radionuclide for each sample during the period was less than the LLD value for the respective radionuclide.

The abbreviation "No Rel" indicates that no releases were performed during the applicable period.

"% of Value" means percent of concentration values in Appendix B, Table 2, Column 2 to 10CFR20. The % of Value for Fission and Activation Products and Dissolved and Entrained Gases provides a comparison of the total concentration of the group to the lowest isotopic concentration value of the particular group. The concentration of Fission and Activation Products and Dissolved and Entrained Gases are compared to the concentration limits for Cs-134 (9E-7 uCi/ml) and Ar-41 (7E-5 uCi/ml), respectively. Concentration limits for Dissolved and Entrained Gases are listed in ODCM Table 12.3-1.

**ZION NUCLEAR POWER STATION
INACTIVE EFFLUENT RELEASE REPORT FOR 2003
LIQUID RELEASES
UNIT 2 (Docket Numbers 50-304)
BATCH MODE**

Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
-------	-----	-----	-----	---------	-----	-----	-----	---------	-----	-----	-----	---------	-----	-----	-----	---------	-------

A. Fission and Activation Products

[illegible]

B. Iodines

[illegible]

C. Tritium

[illegible]

D. Dissolved and Entrained Gases

[illegible]

ZION NUCLEAR POWER STATION

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003

LIQUID RELEASES

UNIT 2 (Docket Numbers 50-304)

CONTINUOUS MODE

Units	Jan	Feb	Mar	1st Qtr	Apr	May	Jun	2nd Qtr	Jul	Aug	Sep	3rd Qtr	Oct	Nov	Dec	4th Qtr	Total
-------	-----	-----	-----	---------	-----	-----	-----	---------	-----	-----	-----	---------	-----	-----	-----	---------	-------

A. Fission and Activation Products

[illegible]

B. Iodines

[illegible]

C. Tritium

[illegible]

D. Dissolved and Entrained Gases

[illegible]

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
UNIT 1 (Docket Number 50-295)

LIQUID EFFLUENTS
SUPPLEMENTAL RELEASE INFORMATION

1	Batch Releases	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	2003
a.	Total Number of Batch Releases	0	0	6	2	8

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
UNIT 2 (Docket Number 50-304)

LIQUID EFFLUENTS
SUPPLEMENTAL RELEASE INFORMATION

4. Batch Releases	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	2003
a. Total Number of Batch Releases	0	0	0	0	0

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

LIQUID EFFLUENTS
SUPPLEMENTAL RELEASE INFORMATION

1. Regulatory Limits

The calculated annual total quantity of all radioactive material above background released from each unit at Zion Station to unrestricted areas is limited by off-site dose restrictions stated in the station technical specifications, Off-site Dose Calculation Manual (ODCM), and 10CFR50 Appendix I. The off-site dose limits per reactor unit are listed below.

	Quarterly (mrem)	Yearly (mrem)
Total Body	1.5	3
Organ	5	10

2. Maximum Permissible Concentrations

Zion Station technical specifications limit concentrations of radioactive material released in liquid effluents to unrestricted areas to ten times the concentration values in Appendix B, Table 2, Column 2 to 10CFR20.

3. Measurements and Approximations of Total Radioactivity

a. Fission and Activation Products	Gamma Spectroscopy, Liquid Scintillation Low-energy Photon Spectroscopy (LEPS, for Fe-55)
b. Tritium	Liquid Scintillation
c. Noble Gases	Gamma Spectroscopy
d. Gross Alpha	Gas Flow Proportional Counting

Composite sample analyses for Fe-55, Sr-89, and Sr-90 are performed by off-site vendor.

4. Batch Releases	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	2003
a. Total Number of Batch Releases	0	0	6	2	8

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

LIQUID EFFLUENTS
LOWER LIMIT OF DETECTION (LLD) VALUES FOR LIQUID RELEASES

<u>Isotope</u>	<u>LLD (uCi/ml)</u>
Alpha	1.00E-07
H-3	1.00E-05
Kr-85	1.00E-05
Mn-54	5.00E-07
Fe-55	1.00E-06
Co-58	5.00E-07
Fe-59	5.00E-07
Co-60	5.00E-07
Zn-65	5.00E-07
Sr-89	5.00E-08
Sr-90	5.00E-08
Mo-99	5.00E-07
Cs-134	5.00E-07
Cs-137	5.00E-07
Ce-141	5.00E-07
Ce-144	5.00E-07

NOTE: LLDs for other liquid effluent isotopes included in the Annual Radioactive Effluent Release Report were not available for submittal.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not irradiated fuel)

1. Type of waste and 2. Estimate of major nuclide composition
a. Spent resins, filter sludges, evaporator bottoms, etc.

Waste Class	Volume (m ³)	Activity (Ci)	Estim. Error in Activity
A	0.00E+00	0.00E+00	2.50E+01%

Nuclide Name	Percent Abundance	Activity (Ci)
H-3	0.00E+00%	0.00E+00
C-14	0.00E+00%	0.00E+00
Cr-51	0.00E+00%	0.00E+00
Mn-54	0.00E+00%	0.00E+00
Fe-55	0.00E+00%	0.00E+00
Fe-59	0.00E+00%	0.00E+00
Co-57	0.00E+00%	0.00E+00
Co-58	0.00E+00%	0.00E+00
Co-60	0.00E+00%	0.00E+00
Ni-59	0.00E+00%	0.00E+00
Ni-63	0.00E+00%	0.00E+00
Sr-89	0.00E+00%	0.00E+00
Sr-90	0.00E+00%	0.00E+00
Zr-95	0.00E+00%	0.00E+00
Nb-95	0.00E+00%	0.00E+00
Tc-99	0.00E+00%	0.00E+00
Ag-110m	0.00E+00%	0.00E+00
Sn-113	0.00E+00%	0.00E+00
Sb-125	0.00E+00%	0.00E+00
I-129	0.00E+00%	0.00E+00
Cs-134	0.00E+00%	0.00E+00
Cs-137	0.00E+00%	0.00E+00
Ce-144	0.00E+00%	0.00E+00
Pu-238	0.00E+00%	0.00E+00
Pu-239	0.00E+00%	0.00E+00
Pu-241	0.00E+00%	0.00E+00
Pu-242	0.00E+00%	0.00E+00
Am-241	0.00E+00%	0.00E+00
Cm-242	0.00E+00%	0.00E+00
Cm-243	0.00E+00%	0.00E+00
Zn-95	0.00E+00%	0.00E+00

Waste Class	Volume (m ³)	Activity (Ci)	Estim. Error in Activity
B	0.00E+00	0.00E+00	2.50E+01%

Nuclide Name	Percent Abundance	Activity (Ci)
H-3	0.00E+00%	0.00E+00
C-14	0.00E+00%	0.00E+00
Cr-51	0.00E+00%	0.00E+00
Mn-54	0.00E+00%	0.00E+00
Fe-55	0.00E+00%	0.00E+00
Fe-59	0.00E+00%	0.00E+00
Co-57	0.00E+00%	0.00E+00
Co-58	0.00E+00%	0.00E+00
Co-60	0.00E+00%	0.00E+00
Ni-59	0.00E+00%	0.00E+00
Ni-63	0.00E+00%	0.00E+00
Sr-89	0.00E+00%	0.00E+00
Sr-90	0.00E+00%	0.00E+00
Zr-95	0.00E+00%	0.00E+00
Nb-95	0.00E+00%	0.00E+00
Tc-99	0.00E+00%	0.00E+00
Ag-110m	0.00E+00%	0.00E+00
Sn-113	0.00E+00%	0.00E+00
Sb-125	0.00E+00%	0.00E+00
I-129	0.00E+00%	0.00E+00
Cs-134	0.00E+00%	0.00E+00
Cs-137	0.00E+00%	0.00E+00
Ce-144	0.00E+00%	0.00E+00
Pu-238	0.00E+00%	0.00E+00
Pu-239	0.00E+00%	0.00E+00
Pu-241	0.00E+00%	0.00E+00
Pu-242	0.00E+00%	0.00E+00
Am-241	0.00E+00%	0.00E+00
Cm-242	0.00E+00%	0.00E+00
Cm-243	0.00E+00%	0.00E+00
Zn-95	0.00E+00%	0.00E+00

Waste Class	Volume (m ³)	Activity (Ci)	Estim. Error in Activity
C	0.00E+00	0.00E+00	2.50E+01%

Nuclide Name	Percent Abundance	Activity (Ci)
H-3	0.00E+00%	0.00E+00
C-14	0.00E+00%	0.00E+00
Cr-51	0.00E+00%	0.00E+00
Mn-54	0.00E+00%	0.00E+00
Fe-55	0.00E+00%	0.00E+00
Fe-59	0.00E+00%	0.00E+00
Co-57	0.00E+00%	0.00E+00
Co-58	0.00E+00%	0.00E+00
Co-60	0.00E+00%	0.00E+00
Ni-59	0.00E+00%	0.00E+00
Ni-63	0.00E+00%	0.00E+00
Sr-89	0.00E+00%	0.00E+00
Sr-90	0.00E+00%	0.00E+00
Zr-95	0.00E+00%	0.00E+00
Nb-95	0.00E+00%	0.00E+00
Tc-99	0.00E+00%	0.00E+00
Ag-110m	0.00E+00%	0.00E+00
Sn-113	0.00E+00%	0.00E+00
Sb-125	0.00E+00%	0.00E+00
I-129	0.00E+00%	0.00E+00
Cs-134	0.00E+00%	0.00E+00
Cs-137	0.00E+00%	0.00E+00
Ce-144	0.00E+00%	0.00E+00
Pu-238	0.00E+00%	0.00E+00
Pu-239	0.00E+00%	0.00E+00
Pu-241	0.00E+00%	0.00E+00
Pu-242	0.00E+00%	0.00E+00
Am-241	0.00E+00%	0.00E+00
Cm-242	0.00E+00%	0.00E+00
Cm-243	0.00E+00%	0.00E+00
Zn-95	0.00E+00%	0.00E+00

Waste Class	Volume (m ³)	Activity (Ci)	Estim. Error in Activity
All	0.00E+00	0.00E+00	2.50E+01%

Nuclide Name	Percent Abundance	Activity (Ci)
H-3	0.00E+00%	0.00E+00
C-14	0.00E+00%	0.00E+00
Cr-51	0.00E+00%	0.00E+00
Mn-54	0.00E+00%	0.00E+00
Fe-55	0.00E+00%	0.00E+00
Fe-59	0.00E+00%	0.00E+00
Co-57	0.00E+00%	0.00E+00
Co-58	0.00E+00%	0.00E+00
Co-60	0.00E+00%	0.00E+00
Ni-59	0.00E+00%	0.00E+00
Ni-63	0.00E+00%	0.00E+00
Sr-89	0.00E+00%	0.00E+00
Sr-90	0.00E+00%	0.00E+00
Zr-95	0.00E+00%	0.00E+00
Nb-95	0.00E+00%	0.00E+00
Tc-99	0.00E+00%	0.00E+00
Ag-110m	0.00E+00%	0.00E+00
Sn-113	0.00E+00%	0.00E+00
Sb-125	0.00E+00%	0.00E+00
I-129	0.00E+00%	0.00E+00
Cs-134	0.00E+00%	0.00E+00
Cs-137	0.00E+00%	0.00E+00
Ce-144	0.00E+00%	0.00E+00
Pu-238	0.00E+00%	0.00E+00
Pu-239	0.00E+00%	0.00E+00
Pu-241	0.00E+00%	0.00E+00
Pu-242	0.00E+00%	0.00E+00
Am-241	0.00E+00%	0.00E+00
Cm-242	0.00E+00%	0.00E+00
Cm-243	0.00E+00%	0.00E+00
Zn-95	0.00E+00%	0.00E+00

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not irradiated fuel)

1. Type of waste and 2. Estimate of major nuclide composition
- b. Dry compressible waste, contaminated equipment, etc.

Waste Class	Volume (m ³)	Activity (Ci)	Estim. Error in Activity
A	0.00E+00	0.00E+00	2.50E+01%

Nuclide Name	Percent Abundance	Activity (Ci)
H-3	0.00E+00%	0.00E+00
C-14	0.00E+00%	0.00E+00
Cr-51	0.00E+00%	0.00E+00
Mn-54	0.00E+00%	0.00E+00
Fe-55	0.00E+00%	0.00E+00
Fe-59	0.00E+00%	0.00E+00
Co-57	0.00E+00%	0.00E+00
Co-58	0.00E+00%	0.00E+00
Co-60	0.00E+00%	0.00E+00
Ni-59	0.00E+00%	0.00E+00
Ni-63	0.00E+00%	0.00E+00
Sr-89	0.00E+00%	0.00E+00
Sr-90	0.00E+00%	0.00E+00
Zr-95	0.00E+00%	0.00E+00
Nb-95	0.00E+00%	0.00E+00
Tc-99	0.00E+00%	0.00E+00
Ag-110m	0.00E+00%	0.00E+00
Sn-113	0.00E+00%	0.00E+00
Sb-125	0.00E+00%	0.00E+00
I-129	0.00E+00%	0.00E+00
Cs-134	0.00E+00%	0.00E+00
Cs-137	0.00E+00%	0.00E+00
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Pu-238	0.00E+00%	0.00E+00
Pu-239	0.00E+00%	0.00E+00
Pu-241	0.00E+00%	0.00E+00
Pu-242	0.00E+00%	0.00E+00
Am-241	0.00E+00%	0.00E+00
Cm-242	0.00E+00%	0.00E+00
Cm-243	0.00E+00%	0.00E+00
Zn-95	0.00E+00%	0.00E+00

Waste Class	Volume (m ³)	Activity (Ci)	Estim. Error in Activity
B	0.00E+00	0.00E+00	0.00E+00%

Nuclide Name	Percent Abundance	Activity (Ci)
H-3	0.00E+00%	0.00E+00
C-14	0.00E+00%	0.00E+00
Cr-51	0.00E+00%	0.00E+00
Mn-54	0.00E+00%	0.00E+00
Fe-55	0.00E+00%	0.00E+00
Fe-59	0.00E+00%	0.00E+00
Co-57	0.00E+00%	0.00E+00
Co-58	0.00E+00%	0.00E+00
Co-60	0.00E+00%	0.00E+00
Ni-59	0.00E+00%	0.00E+00
Ni-63	0.00E+00%	0.00E+00
Sr-89	0.00E+00%	0.00E+00
Sr-90	0.00E+00%	0.00E+00
Zr-95	0.00E+00%	0.00E+00
Nb-95	0.00E+00%	0.00E+00
Tc-99	0.00E+00%	0.00E+00
Ag-110m	0.00E+00%	0.00E+00
Sn-113	0.00E+00%	0.00E+00
Sb-125	0.00E+00%	0.00E+00
I-129	0.00E+00%	0.00E+00
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Pu-239	0.00E+00%	0.00E+00
Pu-241	0.00E+00%	0.00E+00
Pu-242	0.00E+00%	0.00E+00
Am-241	0.00E+00%	0.00E+00
Cm-242	0.00E+00%	0.00E+00
Cm-243	0.00E+00%	0.00E+00
Zn-95	0.00E+00%	0.00E+00

Waste Class	Volume (m ³)	Activity (Ci)	Estim. Error in Activity
C	0.00E+00	0.00E+00	0.00E+00%

Nuclide Name	Percent Abundance	Activity (Ci)
H-3	0.00E+00%	0.00E+00
C-14	0.00E+00%	0.00E+00
Cr-51	0.00E+00%	0.00E+00
Mn-54	0.00E+00%	0.00E+00
Fe-55	0.00E+00%	0.00E+00
Fe-59	0.00E+00%	0.00E+00
Co-57	0.00E+00%	0.00E+00
Co-58	0.00E+00%	0.00E+00
Co-60	0.00E+00%	0.00E+00
Ni-59	0.00E+00%	0.00E+00
Ni-63	0.00E+00%	0.00E+00
Sr-89	0.00E+00%	0.00E+00
Sr-90	0.00E+00%	0.00E+00
Zr-95	0.00E+00%	0.00E+00
Nb-95	0.00E+00%	0.00E+00
Tc-99	0.00E+00%	0.00E+00
Ag-110m	0.00E+00%	0.00E+00
Sn-113	0.00E+00%	0.00E+00
Sb-125	0.00E+00%	0.00E+00
I-129	0.00E+00%	0.00E+00
Cs-134	0.00E+00%	0.00E+00
Cs-137	0.00E+00%	0.00E+00
Ce-144	0.00E+00%	0.00E+00
Pu-238	0.00E+00%	0.00E+00
Pu-239	0.00E+00%	0.00E+00
Pu-241	0.00E+00%	0.00E+00
Pu-242	0.00E+00%	0.00E+00
Am-241	0.00E+00%	0.00E+00
Cm-242	0.00E+00%	0.00E+00
Cm-243	0.00E+00%	0.00E+00
Zn-95	0.00E+00%	0.00E+00

Waste Class	Volume (m ³)	Activity (Ci)	Estim. Error in Activity
All	0.00E+00	0.00E+00	2.50E+01%

Nuclide Name	Percent Abundance	Activity (Ci)
H-3	0.00E+00%	0.00E+00
C-14	0.00E+00%	0.00E+00
Cr-51	0.00E+00%	0.00E+00
Mn-54	0.00E+00%	0.00E+00
Fe-55	0.00E+00%	0.00E+00
Fe-59	0.00E+00%	0.00E+00
Co-57	0.00E+00%	0.00E+00
Co-58	0.00E+00%	0.00E+00
Co-60	0.00E+00%	0.00E+00
Ni-59	0.00E+00%	0.00E+00
Ni-63	0.00E+00%	0.00E+00
Sr-89	0.00E+00%	0.00E+00
Sr-90	0.00E+00%	0.00E+00
Zr-95	0.00E+00%	0.00E+00
Nb-95	0.00E+00%	0.00E+00
Tc-99	0.00E+00%	0.00E+00
Ag-110m	0.00E+00%	0.00E+00
Sn-113	0.00E+00%	0.00E+00
Sb-125	0.00E+00%	0.00E+00
I-129	0.00E+00%	0.00E+00
Cs-134	0.00E+00%	0.00E+00
Cs-137	0.00E+00%	0.00E+00
Ce-144	0.00E+00%	0.00E+00
Pu-238	0.00E+00%	0.00E+00
Pu-239	0.00E+00%	0.00E+00
Pu-241	0.00E+00%	0.00E+00
Pu-242	0.00E+00%	0.00E+00
Am-241	0.00E+00%	0.00E+00
Cm-242	0.00E+00%	0.00E+00
Cm-243	0.00E+00%	0.00E+00
Zn-95	0.00E+00%	0.00E+00

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT REPORT FOR 2003
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not irradiated fuel)

1. Type of waste and 2. Estimate of major nuclide composition
- c. Irradiated components, control rods, etc.

No irradiated component shipments were performed during 2003.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT REPORT FOR 2003
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not irradiated fuel)

3. Solid Waste Disposition

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
0	N/A	N/A

B. IRRADIATED FUEL SHIPMENTS

No irradiated fuel shipments were performed during 2003.

ZION NUCLEAR POWER STATION
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT FOR 2003
UNIT 1 & 2 (Docket Numbers 50-295 & 50-304)

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

Radioactive Waste Shipments for 2003

Shipment Date	Shipment Number	Media	Receiver	Waste Class	Container Type	Solidification Agent	Activity (Ci)	Volume (m ³)	Volume (ft ³)
1st Quarter:									
Sub totals:	0						0.0000000	0.000	0.00
2nd Quarter:									
Sub totals:	0						0.0000000	0.000	0.00
3rd Quarter:									
Sub totals:	0						0.0000000	0.000	0.00
4th Quarter:									
Sub totals:	0						0.0000000	0.000	0.00
Totals:	0						0.0000000	0.000	0.00

	Class A	Class B	Class C
Number of Shipments	3	0	0
Activity (Ci)	0.00E+00	0.00E+00	0.00E+00
Volume (m ³)	0.00E+00	0.00E+00	0.00E+00

Zion Nuclear Station

Period of Record: January - March 2003

Stability Class - Extremely Unstable - 250Ft-33Ft Delta-T (F)
Winds Measured at: 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	2	2	0	0	4
NNE	0	0	13	3	0	0	16
NE	0	0	3	5	0	0	8
ENE	0	0	0	0	0	0	0
E	0	0	2	0	0	0	2
ESE	0	1	2	0	0	0	3
SE	0	1	3	0	0	0	4
SSE	0	1	0	0	0	0	1
S	0	0	0	0	0	0	0
SSW	0	0	2	1	0	0	3
SW	0	0	2	2	0	0	4
WSW	0	0	3	4	0	0	7
W	0	0	11	3	0	0	14
WNW	0	1	5	3	0	0	9
NW	0	0	5	0	0	0	5
NNW	0	0	0	1	0	0	1
Variable	0	0	0	0	0	0	0
Total	0	4	53	24	0	0	81

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: January - March 2003

Stability Class - Moderately Unstable - 250Ft-33Ft Delta-T (F)
Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	2	0	0	0	2
NNE	0	1	1	0	0	0	2
NE	0	0	1	0	0	0	1
ENE	0	1	0	0	0	0	1
E	0	2	0	0	0	0	2
ESE	0	0	1	0	0	0	1
SE	0	0	2	0	0	0	2
SSE	0	1	3	0	0	0	4
S	0	0	2	0	0	0	2
SSW	0	0	3	0	0	0	3
SW	0	0	2	3	0	0	5
WSW	0	1	5	3	0	0	9
W	0	0	9	4	0	0	13
WNW	0	1	9	1	0	0	11
NW	0	0	11	1	0	0	12
NNW	0	0	1	1	0	0	2
Variable	0	0	0	0	0	0	0
Total	0	7	52	13	0	0	72

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: January - March 2003
 Stability Class - Slightly Unstable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	2	0	0	0	2
NNE	0	4	2	1	0	0	7
NE	0	0	1	6	0	0	7
ENE	0	2	0	0	0	0	2
E	0	4	1	0	0	0	5
ESE	0	2	2	0	0	0	4
SE	0	3	2	0	0	0	5
SSE	0	1	1	0	0	0	2
S	0	0	1	0	0	0	1
SSW	0	0	1	1	0	0	2
SW	0	1	10	4	0	0	15
WSW	0	2	4	4	0	0	10
W	0	1	9	5	0	0	15
WNW	0	4	15	5	0	0	24
NW	0	3	16	1	0	0	20
NNW	0	1	7	2	0	0	10
Variable	0	0	0	0	0	0	0
Total	0	28	74	29	0	0	131

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: January - March 2003
 Stability Class - Neutral - 250Ft-33Ft Delta-T (F)
 Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	2	8	13	19	10	2	54
NNE	2	22	37	10	0	0	71
NE	2	4	15	43	10	0	74
ENE	0	5	5	8	4	0	22
E	0	9	2	0	0	0	11
ESE	2	6	3	0	0	0	11
SE	0	8	2	0	0	0	10
SSE	0	17	17	1	0	0	35
S	2	15	14	1	0	0	32
SSW	1	15	17	2	0	0	35
SW	1	18	37	18	1	0	75
WSW	1	17	55	22	0	0	95
W	1	25	25	10	0	0	61
WNW	8	18	52	19	0	0	97
NW	2	40	75	7	0	0	124
NNW	1	10	55	15	0	0	81
Variable	0	0	0	0	0	0	0
Total	25	237	424	175	25	2	888

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: January - March 2003
 Stability Class - Slightly Stable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	1	2	22	1	0	0	26
NNE	1	6	8	2	0	0	17
NE	1	2	2	3	0	0	8
ENE	0	5	4	0	0	0	9
E	3	4	3	3	0	0	13
ESE	6	10	4	1	0	0	21
SE	3	14	2	0	0	0	19
SSE	1	10	10	3	0	0	24
S	3	23	11	0	0	0	37
SSW	4	22	11	1	0	0	38
SW	7	37	23	21	0	0	88
WSW	13	29	33	3	0	0	78
W	5	37	56	11	0	0	109
WNW	12	51	48	4	0	0	115
NW	8	50	15	4	0	0	77
NNW	3	12	11	1	0	0	27
Variable	0	0	0	0	0	0	0
Total	71	314	263	58	0	0	706

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: January - March 2003

Stability Class - Moderately Stable - 250Ft-33Ft Delta-T (F)
Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	3	0	0	0	0	3
NNE	1	0	1	0	0	0	2
NE	0	1	0	0	0	0	1
ENE	1	0	0	0	0	0	1
E	1	1	0	0	0	0	2
ESE	0	2	0	0	0	0	2
SE	0	5	1	0	0	0	6
SSE	0	5	8	0	0	0	13
S	2	14	0	0	0	0	16
SSW	2	7	1	0	0	0	10
SW	6	4	1	0	0	0	11
WSW	11	7	0	0	0	0	18
W	7	11	0	0	0	0	18
WNW	7	8	0	0	0	0	15
NW	0	8	0	0	0	0	8
NNW	2	0	0	0	0	0	2
Variable	0	0	0	0	0	0	0
Total	40	76	12	0	0	0	128

Hours of calm in this stability class: 0

Hours of missing wind measurements in this stability class: 0

Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: January - March 2003
 Stability Class - Extremely Stable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	2	1	0	0	0	0	3
NNE	0	0	0	0	0	0	0
NE	0	1	0	0	0	0	1
ENE	1	1	1	0	0	0	3
E	1	1	1	0	0	0	3
ESE	0	0	0	0	0	0	0
SE	0	1	1	0	0	0	2
SSE	4	16	12	0	0	0	32
S	6	35	3	0	0	0	44
SSW	4	2	0	0	0	0	6
SW	3	1	0	0	0	0	4
WSW	4	7	0	0	0	0	11
W	2	14	0	0	0	0	16
WNW	1	11	0	0	0	0	12
NW	0	2	0	0	0	0	2
NNW	0	1	0	0	0	0	1
Variable	0	0	0	0	0	0	0
Total	28	94	18	0	0	0	140

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: January - March 2003
 Stability Class - Extremely Unstable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	0	3	4	0	7
NNE	0	0	8	5	4	0	17
NE	0	0	0	0	3	1	4
ENE	0	0	0	0	0	0	0
E	0	0	1	1	0	0	2
ESE	0	1	1	0	0	0	2
SE	0	0	4	2	0	0	6
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	3	1	0	4
SW	0	0	0	2	2	0	4
WSW	0	0	1	2	2	1	6
W	0	0	4	8	3	0	15
WNW	0	0	2	3	2	1	8
NW	0	0	1	4	1	0	6
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	1	22	33	22	3	81

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: January - March 2003

Stability Class - Moderately Unstable - 250Ft-33Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	0	2	0	0	2
NNE	0	1	0	0	1	0	2
NE	0	0	1	0	0	0	1
ENE	0	2	0	0	0	0	2
E	0	0	1	0	0	0	1
ESE	0	0	0	0	0	0	0
SE	0	1	3	1	0	0	5
SSE	0	0	0	1	1	0	2
S	0	0	0	1	1	0	2
SSW	0	0	0	3	0	0	3
SW	0	0	1	1	3	0	5
WSW	0	1	2	3	2	2	10
W	0	0	3	7	3	0	13
WNW	0	0	2	8	0	1	11
NW	0	0	3	7	2	0	12
NNW	0	0	0	1	1	0	2
Variable	0	0	0	0	0	0	0
Total	0	5	16	35	14	3	73

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: January - March 2003

Stability Class - Slightly Unstable - 250Ft-33Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	0	1	1	0	2
NNE	0	0	4	1	1	0	6
NE	0	0	0	1	0	6	7
ENE	0	3	0	0	0	0	3
E	0	3	1	0	0	0	4
ESE	0	2	1	0	0	0	3
SE	0	2	7	0	0	0	9
SSE	0	0	0	0	0	0	0
S	0	0	0	2	0	0	2
SSW	0	0	0	3	1	0	4
SW	0	1	0	7	4	0	12
WSW	0	0	4	2	4	1	11
W	0	0	3	7	4	0	14
WNW	0	1	7	13	3	3	27
NW	0	0	7	9	1	0	17
NNW	0	0	1	7	2	0	10
Variable	0	0	0	0	0	0	0
Total	0	12	35	53	21	10	131

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: January - March 2003

Stability Class - Neutral - 250Ft-33Ft Delta-T (F)

Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	1	3	6	7	5	28	50
NNE	1	2	18	22	26	9	78
NE	0	4	4	15	20	31	74
ENE	0	2	3	7	7	0	19
E	0	0	4	3	0	0	7
ESE	0	3	1	1	0	0	5
SE	0	5	16	2	0	0	23
SSE	0	3	16	15	0	0	34
S	0	2	8	14	6	0	30
SSW	1	3	14	15	2	0	35
SW	0	2	16	35	22	2	77
WSW	0	7	19	42	19	10	97
W	2	5	23	20	11	1	62
WNW	0	8	20	35	20	11	94
NW	1	3	29	67	21	1	122
NNW	1	4	15	41	20	1	82
Variable	0	0	0	0	0	0	0
Total	7	56	212	341	179	94	889

Hours of calm in this stability class: 0

Hours of missing wind measurements in this stability class: 0

Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: January - March 2003
 Stability Class - Slightly Stable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	1	0	3	3	9	1	17
NNE	0	1	3	6	9	2	21
NE	1	0	3	4	5	1	14
ENE	0	6	2	2	2	0	12
E	0	2	4	2	3	3	14
ESE	0	6	9	4	4	0	23
SE	0	0	9	5	2	0	16
SSE	0	0	7	12	1	4	24
S	0	2	14	14	4	0	34
SSW	1	3	12	14	5	0	35
SW	0	5	29	25	25	5	89
WSW	1	8	20	27	22	1	79
W	0	8	15	47	26	9	105
WNW	0	4	27	61	18	4	114
NW	0	4	31	39	6	2	82
NNW	1	3	14	16	2	0	36
Variable	0	0	0	0	0	0	0
Total	5	52	202	281	143	32	715

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: January - March 2003
 Stability Class - Moderately Stable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	1	3	0	0	0	4
NNE	0	1	0	1	0	0	2
NE	0	1	0	0	0	0	1
ENE	0	0	1	0	0	0	1
E	2	0	1	0	0	0	3
ESE	0	2	1	3	1	0	7
SE	1	0	1	0	0	0	2
SSE	1	1	4	9	5	0	20
S	0	3	7	3	0	0	13
SSW	0	2	8	8	2	0	20
SW	0	2	8	2	1	0	13
WSW	0	2	3	0	0	0	5
W	1	2	5	2	0	0	10
WNW	0	3	2	2	0	0	7
NW	0	2	7	0	0	0	9
NNW	0	1	7	3	0	0	11
Variable	0	0	0	0	0	0	0
Total	5	23	58	33	9	0	128

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 1
 Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: January - March 2003
 Stability Class - Extremely Stable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	5	0	0	0	0	5
NNE	0	2	0	0	0	0	2
NE	3	1	2	0	0	0	6
ENE	2	1	0	0	0	0	3
E	2	1	0	0	2	0	5
ESE	0	0	0	0	2	0	2
SE	0	1	0	3	1	0	5
SSE	0	0	1	1	4	0	6
S	1	1	7	22	1	0	32
SSW	0	1	14	18	2	0	35
SW	1	1	10	3	0	0	15
WSW	0	2	3	1	0	0	6
W	0	2	1	0	0	0	3
WNW	1	0	0	1	0	0	2
NW	2	0	0	2	0	0	4
NNW	4	3	1	1	0	0	9
Variable	0	0	0	0	0	0	0
Total	16	21	39	52	12	0	140

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: April - June 2003
 Stability Class - Extremely Unstable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	14	25	2	0	41
NNE	0	9	37	18	0	0	64
NE	0	4	7	1	0	0	12
ENE	0	1	1	5	0	0	7
E	0	1	1	0	0	0	2
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	3	0	0	3
SW	0	0	3	5	0	0	8
WSW	0	0	5	2	0	0	7
W	0	0	2	2	0	0	4
WNW	0	0	9	0	0	0	9
NW	0	1	6	0	0	0	7
NNW	0	0	3	2	0	0	5
Variable	0	0	0	0	0	0	0
Total	0	16	88	63	2	0	169

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: April - June 2003

Stability Class - Moderately Unstable - 250Ft-33Ft Delta-T (F)
Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	8	6	0	0	14
NNE	0	5	16	0	0	0	21
NE	0	7	0	1	0	0	8
ENE	0	1	0	0	0	0	1
E	0	0	1	0	0	0	1
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	1	2	0	0	3
WSW	0	0	0	1	0	0	1
W	0	2	1	2	0	0	5
WNW	0	0	2	2	0	0	4
NW	0	0	2	1	0	0	3
NNW	0	0	1	0	0	0	1
Variable	0	0	0	0	0	0	0
Total	0	15	32	15	0	0	62

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: April - June 2003
 Stability Class - Slightly Unstable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	3	21	6	1	0	31
NNE	0	12	10	2	0	0	24
NE	0	8	0	0	0	0	8
ENE	0	1	0	0	0	0	1
E	0	2	0	1	0	0	3
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	1	0	0	0	1
S	0	0	0	0	0	0	0
SSW	0	0	0	3	0	0	3
SW	0	0	1	1	2	0	4
WSW	0	1	2	4	0	1	8
W	0	0	2	0	0	0	2
WNW	0	1	4	1	0	0	6
NW	0	0	2	4	0	0	6
NNW	0	0	2	0	0	0	2
Variable	0	0	0	0	0	0	0
Total	0	28	45	22	3	1	99

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: April - June 2003
 Stability Class - Neutral - 250Ft-33Ft Delta-T (F)
 Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	25	79	34	4	0	142
NNE	4	46	85	10	0	0	145
NE	2	32	14	28	4	0	80
ENE	1	18	1	7	15	0	42
E	0	10	2	1	0	0	13
ESE	0	5	0	0	0	0	5
SE	1	12	2	0	0	0	15
SSE	0	11	6	0	0	0	17
S	0	2	2	0	0	0	4
SSW	0	2	2	4	0	0	8
SW	0	2	12	5	4	0	23
WSW	1	8	21	4	12	0	46
W	2	8	8	3	2	0	23
WNW	1	6	3	7	0	0	17
NW	3	1	12	4	0	0	20
NNW	1	6	16	0	0	0	23
Variable	0	0	0	0	0	0	0
Total	16	194	265	107	41	0	623

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: April - June 2003
 Stability Class - Slightly Stable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	13	81	97	12	0	0	203
NNE	8	66	7	0	0	0	81
NE	8	38	2	0	0	0	48
ENE	0	15	3	0	0	0	18
E	5	6	3	1	0	0	15
ESE	6	22	3	0	1	0	32
SE	8	23	9	0	0	0	40
SSE	6	26	16	0	0	0	48
S	9	18	5	1	0	0	33
SSW	4	8	6	6	0	0	24
SW	3	7	6	11	0	0	27
WSW	3	22	10	2	0	0	37
W	2	22	4	0	0	0	28
WNW	9	9	4	3	0	0	25
NW	4	13	1	0	0	0	18
NNW	7	19	3	0	0	0	29
Variable	0	0	0	0	0	0	0
Total	95	395	179	36	1	0	706

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: April - June 2003
 Stability Class - Moderately Stable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	7	19	0	0	0	0	26
NNE	8	5	0	0	0	0	13
NE	2	5	0	0	0	0	7
ENE	2	8	1	0	0	0	11
E	0	5	2	1	0	0	8
ESE	1	5	2	0	0	0	8
SE	2	10	0	0	0	0	12
SSE	2	17	8	0	0	0	27
S	12	19	9	0	0	0	40
SSW	12	14	2	0	0	0	28
SW	8	5	1	0	0	0	14
WSW	6	10	0	0	0	0	16
W	3	6	0	0	0	0	9
WNW	6	7	0	0	0	0	13
NW	5	13	0	0	0	0	18
NNW	4	15	0	0	0	0	19
Variable	0	0	0	0	0	0	0
Total	80	163	25	1	0	0	269

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: April - June 2003
 Stability Class - Extremely Stable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	2	3	0	0	0	0	5
NNE	2	2	1	0	0	0	5
NE	0	1	2	0	0	0	3
ENE	0	3	4	0	0	0	7
E	2	5	2	0	0	0	9
ESE	1	2	1	1	0	0	5
SE	0	1	1	0	0	0	2
SSE	1	13	9	0	0	0	23
S	11	26	7	0	0	0	44
SSW	16	10	0	0	0	0	26
SW	23	11	0	0	0	0	34
WSW	12	7	0	0	0	0	19
W	6	16	0	0	0	0	22
WNW	4	3	0	0	0	0	7
NW	1	3	0	0	0	0	4
NNW	4	0	0	0	0	0	4
Variable	0	0	0	0	0	0	0
Total	85	106	27	1	0	0	219

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: April - June 2003
 Stability Class - Extremely Unstable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	1	5	21	23	22	72
NNE	0	3	23	3	3	0	32
NE	0	1	10	0	1	0	12
ENE	0	1	1	2	3	0	7
E	0	1	0	0	0	0	1
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	2	0	1	3
SW	0	0	0	3	4	2	9
WSW	0	0	0	3	3	0	6
W	0	0	1	6	3	0	10
WNW	0	0	1	3	0	0	4
NW	0	0	1	6	2	0	9
NNW	0	0	0	1	0	0	1
Variable	0	0	0	0	0	0	0
Total	0	7	42	50	42	25	166

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 11
 Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: April - June 2003
 Stability Class - Moderately Unstable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	1	1	16	7	4	29
NNE	0	1	4	2	0	0	7
NE	0	4	3	0	0	1	8
ENE	0	0	0	0	0	0	0
E	0	0	1	0	0	0	1
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0
SW	0	0	0	2	0	1	3
WSW	0	0	0	0	1	0	1
W	0	0	2	1	0	2	5
WNW	0	0	0	2	0	1	3
NW	0	0	1	2	0	2	5
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	6	12	25	8	11	62

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 2
 Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: April - June 2003
 Stability Class - Slightly Unstable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	9	19	9	5	42
NNE	0	5	11	2	0	0	18
NE	0	0	3	0	0	0	3
ENE	0	0	0	0	0	0	0
E	0	3	0	0	1	0	4
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	1	0	1
S	0	0	0	0	0	0	0
SSW	0	0	0	0	2	2	4
SW	0	0	0	1	1	3	5
WSW	0	1	1	1	3	0	6
W	0	0	0	2	0	0	2
WNW	0	0	2	4	0	1	7
NW	0	0	0	0	4	1	5
NNW	0	0	0	2	0	0	2
Variable	0	0	0	0	0	0	0
Total	0	9	26	31	21	12	99

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 2
 Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: April - June 2003

Stability Class - Neutral - 250Ft-33Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	7	25	68	44	24	168
NNE	2	13	34	39	19	3	110
NE	1	14	8	7	10	17	57
ENE	0	8	3	4	2	14	31
E	0	7	3	2	0	0	12
ESE	0	4	0	0	0	0	4
SE	1	5	9	3	0	0	18
SSE	0	5	8	5	0	0	18
S	0	0	0	0	0	0	0
SSW	0	0	2	4	4	4	14
SW	1	2	1	10	4	6	24
WSW	0	1	7	24	7	11	50
W	0	1	2	5	2	3	13
WNW	0	4	3	5	5	1	18
NW	0	5	1	12	7	3	28
NNW	0	2	7	6	1	0	16
Variable	0	0	0	0	0	0	0
Total	5	78	113	194	105	86	581

Hours of calm in this stability class: 0

Hours of missing wind measurements in this stability class: 49

Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: April - June 2003

Stability Class - Slightly Stable - 250Ft-33Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	2	5	26	79	50	11	173
NNE	0	17	41	33	0	0	91
NE	2	15	21	8	1	0	47
ENE	1	10	9	4	1	1	26
E	1	3	8	1	1	2	16
ESE	0	11	13	3	1	3	31
SE	4	5	37	12	2	0	60
SSE	2	6	19	15	5	1	48
S	1	2	4	4	2	0	13
SSW	1	1	5	9	8	4	28
SW	1	4	6	9	3	10	33
WSW	0	2	10	16	3	1	32
W	0	1	11	13	1	0	26
WNW	2	3	3	6	2	1	17
NW	0	1	1	14	1	2	19
NNW	1	3	8	8	1	0	21
Variable	0	0	0	0	0	0	0
Total	18	89	222	234	82	36	681

Hours of calm in this stability class: 0

Hours of missing wind measurements in this stability class: 28

Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: April - June 2003
 Stability Class - Moderately Stable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	2	16	14	0	0	32
NNE	1	7	10	4	0	0	22
NE	2	4	5	1	0	0	12
ENE	0	1	5	2	1	1	10
E	3	4	4	2	1	2	16
ESE	0	1	3	5	2	2	13
SE	0	2	13	4	0	0	19
SSE	0	5	9	20	5	1	40
S	0	3	14	10	5	0	32
SSW	0	0	7	9	2	0	18
SW	1	2	5	7	0	0	15
WSW	1	1	0	6	0	0	8
W	0	1	3	7	1	0	12
WNW	0	0	3	1	0	0	4
NW	0	0	1	3	1	0	5
NNW	0	2	3	5	0	0	10
Variable	0	0	0	0	0	0	0
Total	8	35	101	100	18	6	268

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 5
 Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: April - June 2003

Stability Class - Extremely Stable - 250Ft-33Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	1	2	5	2	0	0	10
NNE	2	3	1	1	0	0	7
NE	1	2	0	1	0	0	4
ENE	0	3	1	1	3	1	9
E	1	0	0	1	0	1	3
ESE	0	3	0	1	1	3	8
SE	0	3	3	0	0	0	6
SSE	0	8	8	7	4	1	28
S	0	2	24	30	7	2	65
SSW	2	1	13	20	2	0	38
SW	0	1	7	8	1	0	17
WSW	0	2	4	2	1	0	9
W	0	1	2	4	1	0	8
WNW	1	0	1	2	0	0	4
NW	1	0	2	1	0	0	4
NNW	0	5	2	0	0	0	7
Variable	0	0	0	0	0	0	0
Total	9	36	73	81	20	8	227

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 1
Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: October - December 2003

Stability Class - Extremely Unstable - 250Ft-33Ft Delta-T (F)
Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	0	0	0	0	0
NNE	0	0	10	0	0	0	10
NE	0	0	6	0	0	0	6
ENE	0	1	1	0	0	0	2
E	0	3	0	0	0	0	3
ESE	0	3	0	0	0	0	3
SE	0	6	0	0	0	0	6
SSE	0	2	0	0	0	0	2
S	0	0	2	0	0	0	2
SSW	0	0	0	0	0	0	0
SW	0	0	1	3	0	0	4
WSW	0	0	7	1	0	0	8
W	0	0	8	1	0	0	9
WNW	0	1	4	1	0	0	6
NW	0	2	6	1	0	0	9
NNW	0	1	1	0	0	0	2
Variable	0	0	0	0	0	0	0
Total	0	19	46	7	0	0	72

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 0
Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: October - December 2003
 Stability Class - Moderately Unstable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	0	0	0	0	0
NNE	0	0	4	2	0	0	6
NE	0	0	0	0	0	0	0
ENE	0	2	0	0	0	0	2
E	0	1	0	0	0	0	1
ESE	0	2	0	0	0	0	2
SE	0	0	0	0	0	0	0
SSE	0	0	2	0	0	0	2
S	0	0	0	0	0	0	0
SSW	0	0	1	0	0	0	1
SW	0	0	3	0	0	0	3
WSW	0	1	6	2	0	0	9
W	0	1	4	2	0	0	7
WNW	0	2	6	3	0	0	11
NW	0	2	4	0	0	0	6
NNW	0	0	1	1	0	0	2
Variable	0	0	0	0	0	0	0
Total	0	11	31	10	0	0	52

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: October - December 2003
 Stability Class - Slightly Unstable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	1	2	0	0	0	3
NNE	0	2	4	0	0	0	6
NE	0	2	0	0	0	0	2
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	2	1	0	0	0	3
SE	0	3	0	1	0	0	4
SSE	0	0	4	0	0	0	4
S	0	1	1	0	0	0	2
SSW	0	2	0	3	0	0	5
SW	0	0	3	2	0	0	5
WSW	0	1	6	0	0	0	7
W	0	3	6	7	0	0	16
WNW	0	2	9	4	0	0	15
NW	0	1	3	2	0	0	6
NNW	0	2	4	0	0	0	6
Variable	0	0	0	0	0	0	0
Total	0	22	43	19	0	0	84

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: October - December 2003
 Stability Class - Neutral - 250Ft-33Ft Delta-T (F)
 Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	3	13	7	4	1	0	28
NNE	2	19	18	7	0	0	46
NE	2	13	7	7	0	0	29
ENE	0	11	4	24	0	0	39
E	1	13	24	6	0	0	44
ESE	2	14	26	11	0	0	53
SE	2	2	10	3	0	0	17
SSE	2	11	29	33	3	1	79
S	2	15	14	3	0	0	34
SSW	3	18	35	18	0	0	74
SW	1	14	32	40	1	0	88
WSW	1	24	44	19	0	0	88
W	2	32	36	22	5	0	97
WNW	2	31	39	15	3	0	90
NW	0	12	57	9	0	0	78
NNW	1	18	12	7	0	0	38
Variable	0	0	0	0	0	0	0
Total	26	260	394	228	13	1	922

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: October - December 2003
 Stability Class - Slightly Stable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	3	4	7	2	0	0	16
NNE	3	5	6	0	0	0	14
NE	4	8	2	0	0	0	14
ENE	1	7	2	0	0	0	10
E	2	4	4	0	0	0	10
ESE	5	1	2	0	0	0	8
SE	2	6	5	0	0	0	13
SSE	0	17	15	11	3	2	48
S	5	30	35	4	0	0	74
SSW	6	14	25	17	0	0	62
SW	7	21	20	5	0	0	53
WSW	6	22	19	8	0	0	55
W	9	50	16	3	0	0	78
WNW	11	39	25	13	2	0	90
NW	5	28	14	1	0	0	48
NNW	3	18	12	0	0	0	33
Variable	0	0	0	0	0	0	0
Total	72	274	209	64	5	2	626

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: October - December 2003
 Stability Class - Moderately Stable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	3	0	0	0	0	0	3
NNE	2	5	0	0	0	0	7
NE	4	1	0	0	0	0	5
ENE	0	1	0	0	0	0	1
E	0	1	0	0	0	0	1
ESE	0	1	0	0	0	0	1
SE	0	1	0	0	0	0	1
SSE	2	1	3	1	2	0	9
S	2	28	4	1	0	0	35
SSW	5	26	1	0	0	0	32
SW	6	11	0	0	0	0	17
WSW	6	14	2	0	0	0	22
W	5	21	6	0	0	0	32
WNW	3	13	0	0	0	0	16
NW	2	23	0	0	0	0	25
NNW	2	5	0	0	0	0	7
Variable	0	0	0	0	0	0	0
Total	42	152	16	2	2	0	214

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: October - December 2003
 Stability Class - Extremely Stable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 35 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	1	0	0	0	0	0	1
NNE	2	0	0	0	0	0	2
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	1	0	0	0	0	0	1
SE	0	0	0	0	0	0	0
SSE	0	2	2	0	0	0	4
S	3	6	3	0	0	0	12
SSW	14	6	0	0	0	0	20
SW	3	3	0	0	0	0	6
WSW	6	12	0	0	0	0	18
W	16	17	0	0	0	0	33
WNW	4	15	0	0	0	0	19
NW	4	2	0	0	0	0	6
NNW	4	1	0	0	0	0	5
Variable	0	0	0	0	0	0	0
Total	58	64	5	0	0	0	127

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 0
 Hours of missing stability measurements in all stability classes: 0

Zion Nuclear Station

Period of Record: October - December 2003

Stability Class - Extremely Unstable - 250Ft-33Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	4	2	0	0	6
NNE	0	0	8	2	1	0	11
NE	0	1	0	0	0	0	1
ENE	0	0	1	0	0	0	1
E	0	0	2	0	0	0	2
ESE	0	0	3	0	0	0	3
SE	0	1	7	0	0	0	8
SSE	0	0	0	0	0	0	0
S	0	0	1	1	0	0	2
SSW	0	0	0	0	0	0	0
SW	0	0	0	7	4	0	11
WSW	0	0	1	5	3	0	9
W	0	0	2	3	2	0	7
WNW	0	0	2	5	1	0	8
NW	0	1	1	1	0	0	3
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	3	32	26	11	0	72

Hours of calm in this stability class: 0

Hours of missing wind measurements in this stability class: 0

Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: October - December 2003

Stability Class - Moderately Unstable - 250Ft-33Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	1	1	0	0	2
NNE	0	0	0	2	0	1	3
NE	0	2	0	0	0	0	2
ENE	0	0	0	0	0	0	0
E	0	0	2	0	0	0	2
ESE	0	0	0	0	0	0	0
SE	0	1	0	0	0	0	1
SSE	0	0	0	1	0	0	1
S	0	0	0	1	0	0	1
SSW	0	0	1	0	0	0	1
SW	0	0	3	5	2	1	11
WSW	0	0	2	2	1	0	5
W	0	0	2	8	1	1	12
WNW	0	0	3	7	0	2	12
NW	0	0	0	1	2	0	3
NNW	0	0	0	0	0	0	0
Variable	0	0	0	0	0	0	0
Total	0	3	14	28	6	5	56

Hours of calm in this stability class: 0

Hours of missing wind measurements in this stability class: 1

Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: October - December 2003

Stability Class - Slightly Unstable - 250Ft-33Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	0	2	3	0	0	5
NNE	0	1	1	1	0	0	3
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	1	0	0	0	1
SE	0	2	1	1	2	0	6
SSE	0	1	1	1	0	0	3
S	0	0	1	1	0	0	2
SSW	0	1	2	0	1	1	5
SW	0	0	2	3	3	0	8
WSW	0	0	8	2	3	3	16
W	0	1	1	9	2	2	15
WNW	0	0	2	5	2	1	10
NW	0	1	3	3	2	0	9
NNW	0	1	1	2	0	0	4
Variable	0	0	0	0	0	0	0
Total	0	8	26	31	15	7	87

Hours of calm in this stability class: 0

Hours of missing wind measurements in this stability class: 0

Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: October - December 2003

Stability Class - Neutral - 250Ft-33Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	14	10	19	3	1	47
NNE	1	4	4	1	13	2	25
NE	1	8	4	3	9	3	28
ENE	1	3	15	9	20	0	48
E	0	0	12	15	5	0	32
ESE	1	4	7	16	6	0	34
SE	0	3	6	18	13	0	40
SSE	0	6	13	24	19	5	67
S	0	1	9	16	7	0	33
SSW	1	8	16	29	22	7	83
SW	1	6	24	44	36	10	121
WSW	0	8	19	43	36	15	121
W	0	8	29	42	19	5	103
WNW	1	4	24	53	21	8	111
NW	1	6	17	32	13	1	70
NNW	0	5	9	4	2	0	20
Variable	0	0	0	0	0	0	0
Total	8	88	218	368	244	57	983

Hours of calm in this stability class: 0
Hours of missing wind measurements in this stability class: 6
Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: October - December 2003

Stability Class - Slightly Stable - 250Ft-33Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	2	4	1	4	7	0	18
NNE	0	5	2	2	1	0	10
NE	1	6	4	2	0	0	13
ENE	0	4	2	2	0	0	8
E	0	3	4	2	5	0	14
ESE	0	5	5	2	3	0	15
SE	0	3	4	10	4	0	21
SSE	1	1	10	20	15	12	59
S	0	7	10	19	18	6	60
SSW	2	8	9	25	20	3	67
SW	1	2	24	30	16	2	75
WSW	0	2	14	32	18	4	70
W	0	1	17	43	15	2	78
WNW	0	8	7	32	7	9	63
NW	1	1	7	38	1	0	48
NNW	1	1	5	18	2	0	27
Variable	0	0	0	0	0	0	0
Total	9	61	125	281	132	38	646

Hours of calm in this stability class: 0

Hours of missing wind measurements in this stability class: 2

Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: October - December 2003
 Stability Class - Moderately Stable - 250Ft-33Ft Delta-T (F)
 Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	1	2	5	0	0	8
NNE	0	2	2	0	0	0	4
NE	0	1	6	1	0	0	8
ENE	0	1	4	2	0	0	7
E	0	0	2	0	0	0	2
ESE	0	1	2	1	0	0	4
SE	0	1	0	0	0	0	1
SSE	0	1	3	12	5	3	24
S	0	1	3	17	5	1	27
SSW	0	1	3	20	1	0	25
SW	0	1	4	8	4	0	17
WSW	0	1	10	13	7	0	31
W	0	0	3	12	1	0	16
WNW	0	1	2	9	0	0	12
NW	0	1	2	14	2	0	19
NNW	0	2	5	1	0	0	8
Variable	0	0	0	0	0	0	0
Total	0	16	53	115	25	4	213

Hours of calm in this stability class: 0
 Hours of missing wind measurements in this stability class: 4
 Hours of missing stability measurements in all stability classes: 2

Zion Nuclear Station

Period of Record: October - December 2003

Stability Class - Extremely Stable - 250Ft-33Ft Delta-T (F)
Winds Measured at 250 Feet

Wind Direction	Wind Speed (in mph)						Total
	1-3	4-7	8-12	13-18	19-24	> 24	
N	0	3	2	0	0	0	5
NNE	0	1	1	0	0	0	2
NE	0	0	3	0	0	0	3
ENE	0	1	2	1	0	0	4
E	0	0	2	0	0	0	2
ESE	0	2	2	0	0	0	4
SE	0	1	3	1	0	0	5
SSE	0	1	1	6	0	0	8
S	2	8	5	5	4	0	24
SSW	2	3	2	4	0	0	11
SW	0	1	4	6	4	0	15
WSW	1	1	5	7	1	0	15
W	1	2	1	9	3	0	16
WNW	1	1	2	1	0	0	5
NW	0	2	0	4	1	0	7
NNW	2	3	2	0	0	0	7
Variable	0	0	0	0	0	0	0
Total	9	30	37	44	13	0	133

Hours of calm in this stability class: 0

Hours of missing wind measurements in this stability class: 3

Hours of missing stability measurements in all stability classes: 2

January-March, 2003
250Ft-33Ft Delta-T (F)

SPEED		WIND DIRECTION CLASSES															STABILITY CLASSES								
CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNN	NW	NNW	TOTAL	EU	MU	SU	N	SS	MS	ES	TOTAL
	EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
	MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
C	SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00				
A	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00				
L	SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00			
M	MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00		
	ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00	
																									0.00
	EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
	MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					
1	SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00			
-	N	0.09	0.09	0.09	0.00	0.00	0.09	0.00	0.09	0.05	0.05	0.05	0.05	0.37	0.09	0.05	1.16				1.16				
3	SS	0.05	0.05	0.05	0.00	0.14	0.28	0.14	0.05	0.14	0.19	0.33	0.61	0.23	0.56	0.37	0.14	3.31				3.31			
	MS	0.00	0.05	0.00	0.05	0.05	0.00	0.00	0.09	0.09	0.28	0.51	0.33	0.33	0.00	0.09	1.86					1.86			
	ES	0.09	0.00	0.00	0.05	0.05	0.00	0.19	0.28	0.19	0.14	0.19	0.09	0.05	0.00	0.00	1.30						1.30		
																									7.64
	EU	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.05	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.19	0.19							
	MU	0.00	0.05	0.00	0.05	0.09	0.00	0.05	0.00	0.00	0.00	0.05	0.00	0.05	0.00	0.00	0.33		0.33						
4	SU	0.00	0.19	0.00	0.09	0.19	0.09	0.14	0.05	0.00	0.00	0.05	0.09	0.05	0.19	0.14	0.05	1.30			1.30				
-	N	0.37	1.03	0.19	0.23	0.42	0.28																		

January-March, 2003
250Ft-33Ft Delta-T (F)

SPEED	WIND DIRECTION CLASSES																STABILITY CLASSES								
CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	EU	MJ	SU	N	SS	MS	ES	TOTAL
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
1 MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
9 SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00				
- N	0.47	0.00	0.47	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	1.16				1.16				
2 SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00	
																									1.16
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
G MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					
T SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00				
N	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09				0.09				
2 SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00	
																									0.09
TOT	4.38	5.36	4.66	1.77	1.77	1.96	2.24	5.17	6.15	4.52	9.41	10.62	11.46	13.19	11.56	5.78	100.00	3.77	3.36	6.10	41.38	32.90	5.96	6.52	100.00

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-STABILITY CLASSES-
0.19	0.75	0.37	0.00	0.09	0.14	0.19	0.05	0.00	0.14	0.19	0.33	0.65	0.42	0.23	0.05	3.77	Extremely Unstable
0.09	0.09	0.05	0.05	0.09	0.05	0.09	0.19	0.09	0.14	0.23	0.42	0.61	0.51	0.56	0.09	3.36	Moderately Unstable
0.09	0.33	0.33	0.09	0.23	0.19	0.23	0.09	0.05	0.09	0.70	0.47	0.70	1.12	0.93	0.47	6.10	Slightly Unstable
2.52	3.31	3.45	1.03	0.51	0.51	0.47	1.63	1.49	1.63	3.49	4.43	2.84	4.52	5.78	3.77	41.38	Neutral
1.21	0.79	0.37	0.42	0.61	0.98	0.89	1.12	1.72	1.77	4.10	3.63	5.08	5.36	3.59	1.26	32.90	Slightly Stable
0.14	0.09	0.05	0.05	0.09	0.09	0.28	0.61	0.75	0.47	0.51	0.84	0.84	0.70	0.37	0.09	5.96	Moderately Stable
0.14	0.00	0.05	0.14	0.14	0.00	0.09	1.49	2.05	0.28	0.19	0.51	0.75	0.56	0.09	0.05	6.52	Extremely Stable

Wind Direction by Wind Speed

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-WIND SPEED CLASSES-
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	C A L M
0.23	0.19	0.14	0.09	0.23	0.37	0.14	0.23	0.61	0.51	0.79	1.35	0.70	1.30	0.47	0.28	7.64	< 3.5 mph
0.65	1.54	0.37	0.65	0.98	0.98	1.49	2.38	4.05	2.14	2.84	2.94	4.10	4.38	4.80	1.12	35.41	3.6 - 7.5 mph
1.91	2.89	1.03	0.47	0.42	0.56	0.61	2.38	1.44	1.63	3.49	4.66	5.13	6.01	5.68	3.45	41.75	7.6 - 12.5 mph
1.03	0.75	2.66	0.37	0.14	0.05	0.00	0.19	0.05	0.23	2.24	1.68	1.54	1.49	0.61	0.93	13.93	12.6 - 18.5 mph
0.47	0.00	0.47	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	1.16	18.6 - 24.5 mph
0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	> 24.5 mph

January-March, 2003
250Ft-33Ft Delta-T (F)

SPEED		WIND DIRECTION CLASSES															STABILITY CLASSES								
CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NW	TOTAL	EU	MJ	SU	N	SS	MS	ES	TOTAL
	EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
C	SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00				
A	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00			
L	SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00			
M	MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00		
	ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00	
																									0.00
	EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					
1	SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00				
-	N	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.09	0.00	0.05	0.05	0.32				0.32				
3	SS	0.05	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.05	0.00	0.00	0.00	0.05	0.23					0.23			
	MS	0.00	0.00	0.00	0.00	0.09	0.00	0.05	0.05	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.23					0.23			
	ES	0.00	0.00	0.14	0.09	0.09	0.00	0.00	0.05	0.00	0.05	0.00	0.00	0.05	0.09	0.19	0.74						0.74		
																									1.53
	EU	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05							
	MJ	0.00	0.05	0.00	0.09	0.00	0.00	0.05	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.23		0.23						
4	SU	0.00	0.00	0.00	0.14	0.14	0.09	0.09	0.00	0.00	0.05	0.00	0.00	0.05	0.00	0.00	0.56			0.56					
-	N	0.14	0.09	0.19	0.09	0.00	0.14	0.23	0.14	0.09	0.32	0.23	0.37	0.14	0.19	2.60				2.60					
7	SS	0.00	0.05	0.00	0.28	0.09	0.28	0.00	0.09	0.14	0.23														

Zion Nuclear Station
250 ft. Wind Speed and Direction

January-March, 2003
250Ft-33Ft Delta-T (F)

SPEED	WIND DIRECTION CLASSES																STABILITY CLASSES								
CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	EU	MU	SU	N	SS	MS	ES	TOTAL
EU	0.19	0.19	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.09	0.09	0.14	0.09	0.05	0.00	1.02	1.02							
1 MU	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.00	0.14	0.09	0.14	0.00	0.09	0.05	0.65		0.65						
9 SU	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.19	0.19	0.19	0.14	0.05	0.09	0.97			0.97					
- N	0.23	1.21	0.93	0.32	0.00	0.00	0.00	0.00	0.28	0.09	1.02	0.88	0.51	0.93	0.97	0.93	8.30				8.30				
2 SS	0.42	0.42	0.23	0.09	0.14	0.19	0.09	0.05	0.19	0.23	1.16	1.02	1.21	0.83	0.28	0.09	6.63					6.63			
4 MS	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.23	0.00	0.09	0.05	0.00	0.00	0.00	0.00	0.00	0.42					0.42			
ES	0.00	0.00	0.00	0.00	0.09	0.09	0.05	0.19	0.05	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.56						0.56		
																									18.54
EU	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.05	0.00	0.00	0.00	0.14	0.14							
G MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.05	0.00	0.00	0.14		0.14						
T SU	0.00	0.00	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.14	0.00	0.00	0.46			0.46					
N	1.30	0.42	1.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.46	0.05	0.51	0.05	0.05	4.36				4.36				
2 SS	0.05	0.09	0.05	0.00	0.14	0.00	0.00	0.19	0.00	0.00	0.23	0.05	0.42	0.19	0.09	0.00	1.48					1.48			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
																									6.58
TOT	4.03	5.93	4.96	1.85	1.67	1.95	3.06	3.99	5.24	6.31	9.97	9.92	10.29	12.19	11.68	6.95	100.00	3.76	3.38	6.07	41.21	33.15	5.93	6.49	100.00

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-STABILITY CLASSES-
0.32	0.79	0.19	0.00	0.09	0.09	0.28	0.00	0.00	0.19	0.19	0.28	0.70	0.37	0.28	0.00	3.76	Extremely Unstable
0.09	0.09	0.05	0.09	0.05	0.00	0.23	0.09	0.09	0.14	0.23	0.46	0.60	0.51	0.56	0.09	3.38	Moderately Unstable
0.09	0.28	0.32	0.14	0.19	0.14	0.42	0.00	0.09	0.19	0.56	0.51	0.65	1.25	0.79	0.46	6.07	Slightly Unstable
2.32	3.62	3.43	0.88	0.32	0.23	1.07	1.58	1.39	1.62	3.57	4.50	2.87	4.36	5.66	3.80	41.21	Neutral
0.79	0.97	0.65	0.56	0.65	1.07	0.74	1.11	1.58	1.62	4.13	3.66	4.87	5.29	3.80	1.67	33.15	Slightly Stable
0.19	0.09	0.05	0.05	0.14	0.32	0.09	0.93	0.60	0.93	0.60	0.23	0.46	0.32	0.42	0.51	5.93	Moderately Stable
0.23	0.09	0.28	0.14	0.23	0.09	0.23	0.28	1.48	1.62	0.70	0.28	0.14	0.09	0.19	0.42	6.49	Extremely Stable

Wind Direction by Wind Speed

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-WIND SPEED CLASSES-
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	C A L M
0.09	0.05	0.19	0.09	0.19	0.00	0.05	0.05	0.05	0.09	0.05	0.05	0.14	0.05	0.14	0.28	1.53	< 3.5 mph
0.42	0.32	0.28	0.65	0.28	0.65	0.42	0.19	0.37	0.42	0.51	0.93	0.79	0.74	0.42	0.51	7.88	3.6 - 7.5 mph
0.56	1.53	0.46	0.28	0.56	0.60	1.85	1.30	1.67	2.23	2.97	2.41	2.50	2.78	3.62	1.76	27.07	7.6 - 12.5 mph
0.74	1.62	0.93	0.42	0.28	0.37	0.60	1.76	2.60	2.97	3.48	3.57	4.22	5.70	5.93	3.20	38.39	12.6 - 18.5 mph
0.88	1.90	1.30	0.42	0.23	0.32	0.14	0.51	0.56	0.60	2.64	2.27	2.18	1.99	1.44	1.16	18.54	18.6 - 24.5 mph
1.34	0.51	1.81	0.00	0.14	0.00	0.00	0.19	0.00	0.00	0.32	0.70	0.46	0.93	0.14	0.05	6.58	> 24.5 mph

April-June, 2003
250Ft-33Ft Delta-T (F)

SPEED							WIND DIRECTION CLASSES										STABILITY CLASSES											
CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	EU	MU	SU	N	SS	MS	ES	TOTAL			
	EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00										
	MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00									
C	SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00							
A	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00							
L	SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00							
M	MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00						
	ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00		0.00			
																									0.00			
	EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00									
	MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								
1	SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00							
-	N	0.00	0.19	0.09	0.05	0.00	0.00	0.05	0.00	0.00	0.00	0.05	0.09	0.05	0.14	0.05	0.75				0.75							
3	SS	0.61	0.37	0.37	0.00	0.23	0.28	0.37	0.28	0.42	0.19	0.14	0.14	0.09	0.42	0.19	0.33	4.42				4.42						
	MS	0.33	0.37	0.09	0.09	0.00	0.05	0.09	0.09	0.56	0.56	0.37	0.28	0.14	0.28	0.23	0.19	3.73					3.73					
	ES	0.09	0.09	0.00	0.00	0.09	0.05	0.00	0.05	0.51	0.75	1.07	0.56	0.28	0.19	0.05	0.19	3.96						3.96				
																									12.86			
	EU	0.00	0.42	0.19	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.75	0.75										
	MU	0.00	0.23	0.33	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.70	0.70										
4	SU	0.14	0.56	0.37	0.05	0.09	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.05	0.00	0.00	1.30			1.30								
-	N	1.16	2.14	1.49	0.84																							

Zion Nuclear Station
35 ft. Wind Speed and Direction

April-June, 2003
250Ft-33Ft Delta-T (F)

SPEED	WIND DIRECTION CLASSES																STABILITY CLASSES								
CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	EU	MJ	SU	N	SS	MS	ES	TOTAL
EU	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.09							
1 MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
9 SU	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.14			0.14					
- N	0.19	0.00	0.19	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.56	0.09	0.00	0.00	0.00	1.91				1.91				
2 SS	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05					0.05			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	
																									2.19
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
G MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
T SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.05			0.05					
N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
2 SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	
																									0.05
TOT	21.52	16.44	7.73	4.05	2.38	2.33	3.21	5.40	5.64	4.29	5.26	6.24	4.33	3.77	3.54	3.87	100.00	7.87	2.89	4.61	29.02	32.88	12.53	10.20	100.00

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-STABILITY CLASSES-
1.91	2.98	0.56	0.33	0.09	0.00	0.00	0.00	0.00	0.14	0.37	0.33	0.19	0.42	0.33	0.23	7.87	Extremely Unstable
0.65	0.98	0.37	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.14	0.05	0.23	0.19	0.14	0.05	2.89	Moderately Unstable
1.44	1.12	0.37	0.05	0.14	0.00	0.00	0.05	0.00	0.14	0.19	0.37	0.09	0.28	0.28	0.09	4.61	Slightly Unstable
6.61	6.75	3.73	1.96	0.61	0.23	0.70	0.79	0.19	0.37	1.07	2.14	1.07	0.79	0.93	1.07	29.02	Neutral
9.46	3.77	2.24	0.84	0.70	1.49	1.86	2.24	1.54	1.12	1.26	1.72	1.30	1.16	0.84	1.35	32.88	Slightly Stable
1.21	0.61	0.33	0.51	0.37	0.37	0.56	1.26	1.86	1.30	0.65	0.75	0.42	0.61	0.84	0.88	12.53	Moderately Stable
0.23	0.23	0.14	0.33	0.42	0.23	0.09	1.07	2.05	1.21	1.58	0.88	1.02	0.33	0.19	0.19	10.20	Extremely Stable

Wind Direction by Wind Speed

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-WIND SPEED CLASSES-
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	C A L M
1.02	1.02	0.56	0.14	0.33	0.37	0.51	0.42	1.49	1.49	1.58	1.02	0.61	0.93	0.61	0.75	12.86	< 3.5 mph
6.10	6.75	4.42	2.19	1.35	1.58	2.14	3.12	3.03	1.58	1.16	2.24	2.52	1.21	1.44	1.86	42.71	3.6 - 7.5 mph
10.20	7.27	1.16	0.47	0.51	0.28	0.56	1.86	1.07	0.47	1.12	1.77	0.79	1.02	1.07	1.16	30.79	7.6 - 12.5 mph
3.87	1.40	1.40	0.56	0.19	0.05	0.00	0.00	0.05	0.75	1.12	0.61	0.33	0.61	0.42	0.09	11.41	12.6 - 18.5 mph
0.33	0.00	0.19	0.70	0.00	0.05	0.00	0.00	0.00	0.00	0.28	0.56	0.09	0.00	0.00	0.00	2.19	18.6 - 24.5 mph
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.05	> 24.5 mph

April-June, 2003
250Ft-33Ft Delta-T (F)

SPEED							WIND DIRECTION CLASSES										STABILITY CLASSES									
CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	EU	MJ	SU	N	SS	MS	ES	TOTAL	
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								
MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
C SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
A N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
L SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
M MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
																								0.00		
																								0.00		
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
1 SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00				
- N	0.00	0.10	0.05	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.24			0.24					
3 SS	0.10	0.00	0.10	0.05	0.05	0.00	0.19	0.10	0.05	0.05	0.05	0.00	0.00	0.10	0.00	0.05	0.86			0.86						
MS	0.00	0.05	0.10	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.00	0.00	0.00	0.00	0.38			0.38						
ES	0.05	0.10	0.05	0.00	0.05	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.05	0.05	0.00	0.43						0.43			
																								1.92		
EU	0.05	0.14	0.05	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.34								
MJ	0.05	0.05	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29		0.29							
4 SU	0.00	0.24	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.43			0.43						
- N	0.34	0.62	0.67	0.38	0.34	0.19	0.24	0.24	0.00	0.00	0.10	0.05	0.05	0.19	0.24	0.10	3.74									

Zion Nuclear Station
250 ft. Wind Speed and Direction

April-June, 2003
250Ft-33Ft Delta-T (F)

SPEED	WIND DIRECTION CLASSES																STABILITY CLASSES								
CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	EU	MU	SU	N	SS	MS	ES	TOTAL
EU	1.10	0.14	0.05	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.14	0.14	0.00	0.10	0.00	2.02	2.02							
1 MU	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.38		0.38						
9 SU	0.43	0.00	0.00	0.00	0.05	0.00	0.00	0.05	0.00	0.10	0.05	0.14	0.00	0.00	0.19	0.00	1.01			1.01					
- N	2.11	0.91	0.48	0.10	0.00	0.00	0.00	0.00	0.00	0.19	0.19	0.34	0.10	0.24	0.34	0.05	5.04				5.04				
2 SS	2.40	0.00	0.05	0.05	0.05	0.05	0.10	0.24	0.10	0.38	0.14	0.14	0.05	0.10	0.05	0.05	3.93					3.93			
4 MS	0.00	0.00	0.00	0.05	0.05	0.10	0.00	0.24	0.24	0.10	0.00	0.00	0.05	0.00	0.05	0.00	0.86						0.86		
ES	0.00	0.00	0.00	0.14	0.00	0.05	0.00	0.19	0.34	0.10	0.05	0.05	0.05	0.00	0.00	0.00	0.96							0.96	
																									14.20
EU	1.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.10	0.00	0.00	0.00	0.00	0.00	1.20	1.20							
G MU	0.19	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.10	0.05	0.10	0.00	0.53		0.53						
T SU	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.14	0.00	0.00	0.05	0.05	0.00	0.58			0.58					
N	1.15	0.14	0.82	0.67	0.00	0.00	0.00	0.00	0.00	0.19	0.29	0.53	0.14	0.05	0.14	0.00	4.13				4.13				
2 SS	0.53	0.00	0.00	0.05	0.10	0.14	0.00	0.05	0.00	0.19	0.48	0.05	0.00	0.05	0.10	0.00	1.73					1.73			
4 MS	0.00	0.00	0.00	0.05	0.10	0.10	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29						0.29		
ES	0.00	0.00	0.00	0.05	0.05	0.14	0.00	0.05	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38							0.38	
																									8.83
TOT	25.24	13.77	6.86	3.98	2.54	2.69	4.94	6.48	5.28	5.04	5.09	5.37	3.65	2.74	3.60	2.74	100.00	7.97	2.98	4.75	27.88	32.68	12.86	10.89	100.00

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-STABILITY CLASSES-
3.45	1.54	0.58	0.34	0.05	0.00	0.00	0.00	0.00	0.14	0.43	0.29	0.48	0.19	0.43	0.05	7.97	Extremely Unstable
1.39	0.34	0.38	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.14	0.05	0.24	0.14	0.24	0.00	2.98	Moderately Unstable
2.02	0.86	0.14	0.00	0.19	0.00	0.00	0.05	0.00	0.19	0.24	0.29	0.10	0.34	0.24	0.10	4.75	Slightly Unstable
8.06	5.28	2.74	1.49	0.58	0.19	0.86	0.86	0.00	0.67	1.15	2.40	0.62	0.86	1.34	0.77	27.88	Neutral
8.30	4.37	2.26	1.25	0.77	1.49	2.88	2.30	0.62	1.34	1.58	1.54	1.25	0.82	0.91	1.01	32.68	Slightly Stable
1.54	1.06	0.58	0.48	0.77	0.62	0.91	1.92	1.54	0.86	0.72	0.38	0.58	0.19	0.24	0.48	12.86	Moderately Stable
0.48	0.34	0.19	0.43	0.14	0.38	0.29	1.34	3.12	1.82	0.82	0.43	0.38	0.19	0.19	0.34	10.89	Extremely Stable

Wind Direction by Wind Speed

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-WIND SPEED CLASSES-
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	C A L M
0.14	0.24	0.29	0.05	0.24	0.00	0.24	0.10	0.05	0.14	0.14	0.05	0.00	0.14	0.05	0.05	1.92	< 3.5 mph
0.86	2.35	1.92	1.10	0.86	0.91	0.72	1.15	0.34	0.10	0.43	0.34	0.19	0.34	0.29	0.58	12.48	3.6 - 7.5 mph
4.17	5.95	2.40	0.91	0.77	0.77	2.98	2.11	2.02	1.30	0.91	1.06	1.01	0.62	0.34	0.96	28.26	7.6 - 12.5 mph
10.51	4.03	0.82	0.62	0.29	0.43	0.91	2.26	2.11	2.11	1.92	2.50	1.82	1.10	1.82	1.06	34.31	12.6 - 18.5 mph
6.38	1.06	0.58	0.48	0.14	0.19	0.10	0.72	0.67	0.86	0.62	0.86	0.38	0.34	0.72	0.10	14.20	18.6 - 24.5 mph
3.17	0.14	0.86	0.82	0.24	0.38	0.00	0.14	0.10	0.53	1.06	0.58	0.24	0.19	0.38	0.00	8.83	> 24.5 mph

October-December, 2003
250Ft-33Ft Delta-T (F)

SPEED		WIND DIRECTION CLASSES															STABILITY CLASSES								
CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	EU	MJ	SU	N	SS	MS	ES	TOTAL
	EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
C	SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00				
A	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00				
L	SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00			
M	MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00		
E	S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00	
																									0.00
																									0.00
	EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
1	SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00				
-	N	0.14	0.10	0.10	0.00	0.05	0.10	0.10	0.10	0.14	0.05	0.05	0.10	0.10	0.00	0.05	1.24				1.24				
3	SS	0.14	0.14	0.19	0.05	0.10	0.24	0.10	0.00	0.24	0.29	0.33	0.29	0.43	0.52	0.24	0.14	3.43				3.43			
	MS	0.14	0.10	0.19	0.00	0.00	0.00	0.10	0.10	0.24	0.29	0.29	0.24	0.14	0.10	0.10	2.00					2.00			
	ES	0.05	0.10	0.00	0.00	0.00	0.05	0.00	0.00	0.14	0.67	0.14	0.29	0.76	0.19	0.19	2.77						2.77		
																									9.44
	EU	0.00	0.00	0.00	0.05	0.14	0.14	0.29	0.10	0.00	0.00	0.00	0.00	0.05	0.10	0.05	0.91	0.91							
	MJ	0.00	0.00	0.00	0.10	0.05	0.10	0.00	0.00	0.00	0.00	0.05	0.05	0.10	0.10	0.00	0.52		0.52						
4	SU	0.05	0.10	0.10	0.00	0.00	0.14	0.00	0.05	0.10	0.00	0.05	0.14	0.10	0.05	0.10	1.05			1.05					
-	N	0.62	0.91	0.62	0.52	0.62	0.67	0.10	0.52	0.72	0.86	0.67	1.14	1.53	1.48	0.57	0.86	12.40				1			

October-December, 2003
250Ft-33Ft Delta-T (F)

SPEED		WIND DIRECTION CLASSES																STABILITY CLASSES								
CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	EU	MU	SU	N	SS	MS	ES	TOTAL	
	EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								
1	MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
9	SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00					
-	N	0.05	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.05	0.00	0.24	0.14	0.00	0.00	0.62				0.62					
2	SS	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.24					0.24				
4	MS	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10						0.10			
	ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00		
																									0.95	
	EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
G	MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						
T	SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00					
	N	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05				0.05					
2	SS	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10					0.10				
4	MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00			
	ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00		
																									0.14	
TOT		2.43	4.34	2.67	2.58	2.81	3.39	1.96	7.06	7.58	9.25	8.39	9.87	12.97	11.78	8.49	4.43	100.00	3.43	2.48	4.01	43.97	29.85	10.21	6.06	100.00

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-STABILITY CLASSES-
0.00	0.48	0.29	0.10	0.14	0.14	0.29	0.10	0.10	0.00	0.19	0.38	0.43	0.29	0.43	0.10	3.43	Extremely Unstable
0.00	0.29	0.00	0.10	0.05	0.10	0.00	0.10	0.00	0.05	0.14	0.43	0.33	0.52	0.29	0.10	2.48	Moderately Unstable
0.14	0.29	0.10	0.00	0.00	0.14	0.19	0.19	0.10	0.24	0.24	0.33	0.76	0.72	0.29	0.29	4.01	Slightly Unstable
1.34	2.19	1.38	1.86	2.10	2.53	0.81	3.77	1.62	3.53	4.20	4.20	4.63	4.29	3.72	1.81	43.97	Neutral
0.76	0.67	0.67	0.48	0.48	0.38	0.62	2.29	3.53	2.96	2.53	2.62	3.72	4.29	2.29	1.57	29.85	Slightly Stable
0.14	0.33	0.24	0.05	0.05	0.05	0.05	0.43	1.67	1.53	0.81	1.05	1.53	0.76	1.19	0.33	10.21	Moderately Stable
0.05	0.10	0.00	0.00	0.00	0.05	0.00	0.19	0.57	0.95	0.29	0.86	1.57	0.91	0.29	0.24	6.06	Extremely Stable

Wind Direction by Wind Speed

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-WIND SPEED CLASSES-
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	C A L M
0.48	0.43	0.48	0.05	0.14	0.38	0.19	0.19	0.57	1.34	0.81	0.91	1.53	0.95	0.52	0.48	9.44	< 3.5 mph
0.86	1.48	1.14	1.05	1.05	1.10	0.86	1.57	3.81	3.15	2.34	3.53	5.91	4.91	3.34	2.15	38.25	3.6 - 7.5 mph
0.76	2.00	0.72	0.33	1.34	1.38	0.72	2.62	2.81	2.96	2.81	4.01	3.62	3.96	4.01	1.43	35.48	7.6 - 12.5 mph
0.29	0.43	0.33	1.14	0.29	0.52	0.19	2.15	0.38	1.81	2.38	1.43	1.67	1.72	0.62	0.38	15.74	12.6 - 18.5 mph
0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.05	0.00	0.24	0.24	0.00	0.00	0.95	18.6 - 24.5 mph
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	> 24.5 mph

October-December, 2003
250Ft-33Ft Delta-T (F)

SPEED							WIND DIRECTION CLASSES										STABILITY CLASSES									
CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	EU	MU	SU	N	SS	MS	ES	TOTAL	
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00							
C SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00						
A N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00					
L SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00				
M MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00			
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00		
																								0.00		
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00							
1 SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00						
- N	0.00	0.05	0.05	0.05	0.00	0.05	0.00	0.00	0.00	0.05	0.05	0.00	0.00	0.05	0.05	0.00	0.37				0.37					
3 SS	0.09	0.00	0.05	0.00	0.00	0.00	0.00	0.05	0.00	0.09	0.05	0.00	0.00	0.00	0.05	0.05	0.41					0.41				
MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00			
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.09	0.00	0.05	0.05	0.05	0.00	0.09	0.41							0.41		
																								1.19		
EU	0.00	0.00	0.05	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.14	0.14								

Zion Nuclear Station
250 ft. Wind Speed and Direction

October-December, 2003
250ft-33ft Delta-T (F)

SPEED	WIND DIRECTION CLASSES																STABILITY CLASSES								
CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	EU	MU	SU	N	SS	MS	ES	TOTAL
EU	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.14	0.09	0.05	0.00	0.00	0.50	0.50							
1 MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.05	0.05	0.00	0.09	0.00	0.27	0.27							
9 SU	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00	0.05	0.14	0.14	0.09	0.09	0.09	0.00	0.68		0.68						
- N	0.14	0.59	0.41	0.91	0.23	0.27	0.59	0.87	0.32	1.00	1.64	1.64	0.87	0.96	0.59	0.09	11.14			11.14					
2 SS	0.32	0.05	0.00	0.00	0.23	0.14	0.18	0.68	0.82	0.91	0.73	0.82	0.68	0.32	0.05	0.09	6.03			6.03					
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.23	0.05	0.18	0.32	0.05	0.00	0.09	0.00	1.14					1.14			
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.18	0.05	0.14	0.00	0.05	0.00	0.59						0.59		
																								20.37	
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
G MU	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.05	0.09	0.00	0.00	0.23	0.23							
T SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.14	0.09	0.05	0.00	0.00	0.32		0.32						
N	0.05	0.09	0.14	0.00	0.00	0.00	0.00	0.23	0.00	0.32	0.46	0.68	0.23	0.37	0.05	0.00	2.60			2.60					
2 SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55	0.27	0.14	0.09	0.18	0.09	0.41	0.00	0.00	1.74			1.74					
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18					0.18			
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
																								5.07	
TOT	4.16	2.65	2.51	3.11	2.47	2.79	3.74	7.40	6.80	8.77	11.78	12.19	11.28	10.09	7.26	3.01	100.00	3.29	2.56	3.97	44.89	29.50	9.73	6.07	100.00

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-STABILITY CLASSES-
0.27	0.50	0.05	0.05	0.09	0.14	0.37	0.00	0.09	0.00	0.50	0.41	0.32	0.37	0.14	0.00	3.29	Extremely Unstable
0.09	0.14	0.09	0.00	0.09	0.00	0.05	0.05	0.05	0.05	0.50	0.23	0.55	0.55	0.14	0.00	2.56	Moderately Unstable
0.23	0.14	0.00	0.00	0.00	0.05	0.27	0.14	0.09	0.23	0.37	0.73	0.68	0.46	0.41	0.18	3.97	Slightly Unstable
2.15	1.14	1.28	2.19	1.46	1.55	1.83	3.06	1.51	3.79	5.53	5.53	4.70	5.07	3.20	0.91	44.89	Neutral
0.82	0.46	0.59	0.37	0.64	0.68	0.96	2.69	2.74	3.06	3.42	3.20	3.56	2.88	2.19	1.23	29.50	Slightly Stable
0.37	0.18	0.37	0.32	0.09	0.18	0.05	1.10	1.23	1.14	0.78	1.42	0.73	0.55	0.87	0.37	9.73	Moderately Stable
0.23	0.09	0.14	0.18	0.09	0.18	0.23	0.37	1.10	0.50	0.68	0.68	0.73	0.23	0.32	0.32	6.07	Extremely Stable

Wind Direction by Wind Speed

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-WIND SPEED CLASSES-
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	C A L M
0.09	0.05	0.09	0.05	0.00	0.05	0.00	0.05	0.09	0.23	0.09	0.05	0.05	0.09	0.09	0.14	1.19	< 3.5 mph
1.00	0.59	0.82	0.41	0.14	0.55	0.55	0.46	0.78	0.96	0.46	0.55	0.55	0.64	0.55	0.55	9.54	3.6 - 7.5 mph
1.00	0.82	0.78	1.10	1.10	0.91	0.96	1.28	1.32	1.51	2.79	2.69	2.51	1.92	1.37	1.00	23.06	7.6 - 12.5 mph
1.55	0.37	0.27	0.64	0.78	0.87	1.37	2.92	2.74	3.56	4.70	4.75	5.75	5.11	4.25	1.14	40.78	12.6 - 18.5 mph
0.46	0.68	0.41	0.91	0.46	0.41	0.87	1.78	1.55	2.01	3.15	3.15	1.96	1.42	0.96	0.18	20.37	18.6 - 24.5 mph
0.05	0.14	0.14	0.00	0.00	0.00	0.00	0.91	0.32	0.50	0.59	1.00	0.46	0.91	0.05	0.00	5.07	> 24.5 mph

January-December, 2003
250Ft-33Ft Delta-T (F)

SPEED																		WIND DIRECTION CLASSES																		STABILITY CLASSES							
CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	EU	MU	SU	N	SS	MS	ES	TOTAL																		
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00																									
MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00																								
C SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00																						
A N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00																					
L SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00																				
M MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00																			
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00																			
																									0.00																		
																									0.00																		
EU	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.06	0.06																									
MU	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.02																								
1 SU	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.06	0.06			0.06																						
- N	0.07	0.13	0.12	0.01	0.04	0.12	0.10	0.04	0.07	0.05	0.02	0.05	0.06	0.14	0.12	0.06	1.20	1.20				1.20																					
3 SS	0.31	0.23	0.22	0.01	0.18	0.23	0.18	0.18	0.38	0.30	0.29	0.30	0.23	0.56	0.31	0.22	4.13	4.13					4.13																				
MS	0.18	0.16	0.11	0.06	0.05	0.05	0.04	0.06	0.30	0.60	0.43	0.38	0.44	0.37	0.23	0.16	3.62	3.62						3.62																			
ES	0.06	0.06	0.00	0.01	0.04	0.04	0.00	0.10	0.34	0.70	0.60	0.53	0.60	0.31	0.08	0.11	3.57	3.57							3.57																		
																									12.66																		
EU	0.05	0.36	0.30	0.23	0.25	0.20	0.23	0.14	0.02	0.00	0.04	0.02	0.12	0.13	0.08	0.04	2.22	2.22																									
MU	0.01	0.10	0.11	0.06	0.04	0.10	0.04	0.05	0.01	0.01	0.02	0.02	0.08	0.05	0.04	0.00	0.73	0.73																									
4 SU	0.07	0.23	0.16	0.06	0.11	0.12	0.13	0.07	0.05	0.04	0.05	0.05	0.08	0.11	0.06	0.05	1.43	1.43			1.43																						
- N	0.65	1.24	0.65	0.44	0.47	0.40	0.55	0.79	0.6																																		

Zion Nuclear Station
35 ft. Wind Speed and Direction

January-December, 2003
250Ft-33Ft Delta-T (F)

SPEED	WIND DIRECTION CLASSES																STABILITY CLASSES								
CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	EU	MU	SU	N	SS	MS	ES	TOTAL
EU	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02							
1 MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
9 SU	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.04			0.04					
N	0.18	0.00	0.17	0.23	0.00	0.00	0.00	0.04	0.00	0.00	0.07	0.14	0.08	0.04	0.00	0.00	0.95				0.95				
2 SS	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.07					0.07			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02						0.02		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	
																									1.10
EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
G MU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00						
T SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01			0.01					
N	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04				0.04				
2 SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02					0.02			
4 MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
ES	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							0.00	
																									0.07
TOT	8.73	7.89	4.85	2.82	2.38	3.05	3.33	6.38	6.94	6.53	7.98	8.34	9.93	9.36	7.37	4.12	100.00	7.42	3.07	4.86	34.39	31.23	10.97	8.06	100.00

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-STABILITY CLASSES-
0.77	1.71	0.61	0.34	0.30	0.28	0.41	0.25	0.07	0.11	0.46	0.43	0.61	0.58	0.35	0.16	7.42	Extremely Unstable
0.22	0.38	0.14	0.07	0.05	0.11	0.07	0.18	0.04	0.10	0.19	0.32	0.43	0.40	0.29	0.08	3.07	Moderately Unstable
0.52	0.47	0.25	0.07	0.13	0.16	0.18	0.25	0.08	0.14	0.44	0.34	0.53	0.62	0.44	0.23	4.86	Slightly Unstable
3.19	3.41	2.49	1.44	0.92	1.07	0.90	2.22	1.14	1.56	2.64	2.94	2.61	2.86	3.16	1.83	34.39	Neutral
3.42	1.54	1.09	0.60	0.66	1.03	1.38	2.01	2.51	2.08	2.47	2.49	3.31	3.28	2.09	1.26	31.23	Slightly Stable
0.50	0.29	0.22	0.18	0.17	0.24	0.30	0.71	1.71	1.56	0.95	0.91	1.20	0.77	0.84	0.42	10.97	Moderately Stable
0.11	0.10	0.05	0.12	0.14	0.17	0.08	0.76	1.39	0.98	0.82	0.90	1.24	0.85	0.20	0.14	8.06	Extremely Stable

Wind Direction by Wind Speed

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-WIND SPEED CLASSES-
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	C A L M
0.62	0.58	0.46	0.12	0.31	0.44	0.31	0.37	1.09	1.66	1.36	1.26	1.35	1.41	0.74	0.58	12.66	< 3.5 mph
2.49	3.09	2.02	1.39	1.33	1.67	2.08	2.67	4.22	2.57	2.34	2.81	4.40	3.51	3.03	1.51	41.11	3.6 - 7.5 mph
4.04	3.57	1.08	0.54	0.58	0.77	0.88	2.59	1.51	1.60	2.56	3.15	3.19	3.37	3.16	1.67	34.25	7.6 - 12.5 mph
1.35	0.66	1.13	0.54	0.16	0.16	0.06	0.61	0.12	0.71	1.62	0.96	0.91	1.01	0.44	0.36	10.80	12.6 - 18.5 mph
0.22	0.00	0.17	0.23	0.00	0.01	0.00	0.10	0.00	0.00	0.10	0.14	0.08	0.06	0.00	0.00	1.10	18.6 - 24.5 mph
0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.07	> 24.5 mph

January-December, 2003
250Ft-33Ft Delta-T (F)

SPEED		WIND DIRECTION CLASSES															STABILITY CLASSES									
CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	EU	MJ	SU	N	SS	MS	ES	TOTAL	
	EU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00								
	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00							
C	SU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
A	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			0.00					
L	SS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00				0.00				
M	MS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00					0.00			
E	S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00						0.00		
																									0.00	
	EU	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.02								
	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01		0.01							
1	SU	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01	0.00	0.06			0.06						
-	N	0.02	0.05	0.05	0.04	0.00	0.01	0.06	0.01	0.00	0.04	0.02	0.00	0.02	0.01	0.04	0.01	0.38			0.38					
3	SS	0.06	0.00	0.07	0.01	0.01	0.06	0.07	0.02	0.06	0.06	0.01	0.00	0.02	0.02	0.05	0.54				0.54					
	MS	0.00	0.02	0.02	0.00	0.07	0.02	0.01	0.02	0.01	0.00	0.02	0.01	0.01	0.01	0.00	0.25					0.25				
	ES	0.01	0.04	0.05	0.02	0.04	0.00	0.01	0.06	0.06	0.01	0.01	0.02	0.05	0.05	0.10	0.52						0.52			
																									1.79	
	EU	0.02	0.07	0.08	0.06	0.12	0.06	0.06	0.04	0.01	0.00	0.02	0.02	0.05	0.01	0.02	0.01	0.67	0.67							
	MJ	0.01	0.05	0.10	0.02	0.00	0.05	0.04	0.00	0.01	0.00	0.00	0.02	0.00	0.00	0.01	0.31		0.31							
4	SU	0.01	0.08	0.05	0.04	0.08	0.05	0.05	0.04	0.00	0.02	0.01	0.01	0.02	0.05	0.01	0.01	0.54			0.54					
-	N	0.30	0.30	0.32	0.15	0.11	0.14	0.30	0.26</																	

Zion Nuclear Station
250 ft. Wind Speed and Direction

January-December, 2003
250ft-33ft Delta-T (F)

SPEED		WIND DIRECTION CLASSES																STABILITY CLASSES								
CLASS	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	EU	MU	SU	N	SS	MS	ES	TOTAL	
	EU	0.38	0.10	0.05	0.04	0.00	0.00	0.00	0.01	0.02	0.18	0.12	0.13	0.11	0.04	0.00	1.17	1.17								
1	MU	0.08	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.07	0.06	0.06	0.00	0.05	0.01	0.39	0.39								
9	SU	0.13	0.01	0.00	0.00	0.01	0.00	0.04	0.02	0.00	0.05	0.12	0.13	0.07	0.07	0.08	0.76		0.76							
-	N	0.82	0.69	0.57	0.39	0.06	0.08	0.17	0.31	0.18	0.38	0.87	0.75	0.43	0.65	0.50	7.13			7.13						
2	SS	0.88	0.13	0.10	0.04	0.12	0.14	0.19	0.36	0.30	0.39	0.69	0.61	0.55	0.35	0.11	5.01				5.01					
4	MS	0.00	0.00	0.00	0.01	0.01	0.06	0.01	0.32	0.17	0.06	0.15	0.10	0.02	0.00	0.04	0.95					0.95				
	ES	0.00	0.00	0.00	0.04	0.04	0.07	0.02	0.12	0.15	0.05	0.06	0.02	0.05	0.00	0.01	0.63						0.63		16.04	
	EU	0.26	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.01	0.00	0.01	0.00	0.00	0.33	0.33								
G	MU	0.05	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.04	0.05	0.02	0.00	0.23	0.23								
T	SU	0.06	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.05	0.02	0.06	0.01	0.00	0.35		0.35							
	N	0.63	0.17	0.61	0.17	0.00	0.00	0.00	0.06	0.00	0.14	0.21	0.43	0.11	0.26	0.06	2.86			2.86						
2	SS	0.14	0.02	0.01	0.01	0.06	0.07	0.04	0.20	0.07	0.08	0.20	0.08	0.13	0.17	0.05	1.34				1.34					
4	MS	0.00	0.00	0.00	0.01	0.02	0.02	0.04	0.06	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.17					0.17				
	ES	0.00	0.00	0.00	0.01	0.01	0.04	0.02	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.12						0.12		5.39	
TOT		10.19	6.87	4.50	2.96	2.37	2.96	4.94	7.07	6.12	6.70	9.68	8.97	8.40	7.81	6.53	3.94	100.00	7.33	3.12	4.86	34.32	31.14	10.98	8.25	100.00

Wind Direction by Stability

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-STABILITY CLASSES-
1.58	1.12	0.45	0.30	0.25	0.18	0.55	0.18	0.06	0.17	0.60	0.56	0.61	0.45	0.24	0.05	7.33	Extremely Unstable
0.42	0.19	0.15	0.04	0.05	0.06	0.13	0.13	0.06	0.11	0.32	0.31	0.48	0.37	0.26	0.05	3.12	Moderately Unstable
0.68	0.35	0.19	0.05	0.12	0.11	0.27	0.21	0.07	0.18	0.48	0.50	0.43	0.63	0.39	0.20	4.86	Slightly Unstable
3.71	2.78	2.13	1.36	0.69	0.64	1.52	2.07	0.93	1.76	3.09	3.62	2.55	3.18	2.80	1.49	34.32	Neutral
2.86	1.76	1.12	0.79	0.76	1.19	1.73	2.25	1.74	2.12	3.17	2.70	3.11	2.62	2.08	1.17	31.14	Slightly Stable
0.65	0.46	0.29	0.25	0.30	0.48	0.44	1.59	1.49	1.01	1.08	0.82	0.74	0.33	0.51	0.54	10.98	Moderately Stable
0.29	0.20	0.17	0.19	0.20	0.31	0.30	0.63	1.77	1.36	0.94	0.46	0.50	0.23	0.25	0.45	8.25	Extremely Stable

Wind Direction by Wind Speed

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	-WIND SPEED CLASSES-
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	C A L M
0.10	0.11	0.20	0.07	0.12	0.05	0.14	0.12	0.10	0.15	0.14	0.04	0.06	0.10	0.14	0.15	1.79	< 3.5 mph
0.70	1.20	1.01	0.65	0.55	0.77	0.74	0.80	0.51	0.56	0.56	0.62	0.58	0.64	0.43	0.62	10.95	3.6 - 7.5 mph
1.86	2.57	1.14	0.86	0.83	0.99	2.53	2.17	1.84	1.75	2.42	2.12	2.15	1.67	1.64	1.25	27.79	7.6 - 12.5 mph
4.09	1.84	0.71	0.67	0.54	0.67	1.00	2.51	2.74	2.99	3.92	3.82	4.00	3.68	3.36	1.52	38.05	12.6 - 18.5 mph
2.30	0.94	0.71	0.51	0.24	0.36	0.43	1.14	0.82	0.98	2.14	1.79	1.31	1.18	0.82	0.38	16.04	18.6 - 24.5 mph
1.14	0.20	0.71	0.20	0.10	0.13	0.10	0.33	0.11	0.27	0.50	0.60	0.30	0.55	0.14	0.01	5.39	> 24.5 mph

ATTACHMENT 3

Radioactive Effluent Release Report

Summary of Changes to the ODCM

During the calendar year of 2003 there were three changes made to the ODCM. The data processed for 2003 was in accordance with the methodology in this document.

Included in this Annual Report is a copy a ODCM at an end date of 12/31/2003. There were three changes made to the ODCM during the 2003 calendar year and can be tracked by the technical review numbers assigned by the station. The technical review numbers are 1.) TR/006/2003 2.) TR/008/2003 3.) TR/010/2003 and there are copies of the complete technical review attached to this report.

April 18, 2003

TR No: TR/006/2003

To: Art Daniels
Decommissioning Plant Manager

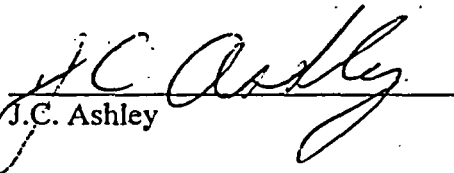
Subject: Qualified Technical Review of Offsite Dose Calculation Manual (ODCM)
Revision

Pursuant to ODCM Section 12.7.3 and Technical Specifications 5.6.1 and 5.9.1, the following provides the basis for the revisions to the ODCM and documentation of the Qualified Technical Review. Section 12.7.3 of the ODCM requires a Qualified Technical Review for revisions to the ODCM.

This review shall be performed by individual(s) with the appropriate ANSI disciplines and approved by the Decommissioning Plant Manager, thereby satisfying the requirements of the Qualified Technical Review.

This change will become effective once Exempt Change 341418, Bypass Lake Discharge Tank and Piping, has been declared operational.

Prepared by:


J.C. Ashley

4-21-03
Date

TR No: TR/006/2003

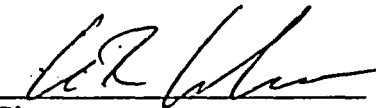
Qualified Technical Review:

Disciplines Required: A, B, D, G


Signature

D & F
Disciplines

4-22-2003
Date


Signature

ABLG
Disciplines

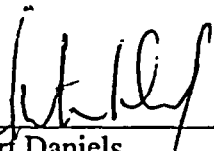
5-6-03
Date

Signature

Disciplines

Date

I concur and approve:


Art Daniels
Decommissioning Plant Manager
Zion Station

6/4/03
Date

Distribution:

Ron Schuster
Ray Landrum
Jim Ashley x
Bob Adams
Mike Petersen (SRC Coordinator) x
Master File

Technical Justification

This ODCM revision is necessary to reflect the installation of Exempt Change No. 341418. This exempt change reroutes liquid effluent from the Boric Acid Monitor Tanks (BAMT) through 0RT-PR05 and 0FCV-WD10 prior to release into the lake discharge canal. The Lake Discharge Tank (LDT) and associated piping have been abandoned due to excessive Microbiologically Induced Corrosion (MIC). The exempt change was subject to the site 10 CFR 50.59 review process.

The function of the liquid waste management system, as discussed in DSAR Section 4.5.2, is to collect, store, process, monitor, and dispose of liquid radioactive waste from the station. The overall purpose is to ensure releases to the lake do not exceed any concentration release limit and liquid releases to the public are ALARA. Control of the liquid waste releases will remain unchanged as a result of this design change. A radiation detector will continue to monitor the effluent prior to release to the lake. Upon detection of abnormal radiation levels by the process radiation detector, a valve closes to isolate the release to the lake and an associated alarm signal is actuated. Additionally, administrative procedural controls equivalent to those currently in place for the Lake Discharge Tanks releases will be in place to ensure proper control of liquid effluent releases to the lake. Minor revisions to the DSAR and the ODCM are necessary to reflect the new system configuration resulting from this design change.

DSAR Section 4.5.2 discusses how liquid waste releases are performed and controlled. Controls are required to ensure all inputs to the tank being released are isolated prior to sampling the tank for release. The tank must be recirculated prior to sampling to ensure uniformity of the sample being analyzed for radio-isotopic profile. The discharge flow path is also isolated using positive control measures when a release is not in progress. Discharge flow rates are controlled to ensure that liquid effluents leaving the plant do not exceed any concentration release limits. Procedure changes are required and will be in place to ensure that these controls are maintained. These procedure changes will account for the altered release configuration which utilizes the BAMT for effluent storage prior to release to the lake. The BAMT essentially will provide the same function previously provided by the abandoned LDTs. These procedural controls will ensure that there is no adverse affect on how liquid waste releases are performed and controlled.

The methodology used to ensure the liquid waste releases do not exceed any concentration release limits is defined in ODCM Chapter 10. The altered system configuration resulting from this design change essentially only changes the storage location for the batch releases being analyzed for discharge to the lake. It does not adversely impact or invalidate the methodology described in the ODCM. Minor revisions to the DSAR and the ODCM are necessary to reflect the new system configuration resulting from this design change.

Radiological control of the liquid effluent using the altered release configuration remains unchanged. Continuous radiation monitoring and automatic isolation of releases remain in place for the liquid being processed. This change will maintain the required level of radioactive effluent control and does not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations.

The following Table summarizes the ODCM changes:

Page/Section	Change Summary
10-iii	Replace LDT reference with BAMT.
10-iv	Delete 10-3. Pump flow capacity chart is no longer required.
10-4/10.2.1.1	Replace LDT reference with BAMT. Change tank capacity from 30,000 gallons to 21,600 gallons to reflect BAMT capacity. Change two LDTs to four BAMTs to reflect the number of BAMTs available.
10-4/10.2.2.1	Replace LDT reference with BAMT. Delete reference to Radiation Monitor ORT-PR04 which has been abandoned in place.
10-5/10.2.3.1	Replace LDT reference with BAMT.
10-6/10.2.3.2.1	Replace LDT reference with BAMT.
10-7/10.2.3.6	Delete Liquid Dilution Flow Rate discussion. It is no longer necessary to determine dilution flow by summing running pumps. Dilution flow is determined by the flow through the CC Hx as identified in ZCP 421-1
10-10/Table 10-3	Delete Table 10-3. Pump flow capacity chart is no longer required. It is no longer necessary to determine dilution flow by summing flows from running pumps. Dilution flow is determined by the flow through the CC Hx as identified in ZCP 421-1.
12-6/Table 12.2-1	Replace LDT references with BAMT. Delete reference to Radiation monitor ORT-PR04 which has been abandoned in place. Delete references to Flow Indicators OF-WD63 and OF-WD67 which have been abandoned in place.
12-7/Table 12.2-1	Replace LDT reference with BAMT.
12-8/Table 12.2-2	Replace LDT reference with BAMT. Delete reference to Radiation Monitor ORT-PR04 which has been abandoned in place. Delete references to Flow Indicators OF-WD63 and OF-WD67 which have been abandoned in place.
12-20/Table 12.3-2	Replace LDT reference with BAMT.
12-54/12.7.4	Change DSAR update frequency from annual to biennial to reflect current DSAR update requirements.

ATTACHMENT C: 50.59 REVIEW COVERSHEET FORM

Station: Zion Station

Activity/Document Number: Misc. document revisions associated with EC No. 341418

Revision Number: 0

Title: Misc document revisions due to EC No. 341418, Bypass Lake Discharge Tank and Associated Piping

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:

(Provide a brief, concise description of what the proposed activity involves.)

Revise site documents to reflect the installation of Exempt Change No. 341418. This exempt change will reroute liquid effluent releases from the Boric Acid Monitor Tanks through 0RT-PR05 and 0FCV-WD10 prior to release into the discharge canal. The Lake Discharge Tank and associated discharge piping will be bypassed and abandoned due continued Microbiologically Induced Corrosion (MIC). Impacted documents are: ODCM Chapters 10 and 12, DSAR Chapter 4, 0R-PR05, ZCP 421-1, PT-26, SOI-3F series, SOI-3 Appendix C, SOI-67E1, SOI 67E2, SOI-67F1, SOI-67F2, Unit 0 ARM (Section 0EL-AN13), and AOP 5.1.

Reason for Activity:

(Discuss why the proposed activity is being performed.)

The Lake Discharge Tank and associated piping has degraded due to MIC. The degradation is extensive and system repairs are not recommended. The document changes are being made to reflect the design change.

Effect of Activity:

(Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.)

Radiological control of the liquid effluent using the altered release configuration remains unchanged. Continuous radiation monitoring and automatic isolation of releases remain in place for the liquid being processed. Minor changes to address the altered configuration will need to be made to the DSAR and the ODCM. Additionally, site procedure changes are required to address the new configuration.

Summary of Conclusion for the Activity's 50.59 Review:

(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.)

A 50.59 screening has been prepared to assess the impact of the design change. It has been concluded that the overall function of the liquid effluent system is not changed by this modification. The document changes are necessary to address the new effluent release configuration.

Attachments:

Attach all 50.59 Review forms completed, as appropriate.

(NOTE: if both a Screening and Evaluation are completed, no Screening No. is required.)

ATTACHMENT C: 50.59 REVIEW COVERSHEET FORM

Station: Zion Station

Activity/Document Number: Misc. document revisions associated with EC No. 341418

Revision Number: 0

Title: Misc document revisions due to EC No. 341418, Bypass Lake Discharge Tank and Associated Piping

Forms Attached: (Check all that apply.)

<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

Applicability Review

50.59 Screening

50.59 Screening No.

2003-0009

Rev. 0

50.59 Evaluation

50.59 Evaluation No.

Rev.

ATTACHMENT E: 50.59 SCREENING FORM

50.59 Screening No. 2003-0009 Rev. No. 0

Activity/Document Number: Misc. document revisions due to EC No. 341418

Revision Number: 0

I. 50.59 Screening Questions (Check correct response and provide separate written response providing the basis for the answer to each question) (See Section 5 of the Resource Manual (RM) for additional guidance):

1. Does the proposed Activity involve a change to an SSC that adversely affects an UFSAR described design function? (See Section 5.2.2.1 of the RM) ☐ YES ☒ NO

The function of the liquid waste management system, as discussed in DSAR Section 4.5.2, is to collect, store, process, monitor, and dispose of liquid radioactive waste from the station. The overall purpose is to ensure releases to the lake do not exceed any concentration release limit (10CFR20 limits) and liquid releases to the public are ALARA. Control of the liquid waste releases will remain unchanged as a result of this modification. A radiation detector will continue to monitor the effluent prior to release to the lake. Upon detection of abnormal radiation levels by the process radiation detector, a valve closes to isolate the release to the lake and an associated alarm signal is actuated. Additionally, administrative procedural controls equivalent to those currently in place for the Lake Discharge Tanks releases will be in place to ensure proper control of liquid effluent releases to the lake. Minor revisions to the DSAR and the ODCM are necessary to reflect the new system configuration resulting from this design change.

2. Does the proposed Activity involve a change to a procedure that adversely affects how UFSAR described SSC design functions are performed or controlled? (See Section 5.2.2.2 of the RM) ☐ YES ☒ NO

DSAR Section 4.5.2 discusses how liquid waste releases are performed and controlled. Controls are required to ensure all inputs to the tank being released are isolated prior to sampling the tank for release. The tank must be recirculated prior to sampling to ensure uniformity of the sample being analyzed for radio-isotopic profile. The discharge flow path is also isolated using positive control measures when a release is not in progress. Discharge flow rates are controlled to ensure that liquid effluents leaving the plant do not exceed any concentration release limits. Procedure changes are required and will be in place to ensure that these controls are maintained. These procedure changes will account for the altered release configuration which utilizes the BAMT for effluent storage prior to release to the lake. The BAMT essentially will provide the same function previously provided by the abandoned LDTs. These procedural controls will ensure that there is no adverse affect on how liquid waste releases are performed and controlled.

3. Does the proposed Activity involve an adverse change to an element of a UFSAR described evaluation methodology, or use of an alternative evaluation methodology, that is used in establishing the design bases or used in the safety analyses? (See Section 5.2.2.3 of the RM) ☐ YES ☒ NO

The methodology used to ensure the liquid waste releases do not exceed any concentration release limits is defined in ODCM Chapter 10. The altered system configuration resulting from this design change essentially only changes the storage location for the batch releases being analyzed for discharge to the lake. It does not adversely impact or invalidate the methodology described in the ODCM. Minor revisions to the DSAR and the ODCM are necessary to reflect the new system configuration resulting from this design change.

50.59 Screening No. 2003-0009 Rev. No. 0

Activity/Document Number: Misc. document revisions due to EC No. 341418

Revision Number: 0

4. Does the proposed Activity involve a test or experiment not described in the UFSAR, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the UFSAR? (See Section 5.2.2.4 of the RM) YES ☐ NO ☒

This activity does not involve a test or experiment not described in the DSAR. It alters the liquid waste management system such that the BAMTs will provide the storage and control function previously performed by the LDTs. The design function of the liquid waste management system is maintained. The system is not being used or controlled in a manner that is outside the design parameters or analyses described in the DSAR and the ODCM. Minor revisions to the DSAR and the ODCM are necessary to reflect the new system configuration resulting from this design change.

5. Does the proposed Activity require a change in the Technical Specifications or Operating License? (See Section 5.2.2.5 of the RM) YES ☐ NO ☒

A review of the operating licenses and the Defueled Technical Specifications has determined that no changes to these documents are necessary as a result of this activity.

II. List the documents (e.g., UFSAR, Technical Specifications, other licensing basis, technical, commitments, etc.) reviewed, including sections numbers where relevant information was found (if not identified in the response to each question).

III. Select the appropriate conditions:

- | | |
|-------------------------------------|---|
| <input checked="" type="checkbox"/> | If <u>all</u> questions are answered NO, then complete the 50.59 Screening and implement the Activity per the applicable governing procedure. |
| <input type="checkbox"/> | If question 1, 2, 3, or 4 is answered YES and question 5 is answered NO, then a 50.59 Evaluation shall be performed. |
| <input type="checkbox"/> | If questions 1, 2, 3, and 4 are answered NO and question 5 is answered YES, then a License Amendment is required prior to implementation of the Activity. |
| <input type="checkbox"/> | If question 5 is answered YES for any portion of an Activity, then a License Amendment is required prior to implementation of that portion of the Activity. In addition, if question 1, 2, 3, or 4 is answered YES for the remaining portions of the Activity, then a 50.59 Evaluation shall be performed for the remaining portions of the Activity. |

IV. Screening Signoffs:

50.59 Screener: J.C. Ashley
(Print name)

Sign: J.C. Ashley
(Signature)

Date: 4/18/03

50.59 Reviewer: VERNON V. VOIGT
(Print name)

Sign: Vernon V. Voigt
(Signature)

Date: 4/18/2003

ZION

Revision 6
June 2003

ZION ANNEX INDEX

CHAPTER 10

REVISION 6

|

CHAPTER 10

RADIOACTIVE EFFLUENT TREATMENT AND MONITORING

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RADIOACTIVE EFFLUENT TREATMENT AND MONITORING

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CHAPTER 10

RADIOACTIVE EFFLUENT TREATMENT AND MONITORING

10.1 AIRBORNE RELEASES

10.1.1 System Description

During operation of the ventilation systems, the principal release points for potentially radioactive airborne effluents are the two auxiliary building ventilation stacks (Unit 1 and Unit 2) and the fuel building roof exhaust. Each is classified as a ground level release.

These ventilation systems maintain acceptable ambient air temperatures for equipment operation and personnel habitability, they provide air flow as needed for contamination control purposes, from lesser contamination potential to areas of greater contamination potential, and they provide bulk exhaust flow for ease of effluent control, sampling, and quantification.

The Aux Bldg (AB) ventilation stacks provide the release points for airborne effluent from the Aux Bldg and the containments. Operation of the AB ventilation system is administratively controlled to ensure that at least one (of 6) exhaust fan is operating when a supply fan is running.

Gaseous effluent flow paths via the ventilation systems are described in the Defueled Safety Analysis Report (DSAR).

10.1.1.1 Ventilation Exhaust Treatment System

Ventilation exhaust treatment systems are designed and installed to reduce radioactive material in particulate form in gaseous effluents by passing ventilation through HEPA and/or pre-filters prior to release to the environment. Such a system is not considered to have any effect on noble gas effluents.

10.1.2 Radiation Monitors

Pertinent information and available diagram(s) are provided in the DSAR.

10.1.2.1 Auxiliary Building Ventilation Stack Effluent Monitors

1RIA-PR49 (Unit 1) and 2RIA-PR49 (Unit 2) continuously monitor the final effluent from the Aux Bldg for beta, particulate and noble gas when the release paths are available.

The monitor outputs data and alarms to the central control console in the control room. The monitor also outputs flow and instrument fail indications.

10.1.2.2 Fuel Building Effluent Air Monitor

The fuel building exhaust monitors, 0RT-PR30A&B, continuously monitor fuel building ventilation exhaust for noble gas and radioactive particulate. The monitors provide specific information on the dispersion and concentration of radioactivity during a radiological event in the fuel building. Local and remote indication are provided.

10.1.2.3 Containment Purge Effluent Monitors

1RIA-PR40 (Unit 1) and 2RIA-PR40 (Unit 2) are designed to supply Operating personnel with information on the beta particulate activity in the respective containment during purging operations. The monitors prevent abnormal or unanticipated effluent release from containment to the public. A high alarm from the monitor automatically initiates containment isolation by closing the pressure and vacuum relief isolation valves and the purge isolation valves. The requirements of the monitor are applicable only when containment is being purged.

10.1.3 Alarm and Trip Setpoints

10.1.3.1 Setpoint Calculation

The effluent noble gas monitor setpoints are conservatively based on the assumption that a release is occurring simultaneously for all gaseous release points at the maximum expected flow rate for each pathway. Furthermore, the setpoints are chosen such that an occurrence of simultaneous high alarms on all pathways would correspond to a station release rate of less than or equal to one half of the applicable release limit.

$$P_{MP} \leq 0.5 \times Q_{IV} \times 1/F^P \times K^P \times C^M \quad (10-1)$$

P_{MP} = Setpoint for monitor, M, on release path, P. [cpm]

0.5 = Factor to reduce release rate by 50%.

Q_{IV} = Total Allowed Release Rate, Vent Release [μ Ci/sec]

F^P = Flow rate through Release Path, P. [cc/sec]

K^P = Factor to apportion a fraction of the total release rate, Q_{IV} , to release path, P.

C^M = Conversion Factor for monitor, M [cpm per μ Ci/cc]

10.1.3.2 Release Limits

Alarm and trip setpoints for noble gas effluent monitors are established to indicate serious radiological events that coincide with Defueled Station Emergency Plan (DSEP) EALs and associated emergency classification.

10.1.3.3 Release Mixture

In the determination of alarm and trip setpoints, the noble gas mixture in the station gaseous effluent is assumed to be 100% Kr85. Zion Station has not operated since February of 1997 and is permanently defueled. Subsequent, decay and lack of production results in the presence of only the longer lived Kr85 in the spent fuel rods.

10.1.3.4 Conversion Factors

Calibration factors/monitor response variables for noble gas monitors are based on the energy characteristics of 100% Kr85.

10.1.3.5 HVAC Flow Rates

Flow rates for aux vent stack release are provided by flow measuring instrumentation. However, flow rates out the vent stack can be calculated based on the number of operating fans in the monitored flow path.

$$F_M = \sum F_{ip} \times N_i \quad (10-4)$$

$$F_M = \text{Total Flow In Monitored Flow Path} \quad [\text{cc/sec}]$$

$$F_{ip} = \text{Flow from fan } i \text{ in path } p. \quad [\text{cc/sec}]$$

$$N_i = \text{Number of fans, in operation}$$

The maximum flow for each fan is used for setpoint calculations because this maximizes the flow, establishing a conservative, "worst case" release rate/concentration for setpoint determination.

Pertinent data for the fans is provided in Table 10-2.

HVAC flows for the remaining monitors are conservatively fixed at upper bound values. Fuel building exhaust flow is based on whether the system is operating in "high" or "low" mode.

<u>Fan Speed</u>	<u>Flow in cc/sec</u>
High Mode	7.08E+6
Low Mode	3.54E+6

10.1.4 Allocation of Effluents from Common Release Points

Radioactive gaseous effluents released from the fuel building are comprised of contributions from both units. Subsequently, allocation of effluent releases is made evenly between the units.

10.2 LIQUID RELEASES

10.2.1 System Description

Available liquid waste processing diagrams are provided in the DSAR.

The liquid radwaste treatment system was designed and installed to allow for a reduction if needed, in the concentration of radioactive liquid effluents by filtration, providing for retention or holdup and/or providing for treatment by demineralizers. The overall purpose is to ensure releases to the lake do not exceed any concentration release limit, and liquid effluent releases to the public are ALARA.

10.2.1.1 Boric Acid Monitor Tanks

There are four Boric Acid Monitor Tanks (21,600-gallon capacity each) which receive liquid waste before discharge to Lake Michigan.

10.2.1.2 Turbine Building Fire Sump

The turbine building floor and equipment drain tanks and the fuel pool cooling tower blowdown are discharged to the fire sump for processing by the waste water treatment facility and ultimate discharge into Lake Michigan. The discharge constitutes a potential for very low level radioactive release.

10.2.2 Radiation Monitors

10.2.2.1 Boric Acid Monitor Tank Monitors

ORT-PR05 monitors releases from the Boric Acid Monitor Tanks. On high alarm, the monitor automatically initiates closure of a valve to prevent further releases. The valve is located over 250 feet downstream of the monitor to allow closure prior to exceeding release limits. The monitor setpoints are found by solving Equation 10-5 for release setpoint P.

Available information is provided in the DSAR.

10.2.2.2 Turbine Building Fire Sump Monitor

ORT-PR25 continuously monitors the discharge line from the fire sump pumps to the waste water treatment facility. On high alarm, the monitor automatically trips all of the fire sump pumps, thereby containing the liquid in the turbine building. The monitor setpoints are found by solving Equation 10-5 for release setpoint P.

Available information on the monitor is provided in the DSAR.

10.2.3 Alarm and Trip Setpoints

10.2.3.1 Setpoint Calculation

Alarm and trip setpoints of liquid effluent monitors at the principal release points are established to ensure that the concentration limits of the Technical Specifications and 10 CFR 20 are not exceeded in the unrestricted area. The monitor setpoints are found by solving Equation 10-5 for a conservative mixture of radionuclides found in liquid effluents.

$$P \leq K \times (C_{mpc})(F^d/F') \quad (10-5)$$

P Release Setpoint [$\mu\text{Ci/mL}$]

The alarm setpoint for radioactivity to be released in liquid effluents.

C_{mpc} Maximum Permissible Concentration [$\mu\text{Ci/mL}$]

F^d Dilution Flow Rate [gpm]

The flow rate of the radwaste dilution stream (condenser cooling water).

F' Discharge Flow Rate [gpm]

The flow rate from the Boric Acid Monitor Tank or fire sump as appropriate.

K Factor of conservatism.
 $K = 0.5$ for Boric Acid Monitor Tank
 $K = 1.0$ for sump

10.2.3.2 Discharge Flow Rates

10.2.3.2.1 Boric Acid Monitor Tank Discharge Flow Rate |

Prior to each batch release, the water is recirculated, sampled, and analyzed.

⁽¹⁾The results of the analysis of the waste sample determine the discharge rate of each batch as follows:

$$F'_{max} = (C_{mpc})(F^d_{act}/C) \quad (10-6) \quad |$$

F'_{max} Maximum Permitted Discharge Flow Rate [gpm]

The maximum permitted flow rate from the Boric Acid Monitor Tank. [gpm] |

F^d_{act} Actual Dilution Flow Rate [gpm]

The actual flow rate of the radwaste dilution stream. |

⁽¹⁾C Sample Radioactivity Concentration [μCi/mL]

The concentration of radioactivity in the Boric Acid Monitor Tank based on measurements of a sample drawn from the tank. |

C_{mpc} has the same definition as in Equation 10-5.

10.2.3.2.2 Turbine Building Fire Sump Discharge Flow Rate

This release path is a continuous discharge. Consequently, the release rate F' in Equation 10-6 is set equal to maximum design capacity for the pumps on the effluent of the waste water treatment facility.

10.2.3.3 Release Limits

Release limits are determined from 10 CFR 20.

10.2.3.4 Release Mixture

The release mixture used for setpoint determination is based on a composition of 100% of a nuclide with a conservative concentration discharge limit to the lake (e.g., Sr90)

⁽¹⁾ A more conservative discharge rate may be calculated based on concentration limits for NPDES constituents (e.g., boron concentration). In either case, discharge procedures verify that all discharge limits to the lake are below applicable limits.

10.2.3.5 Conversion Factors

The conversion factor for 0RT-PR25 (fire sump monitor) is based on detector response to Cs-137. The conversion factors for monitor 0RT-PR05 are based on detector response curves for Cs-137.

10.2.4 Allocation of Effluents from Common Release Points

Radioactive liquid effluents released from the Boric Acid Monitor Tank and turbine building fire sump are comprised of contributions from both units. Under normal operating conditions, it is difficult to apportion the radioactivity between the units. Consequently, allocation is based on the unit discharge canal used for dilution.

10.3 SOLIDIFICATION OF WASTE/PROCESS CONTROL PROGRAM

The process control program (PCP) contains the sampling, analysis, and formulation determination by which solidification of radioactive wastes from liquid systems is ensured.

Table 10-1

Assumed Composition of the Zion Station
Noble Gas Effluent

<u>Isotope</u>	<u>Percent of Effluent</u>
Kr85	100%

Note: Based on time since last unit operation and permanently defueled condition.

TABLE 10-2
HVAC EXHAUST FAN CAPACITIES

FAN	<u>CC/SEC</u>	<u>CFM</u>	<u>CFH</u>
<u>#1 Aux. Bldg</u>			
0A Exh. Fan	3.16×10^7	6.70×10^4	4,020,000
0B Exh. Fan	3.16×10^7	6.70×10^4	4,020,000
0C Exh. Fan	3.16×10^7	6.70×10^4	4,020,000
<u>#2 Aux. Bldg</u>			
0D Exh. Fan	3.16×10^7	6.70×10^4	4,020,000
0E Exh. Fan	3.16×10^7	6.70×10^4	4,020,000
0F Exh. Fan	3.16×10^7	6.70×10^4	4,020,000
<u>#1 Purge Exh.</u>			
1A Purge Fan	1.46×10^7	3.10×10^4	1,860,000
1B Purge Fan	1.46×10^7	3.10×10^4	1,680,000
H ² Purge Fan 1A	1.70×10^5	3.60×10^2	21,600
H ₂ Purge Fan 1B	1.75×10^5	3.40×10^2	22,200
<u>#2 Purge Exh.</u>			
2A Purge Fan	1.65×10^7	3.50×10^4	2,102,400
2B Purge Fan	1.72×10^7	3.65×10^4	2,188,800
H ₂ Purge Fan 2A	1.82×10^5	3.85×10^2	23,100
H ₂ Purge Fan 2B	1.75×10^5	3.71×10^2	22,260
Hot Lab Exh. 0A	1.50×10^6	3.18×10^3	191,000
Hot Lab Exh. 0B	1.18×10^6	2.51×10^3	150,600

SPECIAL NOTE

The requirements of Permanently Defueled Technical Specifications shall take precedence over this chapter, should any differences occur.

ZION

Revision 10
June 2003

CHAPTER 12

REVISION 10

I

CHAPTER 12

RADIOLOGICAL EFFLUENT TECHNICAL STANDARDS
(RETS)
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CHAPTER 12

RADIOACTIVE EFFLUENT TECHNICAL STANDARDS
(RETS)
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12.1 DEFINITIONS

- 12.1.1** A BATCH RELEASE is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated and then thoroughly mixed to assure representative sampling.
- 12.1.2** A CHANNEL CALIBRATION, shall be the adjustment, as necessary, of the channel such that it responds with the necessary range and accuracy to known values of input. The CHANNEL CALIBRATION shall encompass the entire channel including the sensors (where possible), alarm interlock and/or trip functions and shall include the CHANNEL FUNCTIONAL TEST. The CHANNEL CALIBRATION may be performed by any series of sequential, overlapping, or total channel steps such that the entire channel is calibrated.
- 12.1.3** A CHANNEL CHECK shall be the qualitative assessment of channel behavior during operation by observation. This determination shall include, where possible, comparison of the channel indication and/or status with other indications and/or status derived from independent INSTRUMENT CHANNELS measuring the same parameter.
- 12.1.4** A CHANNEL FUNCTIONAL CHECK shall be:
- a. Instruments-The injection of a simulated signal(s) into the channel as close to the primary sensor(s) as practicable to verify OPERABILITY, including all channel outputs, as appropriate.
 - b. Logics-The application of input signals, or the operation of relays or switch contacts, in all the combinations required to produce the required decision outputs including the operation of all ACTUATION DEVICES. Where practicable, the test shall include the operation of the ACTUATED EQUIPMENT as well (i.e. pumps will be started, valves operated, etc.).
- 12.1.5** A COMPOSITE SAMPLE is one in which the quantity of liquid sample is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen which is representative of the liquids released.
- 12.1.6** A CONTINUOUS RELEASE is the discharge of liquid or gaseous wastes of a nondiscrete volume (e.g. from a volume or system that has an input flow during the release).
- 12.1.7** CONTINUOUS SAMPLING is uninterrupted sampling with the exception of sampling interruptions of short duration for routine activities (e.g. filter replacements).
- 12.1.8** DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcurie/gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The Thyroid Dose Conversion factors used for this calculation shall be those listed in Table III of TID-14844, "Calculation of Distance Factors for Power and Test Reactor Sites" or Table E-7 of NRC Regulatory Guide 1.109 Rev. 1, dated October, 1977. This definition is not used in the defueled condition. Decay has eliminated all concerns related to radioactive iodine.
- 12.1.9** MEMBER OF THE PUBLIC means any individual except when that individual is receiving an occupational dose.

- 12.1.10 OCCUPATIONAL DOSE means the dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to radiation and/or radioactive material from licensed and unlicensed sources of radiation, whether in the possession of the licensee or other person. Occupational dose does not include dose from background radiation, as a patient from medical practices, from voluntary participation in medical research programs, or as a member of the public.
- 12.1.11 OPERABLE - A system, subsystem, train, component or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s), and when all necessary attendant instrumentation, controls, electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function(s) are also capable of performing their related support function(s).
- 12.1.12 OPERATING is defined as performing the intended function in the intended manner.
- 12.1.13 The OPERATING CYCLE: DELETED
- 12.1.14 An OPERATIONAL MODE: DELETED
- 12.1.15 The PROCESS CONTROL PROGRAM (PCP) shall contain the current formulas, sampling, analyses, test, and determinations to be made to ensure that processing and packaging of solid radioactive wastes based on demonstrated processing of actual or simulated wet solid wastes will be accomplished in such a way as to assure compliance with 10CFR Parts 20, 61, and 71, State regulations, burial ground requirements, and other requirements governing the disposal of solid radioactive waste.
- 12.1.16 PURGE OR PURGING is the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating condition, in such a manner, that replacement air or gas is required to purify the confinement.
- 12.1.17 RATED THERMAL POWER: DELETED
- 12.1.18 The REACTOR PRESSURE: DELETED
- 12.1.19 The SITE BOUNDARY shall be that line beyond which the land is not owned, leased or otherwise controlled by the licensee.
- 12.1.20 SOLIDIFICATION shall be the conversion of radioactive liquid, resin and sludge wastes from liquid systems into a form that meets shipping and burial site requirements.
- 12.1.21 A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a radioactive source.

- 12.1.22 SURVEILLANCE shall be those parts of the sections which prescribe remedial measures required under designated conditions, activities required to demonstrate instrument operability, and activities performed to ensure applicable offsite dose limits are not exceeded.
- 12.1.23 The SURVEILLANCE FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 12.1-1.
- 12.1.24 THERMAL POWER: DELETED
- 12.1.25 UNRESTRICTED AREA means an area, access to which is neither limited nor controlled by the licensee.
- 12.1.26 GASEOUS EFFLUENT TREATMENT SYSTEM shall be any system designed and installed to reduce radioactive material in particulate form in effluents by passing ventilation through HEPA filters for the purpose of removing particulates from the gaseous exhaust stream prior to the release to the environment. Such a system is not considered to have any affect on noble gas effluents. The iodine removal function is no longer used in the defueled condition.
- 12.1.27 VENTING is the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating condition, in such a manner that replacement air or gas is not provided or required during venting. Vent, used in system names, does not imply a venting process.
- 12.1.28 WASTE GAS HOLDUP SYSTEM: DELETED

TABLE 12.1-1
SURVEILLANCE FREQUENCY NOTATIONS

<u>NOTATION</u>	<u>FREQUENCY *</u>
S (Shiftly)	At least once per 12 hours
D (Daily)	At least once per 24 hours
W (Weekly)	At least once per 7 days
M (Monthly)	At least once per 31 days
Q (Quarterly)	At least once per 92 days
SA (Semiannually)	At least once per 184 days
A (Annually)	At least once per 366 days
R	At least once per 18 months
P (Prior)	Complete prior to start of release
N/A	Not Applicable

* Each Surveillance Requirement shall be performed within the specified time interval with a maximum allowable extension not to exceed 25% of the surveillance interval. These frequency notations do not apply to the Radiological Environmental Monitoring Program as described in Section 12.5.

12.2 INSTRUMENTATION**12.2.1 Radioactive Liquid Plant Monitoring Instrumentation****Operability Requirements**

- 12.2.1.A** The radioactive liquid plant monitoring instrumentation channels shown in Table 12.2-1 shall be OPERABLE AND, the radioactive liquid effluent monitoring instrumentation channels shall have their alarm/trip setpoints set to ensure that the limits of Section 12.3.1.A are met.

Applicability: As indicated in Table 12.2-3.

Action

1. With a radioactive liquid effluent monitoring instrument channel trip setpoint less conservative than the value necessary to prevent violating the limits of Section 12.3.1.A, immediately suspend the release of radioactive liquid effluents monitored by the affected channel or declare the channel inoperable.
2. With one or more radioactive liquid plant monitoring instrumentation channels inoperable, initiate the SURVEILLANCE requirement delineated in Table 12.2-1.

Surveillance Requirements

- 12.2.1.B.1** The liquid effluent monitor setpoints shall be determined in accordance with procedures as described in the ODCM.
- 12.2.1.B.2** Each radioactive liquid plant monitoring instrumentation channel shall be demonstrated OPERABLE by performance of a CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST at the frequencies shown in Table 12.2-2.

Bases

- 12.2.1.C** The radioactive liquid plant monitoring instrumentation is provided to indicate abnormal radiological conditions within the plant, AND,

The radioactive liquid effluent instrumentation is provided to monitor and control, as applicable, the release of radioactive materials in liquid effluents. The alarm/trip setpoints for these instruments shall be calculated in accordance with the procedures in the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of RETS. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63 and 64 of Appendix A to 10CFR Part 50.

TABLE 12.2-1RADIOACTIVE LIQUID PLANT MONITORING INSTRUMENTATION

<u>INSTRUMENT</u>	<u>MINIMUM CHANNELS OPERABLE</u>	<u>SURVEILLANCE #</u>	<u>APPLICABLE CONDITION</u>
1. Liquid Effluent Monitors Providing Automatic Termination of Release			
A. Boric Acid Monitor Tank (BAMT)			
1. OR-PR05	See SURVEILLANCE 1	1	Liquid Release through this Pathway
B. Turbine Bldg.			
1. OR-PR25	1	2	Liquid Release through this Pathway
2. Effluent Continuous Composite Sampler			
A. Turbine Building Fire Sump	1	2	All Times
3. Effluent Flow Rate Monitor			
A. Boric Acid Monitor Tank			
1. OFI-WD005	1	3	Liquid Release through this Pathway
4. Plant System Monitors			
NONE			

TABLE 12.2-1RADIOACTIVE LIQUID PLANT MONITORING INSTRUMENTATION
(Cont'd)

SURVEILLANCE 1	<p>If the monitor is inoperable, effluent releases from the tank may continue for up to 14 days, provided that prior to initiating the release:</p> <ol style="list-style-type: none"><li data-bbox="477 519 1485 580">1. At least two independent samples of the tank's contents are analyzed, in accordance with Section 12.3.1.B.1, and<li data-bbox="477 612 1485 697">2. At least two technically qualified members of the facility staff independently verify the release-rate calculations and discharge flow path valving; <p>Otherwise, suspend release of radioactive effluents via this pathway.</p>
SURVEILLANCE 2	<p>With the number of channels OPERABLE less the minimum number required, effluent releases via this pathway may continue, provided that at least once per day grab samples are analyzed for gross radioactivity (beta /gamma or isotopic) at a lower limit of detection (LLD) as specified in Table 12.3-2. Restore the channel to operable status within 30 days or conduct a station review to determine a plan of action to restore the channel to operable status.</p>
SURVEILLANCE 3	<p>With the number of channels OPERABLE less than the minimum number required, effluent releases via this pathway may continue, for up to 30 days, provided the flow rate is estimated at least once per 4 hours during actual releases. Pump curves may be used to estimate flow.</p>

TABLE 12.2-2RADIOACTIVE LIQUID PLANT MONITORING INSTRUMENTATION SURVEILLANCE

<u>INSTRUMENT</u>	<u>CHANNEL CHECK</u>	<u>SOURCE CHECK</u>	<u>CHANNEL CALIBRATION(1)</u>	<u>CHANNEL FUNCTIONAL TEST (2)</u>
1. Liquid Effluent Monitors Providing Automatic Termination Of Release				
A. Boric Acid Monitor Tank (BAMT)				
1. 0R-PR05	P	P	R	Q
B. Turbine Bldg.				
1. 0R-PR25	D	M	R	Q
2. Effluent Continuous Composite Sampler				
A. Turbine Building Fire Sump	D	N/A	N/A	N/A
3. Effluent Flow Rate Monitor				
A. Boric Acid Monitor Tank (BAMT)				
1. OFI-WD005	D(3)	N/A	R(4)	N/A
4. Plant System Monitors				
NONE				

(1) CHANNEL CALIBRATION shall include performance of a CHANNEL FUNCTIONAL TEST.

(2) The CHANNEL FUNCTIONAL TEST shall also demonstrate that any automatic isolation of this pathway occurs and that control room alarm annunciation occurs if any of the following conditions exist. (if the capability is installed):

- a) Instrument indicates levels above the alarm setpoints.
- b) Circuit failure.
- c) Instrument indicates a downscale failure.
- d) Instrument controls not set in operate mode.

(3) CHANNEL CHECK shall consist of verifying indications of flow during periods of release. CHANNEL CHECK shall be made at least once daily on any day on which continuous, periodic, or BATCH RELEASES are made.

(4) Does not include flow sensor.

12.2.2 Radioactive Plant Monitoring Instrumentation

Operability Requirements

- 12.2.2.A The radioactive plant monitoring instrumentation channels shown in Table 12.2-3 shall be OPERABLE, AND, the radioactive gaseous effluent monitoring instrumentation shall have their alarm/trip setpoints set in accordance with the method prescribed in the ODCM to ensure that the limits of Section 12.4.1.A are met.

Applicability: As indicated in Table 12.2-3.

Action

1. With a radioactive gaseous effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above Section, immediately suspend the release of radioactive gaseous effluents monitored by the affected channel or declare the channel inoperable.
2. With one or more radioactive plant monitoring instrumentation channels inoperable, initiate the SURVEILLANCE requirement as delineated in Table 12.2-3.

Surveillance Requirements

- 12.2.2.B.1 The effluent monitor setpoints shall be determined in accordance with procedures as described in the ODCM.
- 12.2.2.B.2 Each radioactive plant monitoring instrumentation channel shall be demonstrated OPERABLE, when in its APPLICABLE CONDITION, by performance of a CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST at the frequencies shown in Table 12.2-4.

Bases

- 12.2.2.C The radioactive plant monitoring instrumentation is provided to indicate abnormal radiological conditions within the plant, AND,
- The radioactive gaseous effluent instrumentation is provided to monitor, record and control, as applicable, the release of radioactive materials in gaseous effluents during actual or potential releases. The alarm/trip setpoints for these instruments shall be calculated in accordance with the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of 10CFR Part 20.
- An Auxiliary Building (AB) ventilation stack is considered available as a release path from radiologically controlled areas of the Auxiliary Building when any AB exhaust fan is discharging to that stack, or any one of the AB exhaust fan dampers is open on that stack.
- An Auxiliary Building ventilation stack is unavailable as a release path from radiologically controlled areas of the Auxiliary Building when all AB exhaust fan dampers for that stack are mechanically blocked closed.

TABLE 12.2-3
RADIOACTIVE PLANT MONITORING INSTRUMENTATION

<u>INSTRUMENT</u>	<u>MINIMUM CHANNELS OPERABLE</u>	<u>SURVEILLANCE</u>	<u>APPLICABLE CONDITION</u>
1. <u>Effluent Containment Purge or Vent</u>			
A. Particulate Monitor			
1. 1R-PR40A (Channel 1)	1	6 ¹ , 7 ²	Venting or Purging
2. 2R-PR40A (Channel 1)	1	6 ¹ , 7 ²	Venting or Purging
2. <u>Aux Building Effluent Monitoring</u>			
A. Gas Activity Monitor			
1. 1R-PR49E (Channel 5)	1	10	*
2. 2R-PR49E (Channel 5)	1	10	**
B. Particulate Monitor			
1. 1R-PR49A (Channel 1)	1	11	*
2. 2R-PR49A (Channel 1)	1	11	**
C. Flow Rate Monitor			
1. 1LP-084	1	8	*
2. 2LP-084	1	8	**
* Whenever the Unit 1 stack is available as a release path from the Auxiliary Building.			
** Whenever the Unit 2 stack is available as a release path from the Auxiliary Building.			
3. <u>Fuel Building Monitoring</u>			
A. Gas Activity Monitor			
1. ORT-PR30A	1	10	All Times
B. Particulate Monitor			
1. ORT-PR30B	1	11	All Times
C. Area Monitoring			
1. ORT-AR03 ⁽³⁾	1	12	When fuel is present
2. ORE0005	1	14	When fuel is present
3. ORT-AR13	1	13	When fuel building crane is operated with a load on either hook in the bypass mode

¹ During VENTING² During PURGING

- ³ The auto control function on high alarm is no longer required for this monitor (i.e., does not need to be maintained operable for the monitor to be operable).

TABLE 12.2-3RADIOACTIVE PLANT MONITORING INSTRUMENTATION
(Cont'd)

<u>INSTRUMENT</u>	<u>MINIMUM CHANNELS OPERABLE</u>	<u>SURVEILLANCE</u>	<u>APPLICABLE CONDITION</u>
4. <u>Emergency Monitoring</u>			
A. Ventilation			
1. 1RIA-PR49 (Channel 7)	1	9	*
2. 2RIA-PR49 (Channel 7)	1	9	**
3. 1RIA-PR49 (Channel 9)	1	9	*
4. 2RIA-PR49 (Channel 9)	1	9	**

- * Whenever the Unit 1 stack is available as a release path from the Auxiliary Building.
- ** Whenever the Unit 2 stack is available as a release path from the Auxiliary Building.

TABLE 12.2-3RADIOACTIVE PLANT MONITORING INSTRUMENTATION
(Cont'd)TABLE NOTATIONS

SURVEILLANCE 6 -	With the number of channels OPERABLE less than the minimum number required, effluent releases via this pathway may continue for up to 30 days provided grab samples are obtained and analyzed for gross activity at least once per day.
SURVEILLANCE 7 -	With the number of channels OPERABLE less than the minimum number required, and no redundant monitor OPERABLE in this flow path, immediately suspend PURGING of radioactive effluents via this pathway.
SURVEILLANCE 8 -	Effluent releases via this pathway may continue provided the effluent flow rate is estimated at least once per day while a release is in progress. Restore the inoperable panel to OPERABLE status within 30 days OR conduct a station review to determine a plan of action to restore the panel to OPERABLE status.
SURVEILLANCE 9 -	With the number of channels OPERABLE less than the minimum number required, restore the inoperable monitor to OPERABLE status within 30 days OR conduct a station review to determine a plan of action to restore the channel to OPERABLE status.
SURVEILLANCE 10 -	With the number of OPERABLE channels less than the minimum number required, restore the channel to OPERABLE status within 30 days or conduct a station review to determine a plan of action to restore the channel to OPERABLE status. Effluent releases via this pathway may continue provided grab samples are obtained and analyzed for gross activity at least once per day, OR for the case when the associated LP-084 panel is inoperable, continuous sampling is maintained with a portable pump and Operations performs a Channel Check Daily. Compensatory sampling does not return the monitor to an OPERABLE status.
SURVEILLANCE 11 -	With the number of OPERABLE channels less than the minimum number required, restore the channel to OPERABLE status within 30 days or conduct a station review to determine a plan of action to restore the channel to OPERABLE status. Effluent releases via this pathway may continue provided samples are continuously collected as required in Table 12.4-1. For the case when the associated LP-084 panel is inoperable, continuous sampling can be maintained with a portable pump and Operations shall perform a Channel Check Daily. Compensatory sampling does not return the monitor to an OPERABLE status.
SURVEILLANCE 12-	With the number of channels OPERABLE less than the minimum required, stop all movement of fuel within the spent fuel pool and crane operation with loads over the spent fuel pool <u>AND</u> perform area surveys of the monitored area at least once per day.
SURVEILLANCE 13	With the number of channels OPERABLE less than the minimum required, stop operation of overhead crane in bypass after placing loads in safe condition.
SURVEILLANCE 14	Perform area surveys of the monitored area at least once per day.

TABLE 12.2-4RADIOACTIVE PLANT MONITORING INSTRUMENTATION SURVEILLANCE

	<u>CHANNEL CHECK</u>	<u>SOURCE CHECK</u>	<u>CHANNEL CALIBRATION (1)</u>	<u>CHANNEL FUNCTIONAL TEST (2)</u>
1. <u>Effluent Containment Purge or Vent</u>				
A. Particulate Monitor				
1. 1R-PR40A (Channel 1)	D	M	R	Q
2. 2R-PR40A (Channel 1)	D	M	R	Q
2. <u>Aux Building Effluent Monitoring</u>				
A. Gas Activity Monitor				
1. 1R-PR49E (Channel 5)	D	M	R	Q
2. 2R-PR49E (Channel 5)	D	M	R	Q
B. Particulate Monitor				
1. 1R-PR49A (Channel 1)	D	M	R	Q
2. 2R-PR49A (Channel 1)	D	M	R	Q
C. Flow Rate Monitor				
1. 1LP-084	D	N/A	R	Q
2. 2LP-084	D	N/A	R	Q
3. <u>Fuel Building Monitoring</u>				
A. Gas Activity Monitor				
1. 0RT-PR30A	D	M	A	N/A
B. Particulate Monitor				
1. 0RT-PR30B	D	M	A	N/A
C. Area Monitoring				
1. 0RT-AR03	D	M(4)	R	Q
2. 0RE0005	D	M	R	Q
3. 0RT-AR13	D	M(3)	R	Q

TABLE 12.2-4RADIOACTIVE PLANT MONITORING INSTRUMENTATION SURVEILLANCE
(Cont'd)

<u>INSTRUMENT</u>	<u>CHANNEL CHECK</u>	<u>SOURCE CHECK</u>	<u>CHANNEL CALIBRATION (1)</u>	<u>CHANNEL FUNCTIONAL TEST (2)</u>
4. <u>Emergency Monitoring</u>				
A. Ventilation				
1. 1RIA-PR49 (Channel 7)	N/A	N/A	R	Q
2. 2RIA-PR49 (Channel 7)	N/A	N/A	R	Q
3. 1RIA-PR49 (Channel 9)	N/A	N/A	R	Q
4. 2RIA-PR49 (Channel 9)	N/A	N/A	-R	Q

Table 12.2-4RADIOACTIVE PLANT MONITORING INSTRUMENTATION SURVEILLANCE
(Cont'd)TABLE NOTATIONS

- (1) CHANNEL CALIBRATION shall include performance of a CHANNEL FUNCTIONAL TEST.
- (2) The CHANNEL FUNCTIONAL TEST shall also demonstrate that any automatic isolation occurs; and that Control Room alarm annunciation occurs if any of the following conditions exist (if the capability is installed):
 - a) Instrument indicates measured levels above the alarm setpoint.
 - b) Circuit failure.
 - c) Instrument indicates a downscale failure.
 - d) Instrument controls not set in "operate" mode.
- (3) Daily during operations of overhead crane in bypass mode.
- (4) Daily during fuel handling operations or load handling operations in or above the spent fuel pool.

12.3 LIQUID EFFLUENTS**12.3.1 Concentration****Operability Requirements**

12.3.1.A.1 The concentration of radioactive material released from the site to UNRESTRICTED AREAS (see Zion Station ODCM Annex, Appendix F, Figure F-1) shall be limited to 10 times the concentrations specified in Appendix B, Table 2, Column 2 to 10CFR20.1001-20.2402, for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentrations shall be limited to the values listed in Table 12.3-1.

12.3.1.A.2 During the release of radioactive liquid wastes, the combination of dilution water flow and waste water discharge flow shall be established to ensure the discharge concentration limits of 12.3.1.A.1. are not exceeded.

Applicability: At all times.

Action

1. With the concentration of radioactive materials released from the site to UNRESTRICTED AREAS exceeding the limits specified in Section 12.3.1.A.1. immediately decrease the release rate of radioactive materials and/or increase the dilution flow rate to restore the concentration to within the above limits.

Surveillance Requirements

12.3.1.B.1 The radioactivity content of each batch of radioactive liquid waste shall be determined prior to release by sampling and analysis in accordance with Table 12.3-2. The results of pre-release analyses shall be used with the calculational methods in the ODCM to assure that the concentration at the point of release is maintained within the limits of Section 12.3.1.A.1.

12.3.1.B.2 Post-release analyses of samples composited from BATCH RELEASES shall be performed in accordance with Table 12.3-2. The results of the previous post-release analyses shall be used with the calculational methods in the ODCM to assure that the concentrations at the point of release were maintained within the limits of Section 12.3.1.A.1.

12.3.1.B.3 The radioactivity concentration of liquids discharged from continuous release points shall be determined by collection and analysis of samples in accordance with Table 12.3-2. The results of the analysis shall be used with the calculational methods in the ODCM to assure that the concentrations at the point of release were maintained within the limits of Section 12.3.1.A.1.

12.3.1.B.4 Appropriate discharge and dilutions flows for each batch radioactive liquid release shall be determined with the calculational methods in the ODCM to assure that the concentration at the point of release is maintained within the limits of Section 12.3.1.A.1.

Bases

- 12.3.1.C This Section is provided to ensure that the concentration of radioactive materials released in liquid waste effluents from the site to UNRESTRICTED AREAS will be less than ten (10) times the concentration levels specified in Appendix B, Table 2, Column 2 to 10CFR 20.1001-20.2402. This limitation provides additional assurance that the levels of radioactive materials in bodies of water outside the site will result in exposures within (1) the Section II.A design objectives of Appendix I, 10 CFR 50, to a MEMBER OF THE PUBLIC, and (2) the limits of 10CFR20.1301.

TABLE 12.3-1ALLOWABLE CONCENTRATION OF DISSOLVED OR ENTRAINED NOBLE GASES
RELEASED FROM THE SITE TO UNRESTRICTED AREAS IN LIQUID EFFLUENTS

<u>NUCLIDE</u>	<u>A(μCi/ml)*</u>
Kr-85m	2×10^{-4}
Kr-85	5×10^{-4}
Kr-87	4×10^{-5}
Kr-88	9×10^{-5}
Ar-41	7×10^{-5}
Xe-131m	7×10^{-4}
Xe-133m	5×10^{-4}
Xe-133	6×10^{-4}
Xe-135m	2×10^{-4}
Xe-135	2×10^{-4}

* Computed from Equation 20 of ICRP Publication 2(1959), adjusted for infinite cloud submersion in water, and $R = 0.01$ rem/week, density = 1.0 g/cc and $P_w/P_t = 1.0$.

TABLE 12.3-2

RADIOACTIVE LIQUID EFFLUENT SAMPLING AND ANALYSIS SURVEILLANCE

LIQUID RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) ($\mu\text{Ci/ml}$) (a,e)
A. Boric Acid Monitor Tank	Prior to Each Release (c)	Prior to Each Release	Principal Gamma Emitters (e)	5E-7
	P One Batch/M(c)	M	Dissolved and Entrained Gases (Gamma Emitters)	1E-5
	P Each Batch (c)	M Composite (b)	Tritium	1E-5
			Gross Alpha	1E-7
	P Each Batch (c)	Q Composite (b)	Sr-89, Sr-90	5E-8
			Fe-55	1E-6
B. Turbine Building Fire Sump (f)	Continuous During Release (d)	W	Principal Gamma Emitters(e)	5E-7
			Dissolved and Entrained Gases (Gamma Emitters)	1E-5
	Continuous (d)	M Composite (b)	Tritium	1E-5
			Gross Alpha	1E-7
	Continuous (d)	Q Composite (b)	Sr-89, Sr-90	5E-8
			Fe-55	1E-6
C. Waste Neutralizing Tank	Prior to each Release	Prior to each Release	Principal Gamma Emitters (e)	5E-7
	P Each Batch (c)	M Composite (b)	Tritium	1E-5
			Gross Alpha	1E-7

TABLE 12.3-2RADIOACTIVE LIQUID EFFLUENT SAMPLING AND ANALYSIS SURVEILLANCE
(Cont'd)TABLE NOTATIONS

- a. The LLD is the smallest concentration of radioactive material in a sample that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66 s_b}{A \cdot E \cdot V \cdot 2.22 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

Where:

LLD is the lower limit of detection as defined above in picocuries (pCi) per unit mass or volume,

s_b is the square root of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute),

A is the number of gamma rays emitted per disintegration for gamma ray radionuclide analysis ($A = 1.0$) for gross alpha, strontium, and tritium measurement.

E is the counting efficiency (as counts per gamma),

V is the sample size (in units of mass or volume),

2.22 is the number of disintegrations per minute per picocurie,

Y is the fractional radiochemical yield when applicable (otherwise $Y = 1.0$)

λ is the radioactive decay constant for the particular radionuclide, and

Δt is the elapsed time between midpoint of sample collection and time of counting (for plant effluents, not environmental sample).

The value of s_b used in the calculation of the LLD for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. In calculating the LLD for a radionuclide determined by gamma ray spectrometry, the background shall include the typical contributions of other radionuclides normally present in the samples. Typical values of E, V, Y, and Δt shall be used in the calculation. The background count rate is calculated from the background counts that are determined to be within \pm one FWHM (Full Width at Half Maximum) energy band about the energy of the gamma ray peak used for the quantitative analysis for that radionuclide.

TABLE 12.3-2RADIOACTIVE LIQUID EFFLUENT SAMPLING AND ANALYSIS SURVEILLANCE
(Cont'd)TABLE NOTATIONS

For certain mixtures of gamma emitters, it may not be possible to measure radionuclides in concentrations near their sensitivity limits when other nuclides are present in the sample in much greater concentrations. Under these circumstances, it will be more appropriate to calculate the concentrations of such radionuclides using observed ratios with those radionuclides which are measurable.

- b. A COMPOSITE SAMPLE is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen which is representative of the liquids released.
 - 1) To be representative of the quantities and concentrations of radioactive materials in liquid effluents, all samples taken for the composite shall be thoroughly mixed in order for the composite sample to be representative of the effluent release.
 - 2) The weekly and monthly Proportional Composite samples are not required provided that (1) the analysis required for each of these composite samples has been run on each batch discharged, and (2) a monthly record of radionuclides discharged (isotope and quantity) is maintained.
- c. A BATCH RELEASE is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated, and then thoroughly mixed to assure representative sampling.
- d. A CONTINUOUS RELEASE is the discharge of liquid wastes of a nondiscrete volume; e.g., from a volume of system that has an input flow during the continuous release.
- e. The principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Mn-54, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, Ce-144 shall also be measured, but with an LLD of 5E-06. This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides, shall also be identified and reported. Nuclides which are below the LLD for the analyses shall be reported as "less than" the nuclide's LLD, and shall not be reported as being present at the LLD level for that nuclide. The "less than" values shall not be used in the required dose calculations.
- f. If the fire sump composite sampler is inoperable, grab samples shall be taken from the turbine building fire sump once per day.

12.3.2 Dose

Operability Requirements

12.3.2.A The dose or dose commitment to a MEMBER OF THE PUBLIC above background from radioactive materials in liquid effluents released from each unit to UNRESTRICTED AREAS (see Zion Station ODCM Annex, Appendix F, Figure F-1) shall be limited:

1. During any calendar quarter to less than or equal to 1.5 mrem to the total body and to less than or equal to 5 mrem to any organ, and
2. During any calendar year to less than or equal to 3 mrem to the total body and to less than or equal to 10 mrem to any organ.

Applicability: At all times.

Action

1. With the calculated dose from the release of radioactive materials in liquid effluents exceeding twice the limits specified in Section 12.3.2.A, limit the subsequent releases such that the dose or dose commitment to a MEMBER OF THE PUBLIC from all uranium fuel cycle sources is limited to less than or equal to 25 mrem to the total body or any organ (except thyroid, which is limited to less than or equal to 75 mrem) over 12 consecutive months. Demonstrate that radiation exposures to all MEMBERS OF THE PUBLIC from all uranium fuel cycle sources (including all effluent pathways and direct radiation) are less than the 40CFR Part 190 and 40CFR Part 141 Standard, otherwise obtain a variance from the Commission to permit releases which exceed the 40CFR Part 141 or 190 Standard. The radiation exposure analysis shall use methods prescribed in the ODCM.

Surveillance Requirements

12.3.2.B Cumulative dose contributions from liquid effluents for the current calendar quarter and the current calendar year shall be determined in accordance with the methodologies and parameters of the ODCM at least once per 31 days.

Bases

12.3.2.C

This Section is provided to implement the requirements of Sections II.A, III.A and IV.A of Appendix I, 10CFR Part 50. The limiting Condition of Operation implements the guides set forth in Section II.A of Appendix I. The ACTION statements provide the required OPERATING flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in liquid effluents will be kept "as low as is reasonably achievable." Also, for fresh water sites with drinking water supplies, which can be potentially affected by plant operations, there is reasonable assurance that the operation of the facility will not result in radionuclide concentrations in the finished drinking water that are excess of the requirements of 40CFR 141. The dose calculations in the ODCM implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data, such that the actual exposure of an individual through appropriate pathways is unlikely to be substantially underestimated. The equations specified in the ODCM for calculating the dose due to the actual release rate of radioactive materials in liquid effluents are consistent with the methodology provided in Regulatory Guide 1.109; Calculation of Annual Doses to Man from Routine Releases of Radioactive Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I, Revision 1, October 1977 and Regulatory Guides 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," April 1977.

This Section applies to the release of liquid effluents from each unit at the site. For shared radwaste treatment systems, the liquid effluents from the shared systems are proportioned among the units sharing the system.

12.3.3 Liquid Radwaste Treatment System

Operability Requirements

- 12.3.3.A The Liquid Radwaste Treatment System shall be OPERABLE* and appropriate portions of the system shall be used to reduce the radioactive materials in liquid effluents prior to discharge when the projected doses due to liquid effluent, from each unit, to UNRESTRICTED AREAS (see Zion Station ODCM Annex, Appendix F, Figure F-1) would exceed 0.06 mrem to the total body or 0.20 to any organ in a 31-day period.

* The liquid Radwaste Treatment System shall be considered OPERABLE, if liquid waste can be held up and/or discharged within applicable limits.

Applicability: At all times.

Action With the Liquid Radwaste Treatment System inoperable for more than 30 days or with radioactive liquid waste being discharged without treatment and in excess of the above limits, return the system to OPERABLE status and place the appropriate portions of the system in use.

Surveillance Requirements

- 12.3.3.B Doses due to liquid releases from the site to UNRESTRICTED AREAS, shall be projected at least once per 31 days in accordance with the methodologies and parameters of the ODCM when the Liquid Radwaste Treatment System is not being fully utilized.

Bases

- 12.3.3.C The OPERABILITY of the Liquid Radwaste Treatment System ensures that the system will be available for use whenever liquid effluents require treatment prior to release to the environment. The requirement that the appropriate portions of this system be used when specified, provides assurance that the releases of radioactive materials in liquid effluents will be kept "as low as is reasonably achievable." This Section implements the requirements of 10CFR Part 50.36a, General Design Criterion of Appendix A to 10CFR Part 50 and the design objective given in Section II.D of Appendix I to 10CFR Part 50. The specified limits governing the use of appropriate portions of the Liquid Radwaste Treatment System were specified as a 2% fraction of the dose design objectives set forth in Section II.A of Appendix I, 10CFR Part 50, for liquid effluents.

12.4 GASEOUS EFFLUENTS**12.4.1 Dose Rate****Operating Requirements**

12.4.1.A The dose rate due to radioactive materials released in gaseous effluents from the site to areas at or beyond the SITE BOUNDARY (see Zion Station ODCM Annex, Appendix F, Figure F-1), shall be limited to the following:

1. For noble gases: Less than or equal to 500 mrem/yr to the whole body and less than or equal to 3000 mrem/yr to the skin, and
2. For Iodine-131, Iodine-133, tritium and all radionuclides in particulate form with half-lives greater than 8 days: Less than or equal to 1500 mrem/yr to any organ.

Applicability: At all times.

Action

With a release exceeding the above limits, immediately reduce the release rate to within the above limits.

Surveillance Requirements

12.4.1.B The dose rate due to radioactive materials in gaseous effluents shall be determined to be within the prescribed limits in accordance with the methods and procedures of the ODCM by obtaining representative samples and performing analyses in accordance with the sampling and analysis program specified in Table 12.4-1.

Bases

12.4.1.C This Section is provided to ensure that radioactive material discharged in gaseous effluents will not result in the exposure of a Member of the Public in an Unrestricted Area, either at or beyond the Site Boundary in excess of the design objectives of appendix I to 10 CFR part 50. This section is provided to ensure that gaseous effluents from all units on the site will be appropriately controlled. It provides operational flexibility for releasing gaseous effluents to satisfy the Section II.A and II. design objectives of appendix I to 10 CFR part 50. The specified release-rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to an individual at or beyond the SITE BOUNDARY to 500 mrem/year to the total body or to less than or equal to 3000 mrem/year to the skin. These release-rate limits also restrict, at all times, the corresponding organ dose rate above background to a child via the inhalation pathway to less than or equal to 1500 mrem/year. For purposes of calculating dose resulting from airborne releases, the stack is considered a ground-level release.

The Sampling and Analysis Program requirements prescribed in Table 12.4-1 are established to provide representative and appropriate sampling of the radiologically controlled areas. The method and frequency of sampling is based on the effluent flowrate. Continuous Releases are defined for areas with forced ventilation release points. Unventilated Building Releases are defined for areas with no specific release point.

TABLE 12.4-1

RADIOACTIVE GASEOUS EFFLUENT SAMPLING AND ANALYSIS PROGRAM

GASEOUS RELEASE TYPE	SAMPLING METHOD	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) ($\mu\text{Ci/cc}$) (f)
A. Deleted				
B. Containment Vent and Purge	Grab (b)	Prior to Each Release	Noble Gases Principal Gamma Emitters (d)	1E-4
			Tritium	1E-6
C. Continuous Releases ⁽¹⁾ Aux Building Ventilation Stack for both (2) units <u>And</u> Fuel Building Ventilation	Grab (b)	Monthly	Noble Gases Principal Gamma Emitters (d)	1E-4
			Tritium	1E-6
	Continuous (b)(h)	Weekly(c)	Particulate Principal Gamma Emitters (e)	1E-11
	Composite	Quarterly	Sr-89 Particulate	1E-11
			Sr-90 Particulate	1E-11
			Gross Alpha	1E-11
	Continuous (g)(h) Noble Gas Monitor	N.A.	Noble Gases, Gross Beta or Gamma	1E-6

(1) The requirements listed in this table for Continuous Releases are applicable for release paths that are available.

TABLE 12.4-1

RADIOACTIVE GASEOUS EFFLUENT SAMPLING AND ANALYSIS PROGRAM
(Cont'd)

GASEOUS RELEASE TYPE	SAMPLING METHOD	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) ($\mu\text{Ci/cc}$) (f)
D. Unventilated Building Releases ⁽²⁾ Aux Building Above Ground Elevations(i) <u>And</u> Fuel Building (j)	Grab	Daily	Noble Gases Principal Gamma Emitters (d)	1E-4
			Tritium	1E-6
	Continuous (h)	Daily(c)	Particulate Principal Gamma Emitters (e)	1E-11
	Composite	Quarterly	Sr-89 Particulate	1E-11
			Sr-90 Particulate	1E-11
			Gross Alpha	1E-11

(2) The requirements listed in this table for Unventilated Building Releases are applicable for buildings with the normal ventilation release paths isolated.

TABLE 12.4-1RADIOACTIVE GASEOUS EFFLUENT SAMPLING AND ANALYSIS PROGRAM
(Cont'd)TABLE NOTATIONS

- a. Deleted
- b. The ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period in Section 12.4.1.
- c. The particulate filter(s) shall be saved for a quarterly composite analysis for Sr-89 and Sr-90.
- d. For gaseous emissions, the principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138. Other peaks which are measurable and identifiable by gamma-ray spectrometry, together with the above nuclides, shall also be identified and reported when an actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being at the LLD level for that nuclide.
- e. For particulate emissions, the principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Mn-54, Co-60, Zn-65, Co-58, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. Other peaks which are measurable and identifiable by gamma-ray spectrometry, together with the above nuclides, shall also be identified and reported when an actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being at the LLD level for that nuclide.
- f. The LLD is defined in Notation a of Table 12.3-2.
- g. Refer to Table 12.2-3 for required actions when the noble gas monitor is not in service.
- h. Sampling interruptions of short duration for routine activities, e.g. filter replacement, do not constitute a deviation from the requirements for continuous sampling.
- i. The effluent flowrate for Unventilated Building Releases from the Aux Bldg shall be estimated by $F_{AB} \text{ (cfm)} = 72900 \sqrt{dP}$ (in of water). When the Aux Bldg pressure can not be determined, the maximum flowrate of one exhaust fan, 67000 cfm, shall be used as the effluent flowrate.
- j. The effluent flowrate for Unventilated Building Releases from the Fuel Bldg shall be estimated by $F_{FB} \text{ (cfm)} = 24300 \sqrt{dP}$ (in of water). When the Fuel Bldg pressure can not be determined, the maximum flowrate of the exhaust fan, 15000 cfm, shall be used as the effluent flowrate.

12.4.2 Dose - Noble Gases

Operability Requirements

12.4.2.A The air dose due to noble gases released in gaseous effluents from each unit to areas at or beyond the SITE BOUNDARY (see Zion Station ODCM Annex, Appendix F, Figure F-1) shall be limited to the following:

1. During any calendar quarter: Less than or equal to 5 mrad for gamma radiation and less than or equal to 10 mrad for beta radiation, and
2. During any calendar year: Less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation.

Applicability: At all times

Action

1. With the calculated air dose from gaseous effluents exceeding the above limits, define the corrective action(s) to be taken to ensure that future releases are in compliance with Section 12.4.2.A.
2. With the calculated air dose from radioactive noble gases in gaseous effluents exceeding twice the limits of Section 12.4.2.A:
 - a. Limit subsequent releases such that the dose or dose commitment to a MEMBER OF THE PUBLIC from all uranium fuel cycle sources is limited to less than or equal to 25 mrem to the total body or any organ (except the thyroid, which is limited to less than or equal to 75 mrem) over 12 consecutive months.
 - b. Prepare an analysis which demonstrates that radiation exposures to all MEMBERS OF THE PUBLIC from all uranium fuel cycle sources (including all effluents pathways and direct radiation) are less than the 40 CFR Part 190 Standard.

Surveillance Requirements

12.4.2.B Cumulative dose contributions for the current calendar quarter and current calendar year for noble gases shall be determined in accordance with the methodologies and parameters of the ODCM at least once every 31 days.

Bases

12.4.2.C

This Section implements the requirements of Sections II.B, III.A and IV.A of Appendix I, 10CFR Part 50. The Operability Requirements implement the guides set forth in Section II.B of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in gaseous effluents will be kept "as low as is reasonably achievable." The Surveillance Requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I is to be shown by calculation procedures based on models and data such that the actual exposure of an individual through the appropriate pathways is unlikely to be substantially underestimated.

12.4.3 Dose - I-131, I-133, Tritium, and Radioactive Material in Particulate Form**Operability Requirements**

12.4.3.A The dose to a MEMBER OF THE PUBLIC from I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released from each unit to areas at or beyond the SITE BOUNDARY (see Zion Station ODCM Annex, Appendix F, Figure F-1) shall be limited to the following:

1. During any calendar quarter: Less than or equal to 7.5 mrem to any organ, and
2. During any calendar year: Less than or equal to 15 mrem to any organ.

Applicability: At all times.

Action

With the calculated dose from the release of Iodine-131, Iodine-133, tritium and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents exceeding twice the limits of Section 12.4.3.A:

1. Limit subsequent releases such that the dose or dose commitment to a MEMBER OF THE PUBLIC from all uranium fuel cycle sources to less than or equal to 25 mrem to the total body or organ (except the thyroid which is limited to less than or equal to 75 mrem) over 12 consecutive months.
2. Prepare an analysis which demonstrates that radiation exposures to all MEMBERS OF THE PUBLIC from all uranium fuel cycle sources (including all effluent pathways and direct radiation) are less than the 40CFR Part 190 Standard. Otherwise, request a variance from the Commission to permit release which exceeds the 40CFR Part 190 Standard. The radiation exposure analysis shall use the methods prescribed in the ODCM.

Surveillance Requirements

12.4.3.B Cumulative dose contribution for the current calendar quarter and current calendar year for I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days shall be determined in accordance with the methodologies and parameters in the ODCM at least once per 31 days.

Bases

12.4.3.C

This Section implements the requirements of Sections II.C, III.A and IV.A of Appendix I, 10CFR Part 50. The Operability Requirements are the guides set forth in Section II.C of Appendix I. The ACTION statements provide the required operating flexibility and at the same time, implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable." The ODCM calculation methods specified in the Surveillance Requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I is to be shown by calculational procedures based on models and data such that the actual exposure of an individual through appropriate pathways is unlikely to be substantially underestimated. The release-rate specifications for radioiodines, radioactive material in particulate form and radioiodines other than noble gases are dependent on the existing radionuclide pathways to man, at or beyond the SITE BOUNDARY. The pathways which are examined in the development of these calculations are: 1) individual inhalation of airborne radionuclides, 2) disposition of radionuclides onto green leafy vegetation with subsequent consumption by man, 3) deposition onto grassy areas where milk animals and meat producing animals graze with consumption of the milk and meat by man.

12.4.4 Gaseous Effluent Treatment System

Operability Requirements

12.4.4.A The GASEOUS EFFLUENT TREATMENT SYSTEM shall be OPERABLE* and appropriate portions of these systems shall be used to reduce radioactive materials in gaseous effluents when the projected doses in 31 days due to gaseous effluent releases, from each unit, to areas at or beyond the SITE BOUNDARY (see Zion Station ODCM Annex, Appendix F, Figure F-1) would exceed:

1. 0.2 mrad to air from gamma radiation, or
2. 0.4 mrad to air from beta radiation, or
3. 0.3 mrem to any organ.

* The installed GASEOUS EFFLUENT TREATMENT SYSTEM shall be considered OPERABLE by meeting Sections 12.4.1, 12.4.2 and/or 12.4.3, as applicable.

Applicability: At all times.

Action: With the Gaseous Effluent Treatment System inoperable for more than 30 days or with radioactive gaseous waste being discharged without treatment and in excess of the above limits, return the system to OPERABLE status and place the appropriate portions of the system in use.

Surveillance Requirements

12.4.4.B Doses due to gaseous releases from each unit to areas at or beyond the SITE BOUNDARY shall be projected at least once per 31 days in accordance with the methodologies and parameters in the ODCM when the Gaseous Effluent Treatment Systems are not being fully utilized.

Bases

12.4.4.C The OPERABILITY of the GASEOUS EFFLUENT TREATMENT SYSTEM ensures that the system will be available for use whenever gaseous effluents require treatment prior to release to the environment.

The requirement that the appropriate portions of this system be used when specified provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable." This section implements the requirement of 10CFR50.36a, General Design Criterion 60 of Appendix A to 10CFR50 and the design objective given in Section II.D of Appendix I to 10CFR50. The specified limits governing the use of appropriate portions of the Gaseous Effluent Treatment System were specified as a 2% fraction of the dose design objectives set forth in Section II.B and II.C of Appendix I, 10CFR50, for gaseous effluents.

12.5 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**12.5.1 Monitoring Program****Operability Requirements**

- 12.5.1.A The Radiological Environmental Monitoring Program shall be conducted as specified in Table 12.5-1.**

Applicability: At all times.

Action

1. With the Radiological Environmental Monitoring Program not being conducted as specified in Table 12.5-1, prepare and submit to the Commission, in the Annual Radiological Environmental Operating Report, a description of the reasons for not conducting a program as required and the plans for preventing a recurrence.

Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of sampling equipment, if a person who participates in the program goes out of business or no longer can provide sample, or contractor omission which is corrected as soon as discovered. If the equipment malfunctions, corrective actions shall be completed as soon as practical. If a person/business supplying samples goes out of business, a replacement supplier shall be found as soon as possible. All deviations from the sampling schedule shall be described in the Annual Radiological Environmental Operating Report.

2. With the level of radioactivity as a result of plant effluents in an environmental sampling medium at a specified location exceeding the reporting levels of Table 12.5-2 when averaged over any calendar quarter, prepare and submit to the Commission within 30 days a Special Report which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to reduce radioactive effluents so that the potential annual dose* to a MEMBER OF THE PUBLIC is less than the calendar year limits of Section 12.3.2, 12.4.2, or 12.4.3. When more than one of the radionuclides in Table 12.5.2 are detected in the sampling medium, this report shall be submitted if:

$$\frac{\text{concentration (1)}}{\text{reporting level (1)}} + \frac{\text{concentration (2)}}{\text{reporting level (2)}} + \dots \geq 1.0$$

When radionuclides other than those in Table 12.5-2 are detected and are the result of plant effluents, this report shall be submitted if the potential annual dose to a MEMBER OF THE PUBLIC from all radionuclides is equal to or greater than the calendar year limits of Section 12.3.2, 12.4.2, or 12.4.3. This report is not required if the measured level of radioactivity was not the result of plant effluents; however, in such a event, the condition shall be reported and described in the Annual Radiological Environmental Operating Report.

*The methodology and parameters used to estimate the potential dose to a MEMBER OF THE PUBLIC shall be indicated in the report.

3. If the sample type or sampling location(s) required by Table 12.5-1 become(s) permanently unavailable, identify suitable alternative sampling media for the pathway of interest and/or specific locations for obtaining replacement samples and add them to the Radiological Environmental Monitoring Program as soon as practicable. The specific locations from which samples were unavailable may then be deleted from the program.

Prepare and submit a controlled version of the ODCM within 180 days including a revised figure(s) and table reflecting the new location(s) with supporting information identifying the cause of the unavailability of samples and justifying the selection of new location(s) for obtaining samples.

Surveillance Requirements

- 12.5.1.B.1 The Radiological Environmental Monitoring samples shall be collected from the locations specified in the ODCM and analyzed pursuant to Table 12.5-1 and the detection capabilities required by Table 12.5-3.

Bases

- 12.5.1.C The Radiological Environmental Monitoring Program required by this section provides representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures of MEMBERS OF THE PUBLIC resulting from the station operation. This monitoring program implements Section IV.B.2 of Appendix I to 10CFR50 and thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and modeling of the environmental exposure pathways. Guidance for this monitoring program is provided by the Radiological Assessment Branch Technical Position on Environmental Monitoring. The specified monitoring program is based on baseline/historical conditions for direct radiation measurements, soil, biota, and sediments established over years of operational experience and current site conditions/operating activities. The REMP need only be re-evaluated for major changes to site conditions/configuration (e.g., prior to site decommissioning, if a significant release occurs, changing baseline data...). Program changes may be initiated at any time based on operational experience.

The required detection capabilities for environmental sample analyses are tabulated in terms of the lower limits of detection (LLD). The LLDs required by Table 12.5-3 are considered optimum for routine environmental measurements in industrial laboratories. It should be recognized that the LLD is defined as a before the fact limit representing the capability of a measurement system and not as an after the fact limit for a particular measurement.

Detailed discussion of the LLD, and other detection limits, can be found in HASL Procedures Manual, HASL-300 (revised annually), Currie, LA., "Limits for Qualitative Detection and Quantitative Determination-Application to Radiochemistry," Anal. Chem. **40**, 586-93 (1968), and Gartwell, J.K., "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

Interpretations

- 12.5.1.D Table 12.5-1 requires "one sample of each community drinking water supply downstream of the plant within 10 kilometers (6.2 miles)." Drinking water supply is defined as water taken from river, lakes, or reservoirs (not well water) which is used for drinking. Since Lake Michigan has no designated downstream or upstream direction, two drinking water locations (one north/one south) within 10 kilometers shall be sampled as drinking water indicator locations, and two other locations (one north/one south) beyond 10 kilometers shall be sampled as control locations.

TABLE 12.5-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/ OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS ⁽¹⁾	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
1. <u>Airborne</u>	Samples from a total of three locations: a. Indicator- Near Field Three samples from locations within 4 km (2.5 mi) in different sectors.	Continuous sampler operation with particulate sample collection weekly (or more frequently if required due to dust loading).	<u>Particulate Sampler:</u> Gross beta analysis following weekly filter change ⁽³⁾ and gamma isotopic analysis ⁽⁴⁾ quarterly on composite filters by location on near field samples.

TABLE 12.5-1 (Continued)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/ OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS ⁽¹⁾	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
2. <u>Direct Radiation</u> ⁽⁵⁾	<p>Seventeen routine monitoring stations with thermoluminescent dosimeters (TLD), placed with at least one monitoring location in each meteorological sector, as follows:</p> <p>a. Indicator- Inner Ring (100 Series TLD) in the general area of the SITE BOUNDARY (0.1 to 1.5 mi);</p> <p>b. Other</p> <p>One at each Airborne location given in part 1.a.</p> <p>Other TLDs may be placed at special interest locations beyond the Restricted Area where either a MEMBER OF THE PUBLIC or Commonwealth Edison employees have routine access. (300 Series TLD)</p>	Quarterly	Gamma dose on each TLD quarterly.

TABLE 12.5-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/ OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS ⁽¹⁾	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
3. <u>Waterborne</u>	a. <u>Drinking Water Indicator</u> ⁽⁶⁾ One Sample from each community drinking water supply that could be affected by the station discharge within 10 km (6.2 mi) of discharge (north/south).	Weekly grab samples.	Gross beta and gamma isotopic analyses ⁽⁴⁾ on monthly composite; tritium analysis on quarterly composite.
	b. <u>Control</u> ⁽⁶⁾ One sample upstream and downstream (north/south) of discharge.	Weekly grab samples.	Gross beta and gamma isotopic analyses ⁽⁴⁾ on monthly composite; tritium analysis on quarterly composite.
	c. <u>Sediments</u> At least one sample within 10 km (6.2 mi) of discharge	Semiannually.	Gamma isotopic analysis ⁽⁴⁾ semiannually.

TABLE 12.5-1 (Continued)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/ OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS ⁽¹⁾	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
4. Ingestion	<p>a. <u>Fish Indicator</u></p> <p>Representative samples of commercially and recreationally important species in discharge area.</p>	Semiannually	Gamma isotopic analysis ⁽⁴⁾ on edible portions.
	<p>b. <u>Control</u></p> <p>Representative samples of commercially and recreationally important species not influenced by plant discharge.</p>	Semiannually	Gamma isotopic analysis ⁽⁴⁾ on edible portions.

TABLE 12.5-1 (Continued)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
TABLE NOTATIONS

- (1) Specific parameters of distance and direction from the centerline of the midpoint of the two units and additional description where pertinent, shall be provided for each and every sample location in Table 11-1 of the ODCM Station Annexes. Refer to NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants," October 1978, and to Radiological Assessment Branch Technical Position, Revision 1, November 1979.
- (2) Deleted – No longer applicable.
- (3) Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thorium daughter decay. If gross beta activity in any individual air particulate sample is greater than 10 times the 1999 mean of control samples, then, a gamma isotopic analysis shall be performed on that elevated individual sample.
- (4) Gamma isotopic analysis means the identification and quantification of gamma emitting radionuclides that may be attributable to the effluents from the station.
- (5) One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. Film badges shall not be used as dosimeters for measuring direct radiation. The number of locations is not an absolute number. The number of direct radiation monitoring stations may be reduced according to geographical limitations; e.g., If a station is adjacent to a lake (i.e. Zion), some sectors may be over water thereby reducing the number of dosimeters which could be placed at the indicated distances. The frequency of analysis or readout for TLD systems will depend upon the characteristics of the specific system used and should be selected to obtain optimum dose information with minimal fading.
- (6) Refer to Section 12.5.1.D for interpretation on the applicability of "downstream" and "upstream". If no community drinking water supply exists within 6.2 miles of the discharge, surface water sampling shall be performed.
- (7) Deleted – No longer applicable.
- (8) Deleted – No longer applicable.
- (9) DELETED
- (10) Deleted – No longer applicable.

TABLE 12.5-2

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES*

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GASES (pCi/m ³)	FISH (pCi/kg, wet)
H-3	20,000 ⁽¹⁾		
Mn-54	1,000		30,000
Fe-59	400		10,000
Co-58	1,000		30,000
Co-60	300		10,000
Zn-65	300		20,000
Zr-Nb-95	400		
Cs-134	30	10	1,000
Cs-137	50	20	2,000
Ba-La-140	200		

(1) For drinking water samples. This is 40 CFR Part 141 value. If no drinking water pathway exists, a value of 30,000 pCi/l may be used.

* This table contains reporting levels for analyses beyond the requirements of Table 12.5-1.

TABLE 12.5-3

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS⁽¹⁾LOWER LIMIT OF DETECTION (LLD)⁽²⁾⁽³⁾

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GASES (pCi/m ³)	FISH (pCi/kg, wet)	SEDIMENT (pCi/kg, dry)
Gross Beta	4	0.01	1000	
H-3	2,000 ⁽⁷⁾			
Mn-54	15		130	
Co-58,60	15		130	
Zn-65	30		260	
Zr-Nb-95	15			
Cs-134	15	0.01	100	150
Cs-137	18	0.01	100	180

LOWER LIMIT OF DETECTION (LLD)

TABLE 12.5-3 (Continued)
DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS
TABLE NOTATIONS

- (1) This table contains lower limits of detection for analyses beyond the requirements of Table 12.5-1. This table does not imply that only these nuclides are to be detected and reported; other peaks which are measurable and identifiable in the analyses required by Table 12.5-1 shall be reported in the Annual Radiological Environmental Operating Report.
- (2) Required detection capabilities for thermoluminescent dosimeters used for environmental measurements shall be in accordance with the recommendations of Regulatory Guide 4.13.
- (3) The Lower Limit of Detection (LLD) is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation, the LLD is defined as follows:

$$LLD = \frac{4.66 S_b + 3/t_b}{(E)(V)(2.22)(Y)(\exp(-\lambda\Delta t))}$$

$$LLD \sim \frac{4.66 S_b}{(E)(V)(2.22)(Y)(\exp(-\lambda\Delta t))}$$

Where: $4.66 S_b \gg 3/t_b$

LLD = the "a priori" Lower Limit of Detection (picocuries per unit mass or volume),

S_b = the standard deviation of the background counting rate or of the counting rate of a blank sample, as appropriate (counts per minute),

$$= \frac{\sqrt{\text{Total Counts}}}{t_b}$$

E = the counting efficiency(counts per disintegration),

V = the sample size (units of mass or volume),

2.22 = the number of disintegrations per minute per picocurie,

Y = the fractional radiochemical yield, when applicable,

λ = the radioactive decay constant for the particular radionuclide (sec^{-1}),

t_b = counting time of the background or blank (minutes), and

TABLE 12.5-3 (Continued)
DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS
TABLE NOTATIONS

Δt = the elapsed time between sample collection, or end of the sample collection period, and the time of counting (sec).

Typical values of E, V, Y, and Δt should be used in the calculation.

It should be recognized that the LLD is defined as a before the fact limit representing the capability of a measurement system and not as an after the fact limit for a particular measurement.

Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally, background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Operating Report.

- (4) Deleted – No longer applicable.
- (5) Deleted – No longer applicable.
- (6) Deleted – No longer applicable.
- (7) This is the minimum required LLD, however, environmental samples analyzed off-site will be required to use 200 pCi/l.

12.5.2 LAND USE CENSUS

Operability Requirements

- 12.5.2.A A Land Use Census shall be conducted and shall identify within a distance of 10 km (6.2 mi) the location, in each of the following meteorological sectors, A, J, K, L, M, N, P, Q, and R**, the nearest residence. For dose calculation, a garden will be assumed at the nearest residence.

Applicability: At all times.

Action:

With a Land Use Census identifying location(s) that yields a calculated dose or dose commitment, via the same exposure pathway 20% greater than at a location from which samples are currently being obtained in accordance with Section 12.5.1, add the new location(s) within 30 days to the Radiological Environmental Monitoring Program given in Chapter 11 of the ODCM Station Annexes. The sampling location(s), excluding the control location, having the lowest calculated dose or dose commitment(s), via the same exposure pathway, may be deleted from this monitoring program after October 31 of the year in which this Land Use Census was conducted. Submit in the next Annual Radiological Environmental Operating Report documentation for a change in the ODCM including revised figure(s) and table(s) for the ODCM reflecting the new location(s) with information supporting the change in sampling locations.

** The nearest industrial facility shall also be documented if closer than the nearest residence.

Surveillance Requirements

- 12.5.2.B The Land Use Census shall be conducted, between June 1 and October 1, at least once per calendar year using that information that will provide the best results, such as by a door-to-door survey or aerial survey. The result of the Land Use Census shall be included in the Annual Radiological Environmental Operating Report.

Bases

- 12.5.2.C This specification is provided to ensure that changes in the use of areas at and beyond the SITE BOUNDARY are identified and that modifications to the Radiological Environmental Monitoring Program given in the ODCM are made if required by the results of this census.

This census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR Part 50. An annual garden census will not be required since the licensee will assume that there is a garden at the nearest residence in each sector for dose calculations.

12.5.3 INTERLABORATORY COMPARISON PROGRAM

Operability Requirements

12.5.3.A Analyses shall be performed on radioactive materials supplied as part of an interlaboratory comparison program that correspond to samples required by Table 12.5.1.

Applicability: At all times.

Action:

1. With analyses not being performed as required above, report the corrective actions taken to prevent a recurrence to the Commission in the Annual Radiological Environmental Operating Report.

Surveillance Requirements

12.5.3.B A summary of the results obtained as part of the above required interlaboratory comparison program shall be included in the Annual Radiological Environmental Operating Report.

Bases

12.5.3.C The requirement for participation in an interlaboratory comparison program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental samples matrices are performed as part of the quality assurance program for environmental monitoring in order to demonstrate that the results are valid for the purposes of Section IV.B.2 of Appendix I to 10 CFR Part 50.

12.6 PROCESS CONTROL PROGRAM (PCP)**12.6.1 PCP Program Requirements**

Contains the requirements and methodology for the current formulas, sampling, analyses, tests, and determinations performed to ensure the processing and packaging of solid radioactive wastes based on actual or simulated wet solid wastes is accomplished in compliance with:

- 10CFR Parts 20, 61, and 71
- State Regulations
- Burial Site Requirements
- Other Requirements Governing the Shipping and Burial of Radioactive Waste

12.6.2 Changes to the PCP

Changes to the PCP include those changes that affect the process or methodology, by which wastes are solidified, packaged to meet burial site form requirements, classified, or dewatered.

- 12.6.2.1.** Shall be documented and records of reviews performed shall be retained, and

Shall contain sufficient information to support the change together with the appropriate analyses or evaluations justifying the change(s), and

Shall contain a determination that the change will maintain the overall conformance of the solidified waste product to existing requirements of Federal, State, or other applicable regulations, and

Shall become effective after review and acceptance by the Onsite Review and Investigative Function and the approval of the Decommissioning Plant Manager.

12.7 REPORTING REQUIREMENTS**12.7.1 Annual Radiological Environmental Operating Report***

Routine Annual Radiological Environmental Operating Report covering the operation of the Unit(s) during the previous calendar year shall be submitted according to the Permanently Defueled Technical Specifications. The Annual Radiological Environmental Operating Report shall include summaries, interpretations, and an analysis of trends of the results of the radiological environmental surveillance activities for the report period, including, as found appropriate, a comparison of preoperational studies with operational controls or with previous environmental surveillance reports, and an assessment of the observed impacts of the plant operation on the environment.

The Annual Radiological Environmental Operating Report shall include the results of all radiological environmental samples and of all environmental radiation measurements taken during the period pursuant to the locations specified in the tables and figures in the Chapter 11 of the ODCM Station Annexes, as well as summarized and tabulated results of these analyses and measurements in the format of the table in the Radiological Assessment Branch Technical Position, Revision 1, November 1979. In the event that some individual results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report.

The reports shall also include the following: a summary description of the Radiological Environmental Monitoring Program; legible maps covering all sampling locations keyed to a table giving distances and directions from the midpoint between the two units; reasons for not conducting the Radiological Environmental Monitoring Program as required by Section 12.5.1, and discussion for all deviations from the sampling schedule of Table 11.1-1; a Table of Missed Samples and a Table of Sample Anomalies for all deviations from the sampling schedule of Table 11.1-1; discussion of environmental sample measurements that exceed the reporting levels of Table 12.5-2 but are not the result of plant effluents; discussion of all analyses in which the LLD required by Table 12.5-3 was not achievable; results of the Land Use Census required by Section 12.5.2; and the results of licensee participation in an interlaboratory comparison program and the corrective actions being taken if the specified program is not being performed as required by Section 12.5.3.

The Annual Radiological Environmental Operating Report shall also include an annual summary of hourly meteorological data collected over the applicable year. This annual summary may be either in the form of an hour-by-hour listing on magnetic tape of wind speed, wind direction, atmospheric stability, and precipitation (if measured), or in the form of joint frequency distributions of wind speed, wind direction, and atmospheric stability. In lieu of submission with the Annual Radiological Environmental Operating Report, the licensee has the option of retaining this summary of required meteorological data on site in a file that shall be provided to the NRC upon request.

* A single submittal may be made for a multiple unit station.

The Annual Radiological Environmental Operating Report shall also include an assessment of the radiation doses due to the radioactive liquid and gaseous effluents released from the Unit or Station during the previous calendar year. This report shall also include an assessment of radiation doses to the most likely exposed MEMBER OF THE PUBLIC from reactor releases and other nearby uranium fuel cycle sources, including doses from primary effluent pathways and direct radiation, for the previous calendar year. The assessment of radiation doses shall be performed in accordance with the methodology and parameters in the ODCM and in compliance with 10 CFR 20 and 40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operation."

12.7.2 Annual Radioactive Effluent Release Report**

The Annual Radioactive Effluent Release Reports shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit as outlined in Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Material in Liquid and Gaseous Effluent from Light-Water-Cooled Nuclear Power Plants," Revision 1, June 1974, with data summarized on a quarterly basis following the format of Appendix B thereof.

The Annual Radioactive Effluent Release Report shall include a list and description of unplanned releases of radioactive material in liquid effluents from the site to UNRESTRICTED AREAS and of unplanned releases of radioactive material in gaseous effluents from the site to areas at or beyond the SITE BOUNDARY during the reporting period.

The Annual Radioactive Effluent Release Report shall include any changes made during the reporting period to the Process Control Program as well as any major changes to Liquid, Gaseous or Solid Radwaste Treatment Systems, pursuant to Section 12.7.4.

The Annual Radioactive Effluent Release Report shall also include the following: an explanation as to why the inoperability of liquid or gaseous effluent monitoring instrumentation was not corrected within the time specified in Section 12.2.1 or 12.2.2, respectively; and description of the events leading to liquid holdup tanks exceeding the limits of the Permanently Defueled Technical Specifications.

12.7.2.1 Exceptions to Regulatory Guide 1.21 Reporting Requirements:

- a. All references to "semiannual" are not applicable. The report will be submitted according to Technical Specifications.
- b. Hourly meteorological data is recorded for all periods throughout the year, and quarterly summaries will be reported. Separate meteorological data for periods of batch releases are not required to be included.
- c. Total body and significant organ doses to the maximally exposed individual from receiving-water-related exposure pathways will be provided. Associated population dose is not required to be included.

12.7.3 Offsite Dose Calculation Manual (ODCM)**12.7.3.1 Changes to the ODCM:**

- a. Shall be documented and records of reviews performed shall be retained as required by Permanently Defueled Technical Specifications. This documentation shall contain:
 - 1. Sufficient Information to support the change together with the appropriate analyses or evaluations justifying the change(s); and
 - 2. A determination that the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR Part 50 and not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations.
 - 3. Documentation of the fact that the change has been reviewed and found acceptable by a Qualified Technical Review.
- b. Shall become effective after the approval of the Plant Manager on the date specified by the Qualified Technical Review.
- c. Shall be submitted to the Commission in the form of a complete, legible copy of the entire ODCM as a part of or concurrent with the Annual Radioactive Effluent Release Report for the period of the report in which any change to the ODCM was made effective. Each change shall be identified by markings in the margin of the affected pages, clearly indicating the area of the page that was changed, and shall indicate the date (e.g., month/year) the change was implemented.

12.7.3 Offsite Dose Calculation Manual (ODCM)**12.7.3.1 Changes to the ODCM:**

- a. Shall be documented and records of reviews performed shall be retained as required by Permanently Defueled Technical Specifications. This documentation shall contain:
 - 1. Sufficient Information to support the change together with the appropriate analyses or evaluations justifying the change(s); and
 - 2. A determination that the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR Part 50 and not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations.
 - 3. Documentation of the fact that the change has been reviewed and found acceptable by a Qualified Technical Review.
- b. Shall become effective after the approval of the Plant Manager on the date specified by the Qualified Technical Review.
- c. Shall be submitted to the Commission in the form of a complete, legible copy of the entire ODCM as a part of or concurrent with the Annual Radioactive Effluent Release Report for the period of the report in which any change to the ODCM was made effective. Each change shall be identified by markings in the margin of the affected pages, clearly indicating the area of the page that was changed, and shall indicate the date (e.g., month/year) the change was implemented.

12.7.4 Major Changes to Liquid and Gaseous Effluent Treatment Systems***

Licensee-initiated major changes to the Effluent Treatment Systems (liquid and gaseous):

- a. Shall be reported to the Commission in the Annual Radioactive Effluent Release Report for the period in which the evaluation was reviewed by a Qualified Technical Review. The discussion of each change shall contain:
 - 1) A summary of the evaluation that led to the determination that the change could be made in accordance with 10 CFR 50.59;
 - 2) Sufficient detailed information to totally support the reason for the change without benefit of additional and supplemental information;
 - 3) A detailed description of the equipment, components, and processes involved and the interfaces with other plant systems.
 - 4) An evaluation of the change which shows the predicted releases of radioactive materials in liquid and gaseous effluents that differ from those previously predicted in the License application and amendments thereto;
 - 5) An evaluation of the change, which shows the expected maximum exposures to a MEMBER OF THE PUBLIC and to the general population that differ from those previously estimated in the License application and amendments thereto;
 - 6) A comparison of the predicted releases of radioactive materials, in liquid and gaseous effluents, to the actual releases for the period prior to when the changes are to be made;
 - 7) An estimate of the exposure to plant operating personnel as a result of the change; and
 - 8) Documentation of the fact that the change was reviewed and found acceptable by a Qualified Technical Review.
- b. Shall become effective upon review and acceptance by the Qualified Technical Review.

*** Licensees may choose to submit the information called for in this standard as part of the biennial DSAR update.

June 12, 2003

Qualified Technical Review = TR/008/2003

To: Mr. Artice Daniels Jr.


Subject; Qualified Technical Review of Chapter 12 Revision 10 to the Offsite Dose Calculation Manual (ODCM).

Pursuant to the ODCM Section 12.7.3 and Technical Specifications 5.6.1 and 5.9.1, the following basis for revisions to the ODCM and the documentation of the Qualified Technical review is attached.

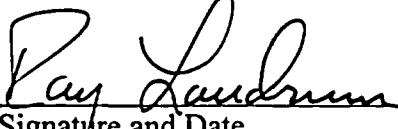
Section 12.7.3 of the ODCM requires a Qualified Technical Review be performed. This review will be performed by at least two qualified individuals with the appropriate ANSI disciplines and approved by the Decommissioned Plant Manager.

Engineering Assigned Disciplines for this Qualified Technical Review are:


ABD

Disciplines are assigned by  Date 6-12-03

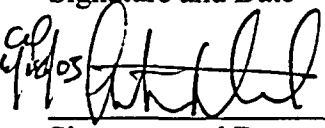
Qualified Technical Reviewers

 6/13/03
Signature and Date RED 6/17/2003

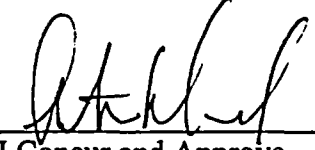
ABG
Disciplines

 6-15-2003
Signature and Date

D, F
Disciplines


Signature and Date

Disciplines


I Concur and Approve

6/12/03
Date

Artice Daniels Jr.
Decommissioning Plant Manager
Zion Station

ATTACHMENT C: 50.59 REVIEW COVERSHEET FORM

Station: Zion Station

Activity/Document Number: ODCM Chapter 12 **Revision Number:** 10

Title: Offsite Dose Calculation Manual

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:

(Provide a brief, concise description of what the proposed activity involves.)

The ODCM provides a method to sample, collect, analyze, and calculate the effluent streams in the determination of Radiological dose to the public.

- The activity associated with this revision is to replace 2 area rad monitors and to remove the word "portable" when referring to a pump that provides flow to the associated rad monitors. Remove the associated footnote that applied to the old monitor.
- Remove the word "portable" from the compensatory measures in maintaining flow to rad monitors.
- Add the phrase "with a load suspended from the hook." For the source check operations of the fuel building crane rad monitor.

Reason for Activity:

(Discuss why the proposed activity is being performed.)

- The rad monitors are being changed so that an interface with a new computer system can occur. The end result will be the transmission of data to the Illinois Department of Nuclear Safety. Footnote associated with the "old" rad monitor is no longer applicable.
- The removal of the word portable from the compensatory measures will allow the installation of any pump that can provide the required flow to the monitor.
- Define the expectations for source check of the rad monitor.

Effect of Activity:

(Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.)

- The rad monitor change will provide an upgrade in technology that will interface with existing computer system. Remove a footnote that is no longer applicable.
- The removal of the word "portable" will allow for the station to provide the required sample flow to the unit specific PR-49 rad monitor using the existing sample pump during trouble shooting, testing or repairs.
- Describe the circumstances in which the rad monitor shall be source checked.

Summary of Conclusion for the Activity's 50.59 Review:

(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.)

The area rad monitors that are currently in place provide an analog readout that is not compatible with the computer that interfaces with the Illinois Department of Nuclear Safety. It became the objective of this plant modification to purchase and install area rad monitors that provide a digital output that input into the computer system that provides data for the Illinois Department of Nuclear Safety. Remove a footnote that is no longer applicable to a rad monitor that is being removed from the ODCM.

The removal of the word "portable" from the compensatory measures allows the station the flexibility to maintain regulated flow to the appropriate rad monitor during repairs, trouble shooting, or calibration so that the instrumentation can be verified to meet all operational criteria prior to the termination of the work request and cancellation of the out of Service.

Give better directions as to when the rad monitor associated with the Fuel Building Crane shall have a source check performed.

Screening of this change to the ODCM is not required. Using attachment D section 1-8 Programs controlled by the Operating License or the Technical Specifications (such as the ODCM) have an establish criteria for changes to be made to this documentation.

Attachments:

Attach all 50.59 Review forms completed, as appropriate.

(NOTE: if both a Screening and Evaluation are completed, no Screening No. is required.)

ATTACHMENT C: 50.59 REVIEW COVERSHEET FORM

Station: Zion Station

Activity/Document Number: ODCM Chapter 12 **Revision Number:** 10

Title: Offsite Dose Calculation Manual

Forms Attached: (Check all that apply.)

<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

Applicability Review

50.59 Screening

50.59 Screening No.

Rev.

50.59 Evaluation

50.59 Evaluation No.

Rev.

ATTACHMENT D: 50.59 APPLICABILITY REVIEW FORM

Activity/Document Number: ODCM CHAPTER 12 Revision Number: 10
Address the questions below for all aspects of the Activity. If the answer is yes for any portion of the Activity, apply the identified process(es) to that portion of the Activity. Note that it is not unusual to have more than one process apply to a given Activity. See Section 4 of the Resource Manual (RM) for additional guidance.

I. Does the proposed Activity involve a change:		
1. Technical Specifications or Operating License (10CFR50.90)?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.1.1 of the RM
2. Conditions of License Quality Assurance program (10CFR50.54(a))? Security Plan (10CFR50.54(p))? Emergency Plan (10CFR50.54(q))?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.1.2 of the RM
3. Codes and Standards IST Program Plan (10CFR50.55a(f))? ISI Program Plan (10CFR50.55a(g))?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.1.3 of the RM
4. ECCS Acceptance Criteria (10CFR50.46)?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.1.4 of the RM
5. Specific Exemptions (10CFR50.12)?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.1.5 of the RM
6. Radiation Protection Program (10CFR20)?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.1.6 of the RM
7. Fire Protection Program (applicable UFSAR or operating license condition)?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.1.7 of the RM
8. Programs controlled by the Operating License or the Technical Specifications (such as the ODCM).	<input type="checkbox"/> NO <input checked="" type="checkbox"/> YES	See Section 4.2.1.7 of the RM
9. Environmental Protection Program	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.1.7 of the RM
10. Other programs controlled by other regulations.	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.1 of the RM
II. Does the proposed Activity involve maintenance which restores SSCs to their original condition or involve a temporary alteration supporting maintenance that will be in effect during at-power operations for 90 days or less?		
	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.2 of the RM
III. Does the proposed Activity involve a change to the:		
1. UFSAR (including documents incorporated by reference) that is excluded from the requirement to perform a 50.59 Review by NEI 96-07 or NEI 98-03?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.3 of the RM
2. Managerial or administrative procedures governing the conduct of facility operations	<input type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.4 of the RM
3. Procedures for performing maintenance activities (subject to 10 CFR 50.65(a)(4))?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.4 of the RM
4. Regulatory commitment not covered by another regulation based change process (see NEI 99-04)?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.3/4.2.4 of the RM
IV. Does the proposed Activity involve a change to the Independent Spent Fuel Storage Installation (ISFSI) (subject to control by 10 CFR 72.48)		
	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.6 of the RM

Check one of the following:

If all aspects of the Activity are controlled by one or more of the above processes, then a 50.59 Screening is not required and the Activity may be implemented in accordance with its governing procedure.

If any portion of the Activity is not controlled by one or more of the above processes, then process a 50.59 Screening for the portion not covered by any of the above processes. The remaining portion of the activity should be implemented in accordance with its governing procedure.

Signoff:

50.59 Screener/50.59 Evaluator: (Circle One)

Row Schuster
(Print name)

Sign: [Signature]
(Signature)

Date: 6/12/2003

Summary of the Changes
made to
Zion Station
Offsite Dose Calculation Manual
ODCM

Change the numeric nomenclature for the installation of new area rad monitors.

Table 12.2-3

3.C.1. Change ORT-AR03 to ORT-AR21

3.C.2. Change ORE-005 to ORT-AR22

Footnote to this table:

³ The auto control function on high alarm is no longer required for this monitor (i.e., does not need to be maintained operable for the monitor to be operable).

This footnote is was applicable to the ORT-AR03, which is being removed from the ODCM.

Remove the word portable for the maintaining of sample flow to the monitor or sample point.

Table 12.2-3

Surveillance 10

Rev 9	Rev 10
With the number of OPERABLE channels less than the minimum number required, restore the channel to OPERABLE status within 30 days or conduct a station review to determine a plan of action to restore the channel to OPERABLE status. Effluent releases via this pathway may continue provided grab samples are obtained and analyzed for gross activity at least once per day, OR for the case when the associated LP-084 panel is inoperable, continuous sampling is maintained with a portable pump and Operations performs a Channel Check Daily. Compensatory sampling does not return the monitor to an OPERABLE status.	With the number of OPERABLE channels less than the minimum number required, restore the channel to OPERABLE status within 30 days or conduct a station review to determine a plan of action to restore the channel to OPERABLE status. Effluent releases via this pathway may continue provided grab samples are obtained and analyzed for gross activity at least once per day, OR for the case when the associated LP-084 panel is inoperable, continuous sampling is maintained with a pump and Operations performs a Channel Check Daily. Compensatory sampling does not return the monitor to an OPERABLE status.

Remove the word portable for the maintaining of sample flow to the monitor or sample point.

Table 12.2-3

Surveillance 11

Rev 9	Rev 10
With the number of OPERABLE channels less than the minimum number required, restore the	With the number of OPERABLE channels less than the minimum number required, restore the

channel to OPERABLE status within 30 days or conduct a station review to determine a plan of action to restore the channel to OPERABLE status. Effluent releases via this pathway may continue provided samples are continuously collected as required in Table 12.4-1. For the case when the associated LP-084 panel is inoperable, continuous sampling can be maintained with a portable pump and Operations shall perform a Channel Check Daily. Compensatory sampling does not return the monitor to an OPERABLE status.	channel to OPERABLE status within 30 days or conduct a station review to determine a plan of action to restore the channel to OPERABLE status. Effluent releases via this pathway may continue provided samples are continuously collected as required in Table 12.4-1. For the case when the associated LP-084 panel is inoperable, continuous sampling can be maintained with a pump and Operations shall perform a Channel Check Daily. Compensatory sampling does not return the monitor to an OPERABLE status.
--	---

Change the numeric nomenclature for the installation of new area rad monitors.

Table 12.2-4

3.C.1. Change ORT-AR03 to ORT-AR21

3.C.2. Change ORE-005 to ORT-AR22

Table 12.2-4

Notations

(3) Daily during operations of overhead crane in by pass mode.

Change to "Daily during operations of overhead crane in by pass mode with a load suspended from the hook."

Letter to File:

Date: July 1, 2003

Subject; Implementation of the ODCM Rev 11

In the process of changing the Offsite Dose Calculation Manual it has been discovered that there were two independent changes occurring simultaneously. This letter is being used to capture the sequence of events.

At the beginning of the process this change was being implemented to account for the change out of the new area monitors in the Fuel building. During this process another change to the ODCM was being performed for the discharge of effluents to lake Michigan.

All of the paper work associated with the area monitors was to change Rev. 9 to Rev 10. In actuality this change should have been Rev. 10 to Rev. 11.

After consultation with the Department Head of Administration this cover letter was generated to capture the changes and the discrepancy in the paperwork as submitted.

A handwritten signature in black ink, appearing to read 'Ron Schuster', with a long horizontal flourish extending to the right.

Ron Schuster
RPM

SPECIAL NOTE

The requirements of Permanently Defueled Technical Specifications shall take precedence over this chapter, should any differences occur.

CHAPTER 12

REVISION 11

|

CHAPTER 12

RADIOLOGICAL EFFLUENT TECHNICAL STANDARDS
(RETS)
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CHAPTER 12

RADIOACTIVE EFFLUENT TECHNICAL STANDARDS
(RETS)
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12.1 DEFINITIONS

- 12.1.1 A BATCH RELEASE is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated and then thoroughly mixed to assure representative sampling.
- 12.1.2 A CHANNEL CALIBRATION, shall be the adjustment, as necessary, of the channel such that it responds with the necessary range and accuracy to known values of input. The CHANNEL CALIBRATION shall encompass the entire channel including the sensors (where possible), alarm interlock and/or trip functions and shall include the CHANNEL FUNCTIONAL TEST. The CHANNEL CALIBRATION may be performed by any series of sequential, overlapping, or total channel steps such that the entire channel is calibrated.
- 12.1.3 A CHANNEL CHECK shall be the qualitative assessment of channel behavior during operation by observation. This determination shall include, where possible, comparison of the channel indication and/or status with other indications and/or status derived from independent INSTRUMENT CHANNELS measuring the same parameter.
- 12.1.4 A CHANNEL FUNCTIONAL CHECK shall be:
- a. Instruments-The injection of a simulated signal(s) into the channel as close to the primary sensor(s) as practicable to verify OPERABILITY, including all channel outputs, as appropriate.
 - b. Logics-The application of input signals, or the operation of relays or switch contacts, in all the combinations required to produce the required decision outputs including the operation of all ACTUATION DEVICES. Where practicable, the test shall include the operation of the ACTUATED EQUIPMENT as well (i.e. pumps will be started, valves operated, etc.).
- 12.1.5 A COMPOSITE SAMPLE is one in which the quantity of liquid sample is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen which is representative of the liquids released.
- 12.1.6 A CONTINUOUS RELEASE is the discharge of liquid or gaseous wastes of a nondiscrete volume (e.g. from a volume or system that has an input flow during the release).
- 12.1.7 CONTINUOUS SAMPLING is uninterrupted sampling with the exception of sampling interruptions of short duration for routine activities (e.g. filter replacements).
- 12.1.8 DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcurie/gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The Thyroid Dose Conversion factors used for this calculation shall be those listed in Table III of TID-14844, "Calculation of Distance Factors for Power and Test Reactor Sites" or Table E-7 of NRC Regulatory Guide 1.109 Rev. 1, dated October, 1977. This definition is not used in the defueled condition. Decay has eliminated all concerns related to radioactive iodine.
- 12.1.9 MEMBER OF THE PUBLIC means any individual except when that individual is receiving an occupational dose.

- 12.1.10 OCCUPATIONAL DOSE means the dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to radiation and/or radioactive material from licensed and unlicensed sources of radiation, whether in the possession of the licensee or other person. Occupational dose does not include dose from background radiation, as a patient from medical practices, from voluntary participation in medical research programs, or as a member of the public.
- 12.1.11 OPERABLE - A system, subsystem, train, component or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s), and when all necessary attendant instrumentation, controls, electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function(s) are also capable of performing their related support function(s).
- 12.1.12 OPERATING is defined as performing the intended function in the intended manner.
- 12.1.13 The OPERATING CYCLE: DELETED
- 12.1.14 An OPERATIONAL MODE: DELETED
- 12.1.15 The PROCESS CONTROL PROGRAM (PCP) shall contain the current formulas, sampling, analyses, test, and determinations to be made to ensure that processing and packaging of solid radioactive wastes based on demonstrated processing of actual or simulated wet solid wastes will be accomplished in such a way as to assure compliance with 10CFR Parts 20, 61, and 71, State regulations, burial ground requirements, and other requirements governing the disposal of solid radioactive waste.
- 12.1.16 PURGE OR PURGING is the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating condition, in such a manner, that replacement air or gas is required to purify the confinement.
- 12.1.17 RATED THERMAL POWER: DELETED
- 12.1.18 The REACTOR PRESSURE: DELETED
- 12.1.19 The SITE BOUNDARY shall be that line beyond which the land is not owned, leased or otherwise controlled by the licensee.
- 12.1.20 SOLIDIFICATION shall be the conversion of radioactive liquid, resin and sludge wastes from liquid systems into a form that meets shipping and burial site requirements.
- 12.1.21 A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a radioactive source.

- 12.1.22 SURVEILLANCE shall be those parts of the sections which prescribe remedial measures required under designated conditions, activities required to demonstrate instrument operability, and activities performed to ensure applicable offsite dose limits are not exceeded.
- 12.1.23 The SURVEILLANCE FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 12.1-1.
- 12.1.24 THERMAL POWER: DELETED
- 12.1.25 UNRESTRICTED AREA means an area, access to which is neither limited nor controlled by the licensee.
- 12.1.26 GASEOUS EFFLUENT TREATMENT SYSTEM shall be any system designed and installed to reduce radioactive material in particulate form in effluents by passing ventilation through HEPA filters for the purpose of removing particulates from the gaseous exhaust stream prior to the release to the environment. Such a system is not considered to have any affect on noble gas effluents. The iodine removal function is no longer used in the defueled condition.
- 12.1.27 VENTING is the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating condition, in such a manner that replacement air or gas is not provided or required during venting. Vent, used in system names, does not imply a venting process.
- 12.1.28 WASTE GAS HOLDUP SYSTEM: DELETED

TABLE 12.1-1
SURVEILLANCE FREQUENCY NOTATIONS

<u>NOTATION</u>		<u>FREQUENCY *</u>
S	(Shiftly)	At least once per 12 hours
D	(Daily)	At least once per 24 hours
W	(Weekly)	At least once per 7 days
M	(Monthly)	At least once per 31 days
Q	(Quarterly)	At least once per 92 days
SA	(Semiannually)	At least once per 184 days
A	(Annually)	At least once per 366 days
R		At least once per 18 months
P	(Prior)	Complete prior to start of release
N/A		Not Applicable

* Each Surveillance Requirement shall be performed within the specified time interval with a maximum allowable extension not to exceed 25% of the surveillance interval. These frequency notations do not apply to the Radiological Environmental Monitoring Program as described in Section 12.5.

12.2 INSTRUMENTATION**12.2.1 Radioactive Liquid Plant Monitoring Instrumentation****Operability Requirements**

- 12.2.1.A The radioactive liquid plant monitoring instrumentation channels shown in Table 12.2-1 shall be OPERABLE AND, the radioactive liquid effluent monitoring instrumentation channels shall have their alarm/trip setpoints set to ensure that the limits of Section 12.3.1.A are met.**

Applicability: As indicated in Table 12.2-3.

Action

- 1. With a radioactive liquid effluent monitoring instrument channel trip setpoint less conservative than the value necessary to prevent violating the limits of Section 12.3.1.A, immediately suspend the release of radioactive liquid effluents monitored by the affected channel or declare the channel inoperable.**
- 2. With one or more radioactive liquid plant monitoring instrumentation channels inoperable, initiate the SURVEILLANCE requirement delineated in Table 12.2-1.**

Surveillance Requirements

- 12.2.1.B.1 The liquid effluent monitor setpoints shall be determined in accordance with procedures as described in the ODCM.**
- 12.2.1.B.2 Each radioactive liquid plant monitoring instrumentation channel shall be demonstrated OPERABLE by performance of a CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST at the frequencies shown in Table 12.2-2.**

Bases

- 12.2.1.C The radioactive liquid plant monitoring instrumentation is provided to indicate abnormal radiological conditions within the plant, AND,**

The radioactive liquid effluent instrumentation is provided to monitor and control, as applicable, the release of radioactive materials in liquid effluents. The alarm/trip setpoints for these instruments shall be calculated in accordance with the procedures in the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of RETS. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63 and 64 of Appendix A to 10CFR Part 50.

TABLE 12.2-1RADIOACTIVE LIQUID PLANT MONITORING INSTRUMENTATION

<u>INSTRUMENT</u>	<u>MINIMUM CHANNELS OPERABLE</u>	<u>SURVEILLANCE #</u>	<u>APPLICABLE CONDITION</u>
1. Liquid Effluent Monitors Providing Automatic Termination of Release			
A. Boric Acid Monitor Tank (BAMT)			
1. OR-PR05	See SURVEILLANCE 1	1	Liquid Release through this Pathway
B. Turbine Bldg.			
1. OR-PR25	1	2	Liquid Release through this Pathway
2. Effluent Continuous Composite Sampler			
A. Turbine Building Fire Sump	1	2	All Times
3. Effluent Flow Rate Monitor			
A. Boric Acid Monitor Tank			
1. OFI-WD005	1	3	Liquid Release through this Pathway
4. Plant System Monitors			
NONE			

TABLE 12.2-1
RADIOACTIVE LIQUID PLANT MONITORING INSTRUMENTATION
(Cont'd)

SURVEILLANCE 1	<p>If the monitor is inoperable, effluent releases from the tank may continue for up to 14 days, provided that prior to initiating the release:</p> <ol style="list-style-type: none">1. At least two independent samples of the tank's contents are analyzed, in accordance with Section 12.3.1.B.1, and2. At least two technically qualified members of the facility staff independently verify the release-rate calculations and discharge flow path valving; <p>Otherwise, suspend release of radioactive effluents via this pathway.</p>
SURVEILLANCE 2	<p>With the number of channels OPERABLE less the minimum number required, effluent releases via this pathway may continue, provided that at least once per day grab samples are analyzed for gross radioactivity (beta /gamma or isotopic) at a lower limit of detection (LLD) as specified in Table 12.3-2. Restore the channel to operable status within 30 days or conduct a station review to determine a plan of action to restore the channel to operable status.</p>
SURVEILLANCE 3	<p>With the number of channels OPERABLE less than the minimum number required, effluent releases via this pathway may continue, for up to 30 days provided the flow rate is estimated at least once per 4 hours during actual releases. Pump curves may be used to estimate flow.</p>

TABLE 12.2-2RADIOACTIVE LIQUID PLANT MONITORING INSTRUMENTATION SURVEILLANCE

<u>INSTRUMENT</u>	<u>CHANNEL CHECK</u>	<u>SOURCE CHECK</u>	<u>CHANNEL CALIBRATION(1)</u>	<u>CHANNEL FUNCTIONAL TEST (2)</u>
1. Liquid Effluent Monitors Providing Automatic Termination Of Release				
A. Boric Acid Monitor Tank (BAMT)				
1. 0R-PR05	P	P	R	Q
B. Turbine Bldg.				
1. 0R-PR25	D	M	R	Q
2. Effluent Continuous Composite Sampler				
A. Turbine Building Fire Sump	D	N/A	N/A	N/A
3. Effluent Flow Rate Monitor				
A. Boric Acid Monitor Tank (BAMT)				
1. OFI-WD005	D(3)	N/A	R(4)	N/A
4. Plant System Monitors				
NONE				

(1) CHANNEL CALIBRATION shall include performance of a CHANNEL FUNCTIONAL TEST.

(2) The CHANNEL FUNCTIONAL TEST shall also demonstrate that any automatic isolation of this pathway occurs and that control room alarm annunciation occurs if any of the following conditions exist. (if the capability is installed):

- a) Instrument indicates levels above the alarm setpoints.
- b) Circuit failure.
- c) Instrument indicates a downscale failure.
- d) Instrument controls not set in operate mode.

(3) CHANNEL CHECK shall consist of verifying indications of flow during periods of release. CHANNEL CHECK shall be made at least once daily on any day on which continuous, periodic, or BATCH RELEASES are made.

(4) Does not include flow sensor.

12.2.2 Radioactive Plant Monitoring Instrumentation

Operability Requirements

- 12.2.2.A The radioactive plant monitoring instrumentation channels shown in Table 12.2-3 shall be OPERABLE, AND, the radioactive gaseous effluent monitoring instrumentation shall have their alarm/trip setpoints set in accordance with the method prescribed in the ODCM to ensure that the limits of Section 12.4.1.A are met.

Applicability: As indicated in Table 12.2-3.

Action

1. With a radioactive gaseous effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above Section, immediately suspend the release of radioactive gaseous effluents monitored by the affected channel or declare the channel inoperable.
2. With one or more radioactive plant monitoring instrumentation channels inoperable, initiate the SURVEILLANCE requirement as delineated in Table 12.2-3.

Surveillance Requirements

- 12.2.2.B.1 The effluent monitor setpoints shall be determined in accordance with procedures as described in the ODCM.
- 12.2.2.B.2 Each radioactive plant monitoring instrumentation channel shall be demonstrated OPERABLE, when in its APPLICABLE CONDITION, by performance of a CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST at the frequencies shown in Table 12.2-4.

Bases

- 12.2.2.C The radioactive plant monitoring instrumentation is provided to indicate abnormal radiological conditions within the plant, AND,
- The radioactive gaseous effluent instrumentation is provided to monitor, record and control, as applicable, the release of radioactive materials in gaseous effluents during actual or potential releases. The alarm/trip setpoints for these instruments shall be calculated in accordance with the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of 10CFR Part 20.
- An Auxiliary Building (AB) ventilation stack is considered available as a release path from radiologically controlled areas of the Auxiliary Building when any AB exhaust fan is discharging to that stack, or any one of the AB exhaust fan dampers is open on that stack.
- An Auxiliary Building ventilation stack is unavailable as a release path from radiologically controlled areas of the Auxiliary Building when all AB exhaust fan dampers for that stack are mechanically blocked closed.

TABLE 12.2-3
RADIOACTIVE PLANT MONITORING INSTRUMENTATION

<u>INSTRUMENT</u>	<u>MINIMUM CHANNELS OPERABLE</u>	<u>SURVEILLANCE</u>	<u>APPLICABLE CONDITION</u>
1. <u>Effluent Containment Purge or Vent</u>			
A. Particulate Monitor			
1. 1R-PR40A (Channel 1)	1	6 ¹ , 7 ²	Venting or Purging
2. 2R-PR40A (Channel 1)	1	6 ¹ , 7 ²	Venting or Purging
2. <u>Aux Building Effluent Monitoring</u>			
A. Gas Activity Monitor			
1. 1R-PR49E (Channel 5)	1	10	*
2. 2R-PR49E (Channel 5)	1	10	**
B. Particulate Monitor			
1. 1R-PR49A (Channel 1)	1	11	*
2. 2R-PR49A (Channel 1)	1	11	**
C. Flow Rate Monitor			
1. 1LP-084	1	8	*
2. 2LP-084	1	8	**
* Whenever the Unit 1 stack is available as a release path from the Auxiliary Building.			
** Whenever the Unit 2 stack is available as a release path from the Auxiliary Building.			
3. <u>Fuel Building Monitoring</u>			
A. Gas Activity Monitor			
1. 0RT-PR30A	1	10	All Times
B. Particulate Monitor			
1. 0RT-PR30B	1	11	All Times
C. Area Monitoring			
1. 0RT-AR21	1	12	When fuel is present
2. 0RT-AR22	1	14	When fuel is present
3. 0RT-AR13	1	13	When fuel building crane is operated with a load on either hook in the bypass mode

¹ During VENTING² During PURGING

TABLE 12.2-3RADIOACTIVE PLANT MONITORING INSTRUMENTATION
(Cont'd)

<u>INSTRUMENT</u>	<u>MINIMUM CHANNELS OPERABLE</u>	<u>SURVEILLANCE</u>	<u>APPLICABLE CONDITION</u>
4. <u>Emergency Monitoring</u>			
A. Ventilation			
1. 1RIA-PR49 (Channel 7)	1	9	*
2. 2RIA-PR49 (Channel 7)	1	9	**
3. 1RIA-PR49 (Channel 9)	1	9	*
4. 2RIA-PR49 (Channel 9)	1	9	**

- * Whenever the Unit 1 stack is available as a release path from the Auxiliary Building.
** Whenever the Unit 2 stack is available as a release path from the Auxiliary Building.

TABLE 12.2-3RADIOACTIVE PLANT MONITORING INSTRUMENTATION
(Cont'd)TABLE NOTATIONS

SURVEILLANCE 6 -	With the number of channels OPERABLE less than the minimum number required, effluent releases via this pathway may continue for up to 30 days provided grab samples are obtained and analyzed for gross activity at least once per day.
SURVEILLANCE 7 -	With the number of channels OPERABLE less than the minimum number required, and no redundant monitor OPERABLE in this flow path, immediately suspend PURGING of radioactive effluents via this pathway.
SURVEILLANCE 8 -	Effluent releases via this pathway may continue provided the effluent flow rate is estimated at least once per day while a release is in progress. Restore the inoperable panel to OPERABLE status within 30 days OR conduct a station review to determine a plan of action to restore the panel to OPERABLE status.
SURVEILLANCE 9 -	With the number of channels OPERABLE less than the minimum number required, restore the inoperable monitor to OPERABLE status within 30 days OR conduct a station review to determine a plan of action to restore the channel to OPERABLE status.
SURVEILLANCE 10 -	With the number of OPERABLE channels less than the minimum number required, restore the channel to OPERABLE status within 30 days or conduct a station review to determine a plan of action to restore the channel to OPERABLE status. Effluent releases via this pathway may continue provided grab samples are obtained and analyzed for gross activity at least once per day, OR for the case when the associated LP-084 panel is inoperable, continuous sampling is maintained with a pump and Operations performs a Channel Check Daily. Compensatory sampling does not return the monitor to an OPERABLE status.
SURVEILLANCE 11 -	With the number of OPERABLE channels less than the minimum number required, restore the channel to OPERABLE status within 30 days or conduct a station review to determine a plan of action to restore the channel to OPERABLE status. Effluent releases via this pathway may continue provided samples are continuously collected as required in Table 12.4-1. For the case when the associated LP-084 panel is inoperable, continuous sampling can be maintained with a pump and Operations shall perform a Channel Check Daily. Compensatory sampling does not return the monitor to an OPERABLE status.
SURVEILLANCE 12-	With the number of channels OPERABLE less than the minimum required, stop all movement of fuel within the spent fuel pool and crane operation with loads over the spent fuel pool <u>AND</u> perform area surveys of the monitored area at least once per day.
SURVEILLANCE 13	With the number of channels OPERABLE less than the minimum required, stop operation of overhead crane in bypass after placing loads in safe condition.
SURVEILLANCE 14	Perform area surveys of the monitored area at least once per day.

TABLE 12.2-4RADIOACTIVE PLANT MONITORING INSTRUMENTATION SURVEILLANCE

	<u>CHANNEL CHECK</u>	<u>SOURCE CHECK</u>	<u>CHANNEL CALIBRATION (1)</u>	<u>CHANNEL FUNCTIONAL TEST (2)</u>
1. <u>Effluent Containment Purge or Vent</u>				
A. Particulate Monitor				
1. 1R-PR40A (Channel 1)	D	M	R	Q
2. 2R-PR40A (Channel 1)	D	M	R	Q
2. <u>Aux Building Effluent Monitoring</u>				
A. Gas Activity Monitor				
1. 1R-PR49E (Channel 5)	D	M	R	Q
2. 2R-PR49E (Channel 5)	D	M	R	Q
B. Particulate Monitor				
1. 1R-PR49A (Channel 1)	D	M	R	Q
2. 2R-PR49A (Channel 1)	D	M	R	Q
C. Flow Rate Monitor				
1. 1LP-084	D	N/A	R	Q
2. 2LP-084	D	N/A	R	Q
3. <u>Fuel Building Monitoring</u>				
A. Gas Activity Monitor				
1. 0RT-PR30A	D	M	A	N/A
B. Particulate Monitor				
1. 0RT-PR30B	D	M	A	N/A
C. Area Monitoring				
1. 0RT-AR21	D	M(4)	R	Q
2. 0RT-AR22	D	M	R	Q
3. 0RT-AR13	D	M(3)	R	Q

TABLE 12.2-4RADIOACTIVE PLANT MONITORING INSTRUMENTATION SURVEILLANCE
(Cont'd)

<u>INSTRUMENT</u>	<u>CHANNEL CHECK</u>	<u>SOURCE CHECK</u>	<u>CHANNEL CALIBRATION (1)</u>	<u>CHANNEL FUNCTIONAL TEST (2)</u>
4. <u>Emergency Monitoring</u>				
A. Ventilation				
1. 1RIA-PR49 (Channel 7)	N/A	N/A	R	Q
2. 2RIA-PR49 (Channel 7)	N/A	N/A	R	Q
3. 1RIA-PR49 (Channel 9)	N/A	N/A	R	Q
4. 2RIA-PR49 (Channel 9)	N/A	N/A	R	Q

Table 12.2-4RADIOACTIVE PLANT MONITORING INSTRUMENTATION SURVEILLANCE
(Cont'd)TABLE NOTATIONS

- (1) CHANNEL CALIBRATION shall include performance of a CHANNEL FUNCTIONAL TEST.
- (2) The CHANNEL FUNCTIONAL TEST shall also demonstrate that any automatic isolation occurs; and that Control Room alarm annunciation occurs if any of the following conditions exist (if the capability is installed):
 - a) Instrument indicates measured levels above the alarm setpoint.
 - b) Circuit failure.
 - c) Instrument indicates a downscale failure.
 - d) Instrument controls not set in "operate" mode.
- (3) Daily during operations of overhead crane in bypass mode with a load suspended from the hook. |
- (4) Daily during fuel handling operations or load handling operations in or above the spent fuel pool.

12.3 LIQUID EFFLUENTS**12.3.1 Concentration****Operability Requirements**

12.3.1.A.1 The concentration of radioactive material released from the site to UNRESTRICTED AREAS (see Zion Station ODCM Annex, Appendix F, Figure F-1) shall be limited to 10 times the concentrations specified in Appendix B, Table 2, Column 2 to 10CFR20.1001-20.2402, for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentrations shall be limited to the values listed in Table 12.3-1.

12.3.1.A.2 During the release of radioactive liquid wastes, the combination of dilution water flow and waste water discharge flow shall be established to ensure the discharge concentration limits of 12.3.1.A.1. are not exceeded.

Applicability: At all times.

Action

1. With the concentration of radioactive materials released from the site to UNRESTRICTED AREAS exceeding the limits specified in Section 12.3.1.A.1. immediately decrease the release rate of radioactive materials and/or increase the dilution flow rate to restore the concentration to within the above limits.

Surveillance Requirements

12.3.1.B.1 The radioactivity content of each batch of radioactive liquid waste shall be determined prior to release by sampling and analysis in accordance with Table 12.3-2. The results of pre-release analyses shall be used with the calculational methods in the ODCM to assure that the concentration at the point of release is maintained within the limits of Section 12.3.1.A.1.

12.3.1.B.2 Post-release analyses of samples composited from BATCH RELEASES shall be performed in accordance with Table 12.3-2. The results of the previous post-release analyses shall be used with the calculational methods in the ODCM to assure that the concentrations at the point of release were maintained within the limits of Section 12.3.1.A.1.

12.3.1.B.3 The radioactivity concentration of liquids discharged from continuous release points shall be determined by collection and analysis of samples in accordance with Table 12.3-2. The results of the analysis shall be used with the calculational methods in the ODCM to assure that the concentrations at the point of release were maintained within the limits of Section 12.3.1.A.1.

12.3.1.B.4 Appropriate discharge and dilutions flows for each batch radioactive liquid release shall be determined with the calculational methods in the ODCM to assure that the concentration at the point of release is maintained within the limits of Section 12.3.1.A.1.

Bases

- 12.3.1.C This Section is provided to ensure that the concentration of radioactive materials released in liquid waste effluents from the site to UNRESTRICTED AREAS will be less than ten (10) times the concentration levels specified in Appendix B, Table 2, Column 2 to 10CFR 20.1001-20.2402. This limitation provides additional assurance that the levels of radioactive materials in bodies of water outside the site will result in exposures within (1) the Section II.A design objectives of Appendix I, 10 CFR 50, to a MEMBER OF THE PUBLIC, and (2) the limits of 10CFR20.1301.

TABLE 12.3-1ALLOWABLE CONCENTRATION OF DISSOLVED OR ENTRAINED NOBLE GASES
RELEASED FROM THE SITE TO UNRESTRICTED AREAS IN LIQUID EFFLUENTS

<u>NUCLIDE</u>	<u>A(μCi/ml)*</u>
Kr-85m	2×10^{-4}
Kr-85	5×10^{-4}
Kr-87	4×10^{-5}
Kr-88	9×10^{-5}
Ar-41	7×10^{-5}
Xe-131m	7×10^{-4}
Xe-133m	5×10^{-4}
Xe-133	6×10^{-4}
Xe-135m	2×10^{-4}
Xe-135	2×10^{-4}

* Computed from Equation 20 of ICRP Publication 2(1959), adjusted for infinite cloud submersion in water, and R = 0.01 rem/week, density = 1.0 g/cc and Pw/Pt = 1.0.

TABLE 12.3-2RADIOACTIVE LIQUID EFFLUENT SAMPLING AND ANALYSIS SURVEILLANCE

LIQUID RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) ($\mu\text{Ci/ml}$) (a,e)
A. Boric Acid Monitor Tank	Prior to Each Release (c)	Prior to Each Release	Principal Gamma Emitters (e)	5E-7
	P One Batch/M(c)	M	Dissolved and Entrained Gases (Gamma Emitters)	1E-5
	P Each Batch (c)	M Composite (b)	Tritium	1E-5
			Gross Alpha	1E-7
	P Each Batch (c)	Q Composite (b)	Sr-89, Sr-90	5E-8
			Fe-55	1E-6
B. Turbine Building Fire Sump (f)	Continuous During Release (d)	W	Principal Gamma Emitters(e)	5E-7
			Dissolved and Entrained Gases (Gamma Emitters)	1E-5
	Continuous (d)	M Composite (b)	Tritium	1E-5
			Gross Alpha	1E-7
	Continuous (d)	Q Composite (b)	Sr-89, Sr-90	5E-8
			Fe-55	1E-6
C. Waste Neutralizing Tank	Prior to each Release	Prior to each Release	Principal Gamma Emitters (e)	5E-7
	P Each Batch (c)	M Composite (b)	Tritium	1E-5
			Gross Alpha	1E-7

TABLE 12.3-2RADIOACTIVE LIQUID EFFLUENT SAMPLING AND ANALYSIS SURVEILLANCE
(Cont'd)TABLE NOTATIONS

- a. The LLD is the smallest concentration of radioactive material in a sample that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66 s_b}{A \cdot E \cdot V \cdot 2.22 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

Where:

LLD is the lower limit of detection as defined above in picocuries (pCi) per unit mass or volume,

s_b is the square root of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute),

A is the number of gamma rays emitted per disintegration for gamma ray radionuclide analysis ($A = 1.0$) for gross alpha, strontium, and tritium measurement.

E is the counting efficiency (as counts per gamma),

V is the sample size (in units of mass or volume),

2.22 is the number of disintegrations per minute per picocurie,

Y is the fractional radiochemical yield when applicable (otherwise $Y = 1.0$)

λ is the radioactive decay constant for the particular radionuclide, and

Δt is the elapsed time between midpoint of sample collection and time of counting (for plant effluents, not environmental sample).

The value of s_b used in the calculation of the LLD for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. In calculating the LLD for a radionuclide determined by gamma ray spectrometry, the background shall include the typical contributions of other radionuclides normally present in the samples. Typical values of E, V, Y, and Δt shall be used in the calculation. The background count rate is calculated from the background counts that are determined to be within \pm one FWHM (Full Width at Half Maximum) energy band about the energy of the gamma ray peak used for the quantitative analysis for that radionuclide.

TABLE 12.3-2RADIOACTIVE LIQUID EFFLUENT SAMPLING AND ANALYSIS SURVEILLANCE
(Cont'd)TABLE NOTATIONS

For certain mixtures of gamma emitters, it may not be possible to measure radionuclides in concentrations near their sensitivity limits when other nuclides are present in the sample in much greater concentrations. Under these circumstances, it will be more appropriate to calculate the concentrations of such radionuclides using observed ratios with those radionuclides which are measurable.

- b. A COMPOSITE SAMPLE is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen which is representative of the liquids released.
- 1) To be representative of the quantities and concentrations of radioactive materials in liquid effluents, all samples taken for the composite shall be thoroughly mixed in order for the composite sample to be representative of the effluent release.
 - 2) The weekly and monthly Proportional Composite samples are not required provided that (1) the analysis required for each of these composite samples has been run on each batch discharged, and (2) a monthly record of radionuclides discharged (isotope and quantity) is maintained.
- c. A BATCH RELEASE is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated, and then thoroughly mixed to assure representative sampling.
- d. A CONTINUOUS RELEASE is the discharge of liquid wastes of a nondiscrete volume; e.g., from a volume of system that has an input flow during the continuous release.
- e. The principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Mn-54, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141. Ce-144 shall also be measured, but with an LLD of 5E-06. This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides, shall also be identified and reported. Nuclides which are below the LLD for the analyses shall be reported as "less than" the nuclide's LLD, and shall not be reported as being present at the LLD level for that nuclide. The "less than" values shall not be used in the required dose calculations.
- f. If the fire sump composite sampler is inoperable, grab samples shall be taken from the turbine building fire sump once per day.

12.3.2 Dose**Operability Requirements**

12.3.2.A The dose or dose commitment to a MEMBER OF THE PUBLIC above background from radioactive materials in liquid effluents released from each unit to UNRESTRICTED AREAS (see Zion Station ODCM Annex, Appendix F, Figure F-1) shall be limited:

1. During any calendar quarter to less than or equal to 1.5 mrem to the total body and to less than or equal to 5 mrem to any organ, and
2. During any calendar year to less than or equal to 3 mrem to the total body and to less than or equal to 10 mrem to any organ.

Applicability: At all times.

Action

1. With the calculated dose from the release of radioactive materials in liquid effluents exceeding twice the limits specified in Section 12.3.2.A, limit the subsequent releases such that the dose or dose commitment to a MEMBER OF THE PUBLIC from all uranium fuel cycle sources is limited to less than or equal to 25 mrem to the total body or any organ (except thyroid, which is limited to less than or equal to 75 mrem) over 12 consecutive months. Demonstrate that radiation exposures to all MEMBERS OF THE PUBLIC from all uranium fuel cycle sources (including all effluent pathways and direct radiation) are less than the 40CFR Part 190 and 40CFR Part 141 Standard, otherwise obtain a variance from the Commission to permit releases which exceed the 40CFR Part 141 or 190 Standard. The radiation exposure analysis shall use methods prescribed in the ODCM.

Surveillance Requirements

12.3.2.B Cumulative dose contributions from liquid effluents for the current calendar quarter and the current calendar year shall be determined in accordance with the methodologies and parameters of the ODCM at least once per 31 days.

Bases

12.3.2.C

This Section is provided to implement the requirements of Sections II.A, III.A and IV.A of Appendix I, 10CFR Part 50. The limiting Condition of Operation implements the guides set forth in Section II.A of Appendix I. The ACTION statements provide the required OPERATING flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in liquid effluents will be kept "as low as is reasonably achievable." Also, for fresh water sites with drinking water supplies, which can be potentially affected by plant operations, there is reasonable assurance that the operation of the facility will not result in radionuclide concentrations in the finished drinking water that are excess of the requirements of 40CFR 141. The dose calculations in the ODCM implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data, such that the actual exposure of an individual through appropriate pathways is unlikely to be substantially underestimated. The equations specified in the ODCM for calculating the dose due to the actual release rate of radioactive materials in liquid effluents are consistent with the methodology provided in Regulatory Guide 1.109; Calculation of Annual Doses to Man from Routine Releases of Radioactive Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I, Revision 1, October 1977 and Regulatory Guides 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," April 1977.

This Section applies to the release of liquid effluents from each unit at the site. For shared radwaste treatment systems, the liquid effluents from the shared systems are proportioned among the units sharing the system.

12.3.3 Liquid Radwaste Treatment System

Operability Requirements

- 12.3.3.A The Liquid Radwaste Treatment System shall be OPERABLE* and appropriate portions of the system shall be used to reduce the radioactive materials in liquid effluents prior to discharge when the projected doses due to liquid effluent, from each unit, to UNRESTRICTED AREAS (see Zion Station ODCM Annex, Appendix F, Figure F-1) would exceed 0.06 mrem to the total body or 0.20 to any organ in a 31-day period.

* The liquid Radwaste Treatment System shall be considered OPERABLE, if liquid waste can be held up and/or discharged within applicable limits.

Applicability: At all times.

Action With the Liquid Radwaste Treatment System inoperable for more than 30 days or with radioactive liquid waste being discharged without treatment and in excess of the above limits, return the system to OPERABLE status and place the appropriate portions of the system in use.

Surveillance Requirements

- 12.3.3.B Doses due to liquid releases from the site to UNRESTRICTED AREAS, shall be projected at least once per 31 days in accordance with the methodologies and parameters of the ODCM when the Liquid Radwaste Treatment System is not being fully utilized.

Bases

- 12.3.3.C The OPERABILITY of the Liquid Radwaste Treatment System ensures that the system will be available for use whenever liquid effluents require treatment prior to release to the environment. The requirement that the appropriate portions of this system be used when specified, provides assurance that the releases of radioactive materials in liquid effluents will be kept "as low as is reasonably achievable." This Section implements the requirements of 10CFR Part 50.36a, General Design Criterion of Appendix A to 10CFR Part 50 and the design objective given in Section II.D of Appendix I to 10CFR Part 50. The specified limits governing the use of appropriate portions of the Liquid Radwaste Treatment System were specified as a 2% fraction of the dose design objectives set forth in Section II.A of Appendix I, 10CFR Part 50, for liquid effluents.

12.4 GASEOUS EFFLUENTS**12.4.1 Dose Rate****Operating Requirements**

12.4.1.A The dose rate due to radioactive materials released in gaseous effluents from the site to areas at or beyond the SITE BOUNDARY (see Zion Station ODCM Annex, Appendix F, Figure F-1), shall be limited to the following:

1. For noble gases: Less than or equal to 500 mrem/yr to the whole body and less than or equal to 3000 mrem/yr to the skin, and
2. For Iodine-131, Iodine-133, tritium and all radionuclides in particulate form with half-lives greater than 8 days: Less than or equal to 1500 mrem/yr to any organ.

Applicability: At all times.

Action

With a release exceeding the above limits, immediately reduce the release rate to within the above limits.

Surveillance Requirements

12.4.1.B The dose rate due to radioactive materials in gaseous effluents shall be determined to be within the prescribed limits in accordance with the methods and procedures of the ODCM by obtaining representative samples and performing analyses in accordance with the sampling and analysis program specified in Table 12.4-1.

Bases

12.4.1.C This Section is provided to ensure that radioactive material discharged in gaseous effluents will not result in the exposure of a Member of the Public in an Unrestricted Area, either at or beyond the Site Boundary in excess of the design objectives of appendix I to 10 CFR part 50. This section is provided to ensure that gaseous effluents from all units on the site will be appropriately controlled. It provides operational flexibility for releasing gaseous effluents to satisfy the Section II.A and II. design objectives of appendix I to 10 CFR part 50. The specified release-rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to an individual at or beyond the SITE BOUNDARY to 500 mrem/year to the total body or to less than or equal to 3000 mrem/year to the skin. These release-rate limits also restrict, at all times, the corresponding organ dose rate above background to a child via the inhalation pathway to less than or equal to 1500 mrem/year. For purposes of calculating dose resulting from airborne releases, the stack is considered a ground-level release.

The Sampling and Analysis Program requirements prescribed in Table 12.4-1 are established to provide representative and appropriate sampling of the radiologically controlled areas. The method and frequency of sampling is based on the effluent flowrate. Continuous Releases are defined for areas with forced ventilation release points. Unventilated Building Releases are defined for areas with no specific release point.

TABLE 12.4-1RADIOACTIVE GASEOUS EFFLUENT SAMPLING AND ANALYSIS PROGRAM

GASEOUS RELEASE TYPE	SAMPLING METHOD	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) ($\mu\text{Ci/cc}$) (f)
A. Deleted				
B. Containment Vent and Purge	Grab (b)	Prior to Each Release	Noble Gases	1E-4
			Principal Gamma Emitters (d)	
			Tritium	1E-6
C. Continuous Releases ⁽¹⁾ Aux Building Ventilation Stack for both (2) units <u>And</u> Fuel Building Ventilation	Grab (b)	Monthly	Noble Gases	1E-4
			Principal Gamma Emitters (d)	
			Tritium	1E-6
	Continuous (b)(h)	Weekly(c)	Particulate	1E-11
	Composite	Quarterly	Principal Gamma Emitters (e)	
			Sr-89 Particulate	1E-11
			Sr-90 Particulate	1E-11
			Gross Alpha	1E-11
	Continuous (g)(h) Noble Gas Monitor	N.A.	Noble Gases, Gross Beta or Gamma	1E-6

(1) The requirements listed in this table for Continuous Releases are applicable for release paths that are available.

TABLE 12.4-1RADIOACTIVE GASEOUS EFFLUENT SAMPLING AND ANALYSIS PROGRAM
(Cont'd)

GASEOUS RELEASE TYPE	SAMPLING METHOD	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) ($\mu\text{Ci/cc}$) (f)
D. Unventilated Building Releases ⁽²⁾ Aux Building Above Ground Elevations(i) <u>And</u> Fuel Building (j)	Grab	Daily	Noble Gases Principal Gamma Emitters (d)	1E-4
			Tritium	1E-6
	Continuous (h)	Daily(c)	Particulate Principal Gamma Emitters (e)	1E-11
	Composite	Quarterly	Sr-89 Particulate	1E-11
			Sr-90 Particulate	1E-11
			Gross Alpha	1E-11

(2) The requirements listed in this table for Unventilated Building Releases are applicable for buildings with the normal ventilation release paths isolated.

TABLE 12.4-1RADIOACTIVE GASEOUS EFFLUENT SAMPLING AND ANALYSIS PROGRAM
(Cont'd)TABLE NOTATIONS

- a. Deleted
- b. The ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period in Section 12.4.1.
- c. The particulate filter(s) shall be saved for a quarterly composite analysis for Sr-89 and Sr-90.
- d. For gaseous emissions, the principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138. Other peaks which are measurable and identifiable by gamma-ray spectrometry, together with the above nuclides, shall also be identified and reported when an actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being at the LLD level for that nuclide.
- e. For particulate emissions, the principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Mn-54, Co-60, Zn-65, Co-58, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. Other peaks which are measurable and identifiable by gamma-ray spectrometry, together with the above nuclides, shall also be identified and reported when an actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being at the LLD level for that nuclide.
- f. The LLD is defined in Notation a of Table 12.3-2.
- g. Refer to Table 12.2-3 for required actions when the noble gas monitor is not in service.
- h. Sampling interruptions of short duration for routine activities, e.g. filter replacement, do not constitute a deviation from the requirements for continuous sampling.
- i. The effluent flowrate for Unventilated Building Releases from the Aux Bldg shall be estimated by $F_{AB} \text{ (cfm)} = 72900 \sqrt{dP}$ (in of water). When the Aux Bldg pressure can not be determined, the maximum flowrate of one exhaust fan, 67000 cfm, shall be used as the effluent flowrate.
- j. The effluent flowrate for Unventilated Building Releases from the Fuel Bldg shall be estimated by $F_{FB} \text{ (cfm)} = 24300 \sqrt{dP}$ (in of water). When the Fuel Bldg pressure can not be determined, the maximum flowrate of the exhaust fan, 15000 cfm, shall be used as the effluent flowrate.

12.4.2 Dose - Noble Gases**Operability Requirements**

12.4.2.A The air dose due to noble gases released in gaseous effluents from each unit to areas at or beyond the SITE BOUNDARY (see Zion Station ODCM Annex, Appendix F, Figure F-1) shall be limited to the following:

1. During any calendar quarter: Less than or equal to 5 mrad for gamma radiation and less than or equal to 10 mrad for beta radiation, and
2. During any calendar year: Less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation.

Applicability: At all times

Action

1. With the calculated air dose from gaseous effluents exceeding the above limits, define the corrective action(s) to be taken to ensure that future releases are in compliance with Section 12.4.2.A.
2. With the calculated air dose from radioactive noble gases in gaseous effluents exceeding twice the limits of Section 12.4.2.A:
 - a. Limit subsequent releases such that the dose or dose commitment to a MEMBER OF THE PUBLIC from all uranium fuel cycle sources is limited to less than or equal to 25 mrem to the total body or any organ (except the thyroid, which is limited to less than or equal to 75 mrem) over 12 consecutive months.
 - b. Prepare an analysis which demonstrates that radiation exposures to all MEMBERS OF THE PUBLIC from all uranium fuel cycle sources (including all effluents pathways and direct radiation) are less than the 40 CFR Part 190 Standard.

Surveillance Requirements

12.4.2.B Cumulative dose contributions for the current calendar quarter and current calendar year for noble gases shall be determined in accordance with the methodologies and parameters of the ODCM at least once every 31 days.

Bases

12.4.2.C

This Section implements the requirements of Sections II.B, III.A and IV.A of Appendix I, 10CFR Part 50. The Operability Requirements implement the guides set forth in Section II.B of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in gaseous effluents will be kept "as low as is reasonably achievable." The Surveillance Requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I is to be shown by calculation procedures based on models and data such that the actual exposure of an individual through the appropriate pathways is unlikely to be substantially underestimated.

12.4.3 Dose - I-131, I-133, Tritium, and Radioactive Material in Particulate Form**Operability Requirements**

12.4.3.A The dose to a MEMBER OF THE PUBLIC from I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released from each unit to areas at or beyond the SITE BOUNDARY (see Zion Station ODCM Annex, Appendix F, Figure F-1) shall be limited to the following:

1. During any calendar quarter: Less than or equal to 7.5 mrem to any organ, and
2. During any calendar year: Less than or equal to 15 mrem to any organ.

Applicability: At all times.

Action

With the calculated dose from the release of Iodine-131, Iodine-133, tritium and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents exceeding twice the limits of Section 12.4.3.A:

1. Limit subsequent releases such that the dose or dose commitment to a MEMBER OF THE PUBLIC from all uranium fuel cycle sources to less than or equal to 25 mrem to the total body or organ (except the thyroid which is limited to less than or equal to 75 mrem) over 12 consecutive months.
2. Prepare an analysis which demonstrates that radiation exposures to all MEMBERS OF THE PUBLIC from all uranium fuel cycle sources (including all effluent pathways and direct radiation) are less than the 40CFR Part 190 Standard. Otherwise, request a variance from the Commission to permit release which exceeds the 40CFR Part 190 Standard. The radiation exposure analysis shall use the methods prescribed in the ODCM.

Surveillance Requirements

12.4.3.B Cumulative dose contribution for the current calendar quarter and current calendar year for I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days shall be determined in accordance with the methodologies and parameters in the ODCM at least once per 31 days.

Bases

12.4.3.C

This Section implements the requirements of Sections II.C, III.A and IV.A of Appendix I, 10CFR Part 50. The Operability Requirements are the guides set forth in Section II.C of Appendix I. The ACTION statements provide the required operating flexibility and at the same time, implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable." The ODCM calculation methods specified in the Surveillance Requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I is to be shown by calculational procedures based on models and data such that the actual exposure of an individual through appropriate pathways is unlikely to be substantially underestimated. The release-rate specifications for radioiodines, radioactive material in particulate form and radioiodines other than noble gases are dependent on the existing radionuclide pathways to man, at or beyond the SITE BOUNDARY. The pathways which are examined in the development of these calculations are: 1) individual inhalation of airborne radionuclides, 2) disposition of radionuclides onto green leafy vegetation with subsequent consumption by man, 3) deposition onto grassy areas where milk animals and meat producing animals graze with consumption of the milk and meat by man.

12.4.4 Gaseous Effluent Treatment System**Operability Requirements**

12.4.4.A The GASEOUS EFFLUENT TREATMENT SYSTEM shall be OPERABLE* and appropriate portions of these systems shall be used to reduce radioactive materials in gaseous effluents when the projected doses in 31 days due to gaseous effluent releases, from each unit, to areas at or beyond the SITE BOUNDARY (see Zion Station ODCM Annex, Appendix F, Figure F-1) would exceed:

1. 0.2 mrad to air from gamma radiation, or
2. 0.4 mrad to air from beta radiation, or
3. 0.3 mrem to any organ.

* The installed GASEOUS EFFLUENT TREATMENT SYSTEM shall be considered OPERABLE by meeting Sections 12.4.1, 12.4.2 and/or 12.4.3, as applicable.

Applicability: At all times.

Action: With the Gaseous Effluent Treatment System inoperable for more than 30 days or with radioactive gaseous waste being discharged without treatment and in excess of the above limits, return the system to OPERABLE status and place the appropriate portions of the system in use.

Surveillance Requirements

12.4.4.B Doses due to gaseous releases from each unit to areas at or beyond the SITE BOUNDARY shall be projected at least once per 31 days in accordance with the methodologies and parameters in the ODCM when the Gaseous Effluent Treatment Systems are not being fully utilized.

Bases

12.4.4.C The OPERABILITY of the GASEOUS EFFLUENT TREATMENT SYSTEM ensures that the system will be available for use whenever gaseous effluents require treatment prior to release to the environment.

The requirement that the appropriate portions of this system be used when specified provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable." This section implements the requirement of 10CFR50.36a, General Design Criterion 60 of Appendix A to 10CFR50 and the design objective given in Section II.D of Appendix I to 10CFR50. The specified limits governing the use of appropriate portions of the Gaseous Effluent Treatment System were specified as a 2% fraction of the dose design objectives set forth in Section II.B and II.C of Appendix I, 10CFR50, for gaseous effluents.

12.5 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**12.5.1 Monitoring Program****Operability Requirements**

12.5.1.A The Radiological Environmental Monitoring Program shall be conducted as specified in Table 12.5-1.

Applicability: At all times.

Action

1. With the Radiological Environmental Monitoring Program not being conducted as specified in Table 12.5-1, prepare and submit to the Commission, in the Annual Radiological Environmental Operating Report, a description of the reasons for not conducting a program as required and the plans for preventing a recurrence.

Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of sampling equipment, if a person who participates in the program goes out of business or no longer can provide sample, or contractor omission which is corrected as soon as discovered. If the equipment malfunctions, corrective actions shall be completed as soon as practical. If a person/business supplying samples goes out of business, a replacement supplier shall be found as soon as possible. All deviations from the sampling schedule shall be described in the Annual Radiological Environmental Operating Report.

2. With the level of radioactivity as a result of plant effluents in an environmental sampling medium at a specified location exceeding the reporting levels of Table 12.5-2 when averaged over any calendar quarter, prepare and submit to the Commission within 30 days a Special Report which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to reduce radioactive effluents so that the potential annual dose* to a MEMBER OF THE PUBLIC is less than the calendar year limits of Section 12.3.2, 12.4.2, or 12.4.3. When more than one of the radionuclides in Table 12.5.2 are detected in the sampling medium, this report shall be submitted if:

$$\frac{\text{concentration (1)}}{\text{reporting level (1)}} + \frac{\text{concentration (2)}}{\text{reporting level (2)}} + \dots \geq 1.0$$

When radionuclides other than those in Table 12.5-2 are detected and are the result of plant effluents, this report shall be submitted if the potential annual dose to a MEMBER OF THE PUBLIC from all radionuclides is equal to or greater than the calendar year limits of Section 12.3.2, 12.4.2, or 12.4.3. This report is not required if the measured level of radioactivity was not the result of plant effluents; however, in such a event, the condition shall be reported and described in the Annual Radiological Environmental Operating Report.

*The methodology and parameters used to estimate the potential dose to a MEMBER OF THE PUBLIC shall be indicated in the report.

3. If the sample type or sampling location(s) required by Table 12.5-1 become(s) permanently unavailable, identify suitable alternative sampling media for the pathway of interest and/or specific locations for obtaining replacement samples and add them to the Radiological Environmental Monitoring Program as soon as practicable. The specific locations from which samples were unavailable may then be deleted from the program.

Prepare and submit a controlled version of the ODCM within 180 days including a revised figure(s) and table reflecting the new location(s) with supporting information identifying the cause of the unavailability of samples and justifying the selection of new location(s) for obtaining samples.

Surveillance Requirements

- 12.5.1.B.1 The Radiological Environmental Monitoring samples shall be collected from the locations specified in the ODCM and analyzed pursuant to Table 12.5-1 and the detection capabilities required by Table 12.5-3.

Bases

- 12.5.1.C The Radiological Environmental Monitoring Program required by this section provides representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures of MEMBERS OF THE PUBLIC resulting from the station operation. This monitoring program implements Section IV.B.2 of Appendix I to 10CFR50 and thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and modeling of the environmental exposure pathways. Guidance for this monitoring program is provided by the Radiological Assessment Branch Technical Position on Environmental Monitoring. The specified monitoring program is based on baseline/historical conditions for direct radiation measurements, soil, biota, and sediments established over years of operational experience and current site conditions/operating activities. The REMP need only be re-evaluated for major changes to site conditions/configuration (e.g., prior to site decommissioning, if a significant release occurs, changing baseline data...). Program changes may be initiated at any time based on operational experience.

The required detection capabilities for environmental sample analyses are tabulated in terms of the lower limits of detection (LLD). The LLDs required by Table 12.5-3 are considered optimum for routine environmental measurements in industrial laboratories. It should be recognized that the LLD is defined as a before the fact limit representing the capability of a measurement system and not as an after the fact limit for a particular measurement.

Detailed discussion of the LLD, and other detection limits, can be found in HASL Procedures Manual, HASL-300 (revised annually), Currie, LA., "Limits for Qualitative Detection and Quantitative Determination-Application to Radiochemistry," Anal. Chem. **40**, 586-93 (1968), and Gartwell, J.K., "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

Interpretations

- 12.5.1.D Table 12.5-1 requires "one sample of each community drinking water supply downstream of the plant within 10 kilometers (6.2 miles)." Drinking water supply is defined as water taken from river, lakes, or reservoirs (not well water) which is used for drinking. Since Lake Michigan has no designated downstream or upstream direction, two drinking water locations (one north/one south) within 10 kilometers shall be sampled as drinking water indicator locations, and two other locations (one north/one south) beyond 10 kilometers shall be sampled as control locations.

TABLE 12.5-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/ OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS ⁽¹⁾	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
1. <u>Airborne</u>	Samples from a total of three locations: a. Indicator- Near Field Three samples from locations within 4 km (2.5 mi) in different sectors.	Continuous sampler operation with particulate sample collection weekly (or more frequently if required due to dust loading).	<u>Particulate Sampler:</u> Gross beta analysis following weekly filter change ⁽³⁾ and gamma isotopic analysis ⁽⁴⁾ quarterly on composite filters by location on near field samples.

TABLE 12.5-1 (Continued)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/ OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS ⁽¹⁾	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
<p>2. <u>Direct Radiation</u>⁽⁵⁾</p>	<p>Seventeen routine monitoring stations with thermoluminescent dosimeters (TLD), placed with at least one monitoring location in each meteorological sector, as follows:</p> <p>a. Indicator- Inner Ring (100 Series TLD) in the general area of the SITE BOUNDARY (0.1 to 1.5 mi);</p> <p>b. Other</p> <p>One at each Airborne location given in part 1.a.</p> <p>Other TLDs may be placed at special interest locations beyond the Restricted Area where either a MEMBER OF THE PUBLIC or Commonwealth Edison employees have routine access. (300 Series TLD)</p>	<p>Quarterly</p>	<p>Gamma dose on each TLD quarterly.</p>

TABLE 12.5-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/ OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS ⁽¹⁾	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
3. <u>Waterborne</u>	<p>a. <u>Drinking Water Indicator</u>⁽⁶⁾</p> <p>One Sample from each community drinking water supply that could be affected by the station discharge within 10 km (6.2 mi) of discharge (north/south).</p>	Weekly grab samples.	Gross beta and gamma isotopic analyses ⁽⁴⁾ on monthly composite; tritium analysis on quarterly composite.
	<p>b. <u>Control</u>⁽⁶⁾</p> <p>One sample upstream and downstream (north/south) of discharge.</p>	Weekly grab samples.	Gross beta and gamma isotopic analyses ⁽⁴⁾ on monthly composite; tritium analysis on quarterly composite.
	<p>c. <u>Sediments</u></p> <p>At least one sample within 10 km (6.2 mi) of discharge</p>	Semiannually.	Gamma isotopic analysis ⁽⁴⁾ semiannually.

TABLE 12.5-1 (Continued)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/ OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS ⁽¹⁾	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
4. Ingestion	a. <u>Fish Indicator</u> Representative samples of commercially and recreationally important species in discharge area.	Semiannually	Gamma isotopic analysis ⁽⁴⁾ on edible portions.
	b. <u>Control</u> Representative samples of commercially and recreationally important species not influenced by plant discharge.	Semiannually	Gamma isotopic analysis ⁽⁴⁾ on edible portions.

TABLE 12.5-1 (Continued)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
TABLE NOTATIONS

- (1) Specific parameters of distance and direction from the centerline of the midpoint of the two units and additional description where pertinent, shall be provided for each and every sample location in Table 11-1 of the ODCM Station Annexes. Refer to NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants," October 1978, and to Radiological Assessment Branch Technical Position, Revision 1, November 1979.
- (2) Deleted – No longer applicable.
- (3) Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thorium daughter decay. If gross beta activity in any individual air particulate sample is greater than 10 times the 1999 mean of control samples, then, a gamma isotopic analysis shall be performed on that elevated individual sample.
- (4) Gamma isotopic analysis means the identification and quantification of gamma emitting radionuclides that may be attributable to the effluents from the station.
- (5) One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. Film badges shall not be used as dosimeters for measuring direct radiation. The number of locations is not an absolute number. The number of direct radiation monitoring stations may be reduced according to geographical limitations; e.g., If a station is adjacent to a lake (i.e. Zion), some sectors may be over water thereby reducing the number of dosimeters which could be placed at the indicated distances. The frequency of analysis or readout for TLD systems will depend upon the characteristics of the specific system used and should be selected to obtain optimum dose information with minimal fading.
- (6) Refer to Section 12.5.1.D for interpretation on the applicability of "downstream" and "upstream". If no community drinking water supply exists within 6.2 miles of the discharge, surface water sampling shall be performed.
- (7) Deleted – No longer applicable.
- (8) Deleted – No longer applicable.
- (9) DELETED
- (10) Deleted – No longer applicable.

TABLE 12.5-2

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES*

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GASES (pCi/m ³)	FISH (pCi/kg, wet)
H-3	20,000 ⁽¹⁾		
Mn-54	1,000		30,000
Fe-59	400		10,000
Co-58	1,000		30,000
Co-60	300		10,000
Zn-65	300		20,000
Zr-Nb-95	400		
Cs-134	30	10	1,000
Cs-137	50	20	2,000
Ba-La-140	200		

(1) For drinking water samples. This is 40 CFR Part 141 value. If no drinking water pathway exists, a value of 30,000 pCi/l may be used.

* This table contains reporting levels for analyses beyond the requirements of Table 12.5-1.

TABLE 12.5-3

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS⁽¹⁾LOWER LIMIT OF DETECTION (LLD)⁽²⁾⁽³⁾

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GASES (pCi/m ³)	FISH (pCi/kg, wet)	SEDIMENT (pCi/kg, dry)
Gross Beta	4	0.01	1000	
H-3	2,000 ⁽⁷⁾			
Mn-54	15		130	
Co-58,60	15		130	
Zn-65	30		260	
Zr-Nb-95	15			
Cs-134	15	0.01	100	150
Cs-137	18	0.01	100	180

TABLE 12.5-3 (Continued)
DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS
TABLE NOTATIONS

- (1) This table contains lower limits of detection for analyses beyond the requirements of Table 12.5-1. This table does not imply that only these nuclides are to be detected and reported; other peaks which are measurable and identifiable in the analyses required by Table 12.5-1 shall be reported in the Annual Radiological Environmental Operating Report.
- (2) Required detection capabilities for thermoluminescent dosimeters used for environmental measurements shall be in accordance with the recommendations of Regulatory Guide 4.13.
- (3) The Lower Limit of Detection (LLD) is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation, the LLD is defined as follows:

$$LLD = \frac{4.66 S_b + 3/t_b}{(E) (V) (2.22) (Y) (\exp (-\lambda \Delta t))}$$

$$LLD \sim \frac{4.66 S_b}{(E) (V) (2.22) (Y) (\exp (-\lambda \Delta t))}$$

Where: $4.66 S_b \gg 3/t_b$

LLD = the "a priori" Lower Limit of Detection (picocuries per unit mass or volume),

S_b = the standard deviation of the background counting rate or of the counting rate of a blank sample, as appropriate (counts per minute),

$$= \frac{\sqrt{\text{Total Counts}}}{t_b}$$

E = the counting efficiency(counts per disintegration),

V = the sample size (units of mass or volume),

2.22 = the number of disintegrations per minute per picocurie,

Y = the fractional radiochemical yield, when applicable,

λ = the radioactive decay constant for the particular radionuclide (sec^{-1}),

t_b = counting time of the background or blank (minutes), and

TABLE 12.5-3 (Continued)
DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS
TABLE NOTATIONS

Δt = the elapsed time between sample collection, or end of the sample collection period, and the time of counting (sec).

Typical values of E, V, Y, and Δt should be used in the calculation.

It should be recognized that the LLD is defined as a before the fact limit representing the capability of a measurement system and not as an after the fact limit for a particular measurement.

Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally, background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Operating Report.

- (4) Deleted – No longer applicable.
- (5) Deleted – No longer applicable.
- (6) Deleted – No longer applicable.
- (7) This is the minimum required LLD, however, environmental samples analyzed off-site will be required to use 200 pCi/l.

12.5.2 LAND USE CENSUS

Operability Requirements

- 12.5.2.A A Land Use Census shall be conducted and shall identify within a distance of 10 km (6.2 mi) the location, in each of the following meteorological sectors, A, J, K, L, M, N, P, Q, and R**, the nearest residence. For dose calculation, a garden will be assumed at the nearest residence.

Applicability: At all times.

Action:

With a Land Use Census identifying location(s) that yields a calculated dose or dose commitment, via the same exposure pathway 20% greater than at a location from which samples are currently being obtained in accordance with Section 12.5.1, add the new location(s) within 30 days to the Radiological Environmental Monitoring Program given in Chapter 11 of the ODCM Station Annexes. The sampling location(s), excluding the control location, having the lowest calculated dose or dose commitment(s), via the same exposure pathway, may be deleted from this monitoring program after October 31 of the year in which this Land Use Census was conducted. Submit in the next Annual Radiological Environmental Operating Report documentation for a change in the ODCM including revised figure(s) and table(s) for the ODCM reflecting the new location(s) with information supporting the change in sampling locations.

** The nearest industrial facility shall also be documented if closer than the nearest residence.

Surveillance Requirements

- 12.5.2.B The Land Use Census shall be conducted, between June 1 and October 1, at least once per calendar year using that information that will provide the best results, such as by a door-to-door survey or aerial survey. The result of the Land Use Census shall be included in the Annual Radiological Environmental Operating Report.

Bases

- 12.5.2.C This specification is provided to ensure that changes in the use of areas at and beyond the SITE BOUNDARY are identified and that modifications to the Radiological Environmental Monitoring Program given in the ODCM are made if required by the results of this census.

This census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR Part 50. An annual garden census will not be required since the licensee will assume that there is a garden at the nearest residence in each sector for dose calculations.

12.5.3 INTERLABORATORY COMPARISON PROGRAM**Operability Requirements**

- 12.5.3.A Analyses shall be performed on radioactive materials supplied as part of an interlaboratory comparison program that correspond to samples required by Table 12.5.1.

Applicability: At all times.

Action:

1. With analyses not being performed as required above, report the corrective actions taken to prevent a recurrence to the Commission in the Annual Radiological Environmental Operating Report.

Surveillance Requirements

- 12.5.3.B A summary of the results obtained as part of the above required interlaboratory comparison program shall be included in the Annual Radiological Environmental Operating Report.

Bases

- 12.5.3.C The requirement for participation in an interlaboratory comparison program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental samples matrices are performed as part of the quality assurance program for environmental monitoring in order to demonstrate that the results are valid for the purposes of Section IV.B.2 of Appendix I to 10 CFR Part 50.

12.6 PROCESS CONTROL PROGRAM (PCP)**12.6.1 PCP Program Requirements**

Contains the requirements and methodology for the current formulas, sampling, analyses, tests, and determinations performed to ensure the processing and packaging of solid radioactive wastes based on actual or simulated wet solid wastes is accomplished in compliance with:

- 10CFR Parts 20, 61, and 71
- State Regulations
- Burial Site Requirements
- Other Requirements Governing the Shipping and Burial of Radioactive Waste

12.6.2 Changes to the PCP

Changes to the PCP include those changes that affect the process or methodology, by which wastes are solidified, packaged to meet burial site form requirements, classified, or dewatered.

12.6.2.1. Shall be documented and records of reviews performed shall be retained, and

Shall contain sufficient information to support the change together with the appropriate analyses or evaluations justifying the change(s), and

Shall contain a determination that the change will maintain the overall conformance of the solidified waste product to existing requirements of Federal, State, or other applicable regulations, and

Shall become effective after review and acceptance by the Onsite Review and Investigative Function and the approval of the Decommissioning Plant Manager.

12.7 REPORTING REQUIREMENTS

12.7.1 Annual Radiological Environmental Operating Report*

Routine Annual Radiological Environmental Operating Report covering the operation of the Unit(s) during the previous calendar year shall be submitted according to the Permanently Defueled Technical Specifications. The Annual Radiological Environmental Operating Report shall include summaries, interpretations, and an analysis of trends of the results of the radiological environmental surveillance activities for the report period, including, as found appropriate, a comparison of preoperational studies with operational controls or with previous environmental surveillance reports, and an assessment of the observed impacts of the plant operation on the environment.

The Annual Radiological Environmental Operating Report shall include the results of all radiological environmental samples and of all environmental radiation measurements taken during the period pursuant to the locations specified in the tables and figures in the Chapter 11 of the ODCM Station Annexes, as well as summarized and tabulated results of these analyses and measurements in the format of the table in the Radiological Assessment Branch Technical Position, Revision 1, November 1979. In the event that some individual results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report.

The reports shall also include the following: a summary description of the Radiological Environmental Monitoring Program; legible maps covering all sampling locations keyed to a table giving distances and directions from the midpoint between the two units; reasons for not conducting the Radiological Environmental Monitoring Program as required by Section 12.5.1, and discussion for all deviations from the sampling schedule of Table 11.1-1; a Table of Missed Samples and a Table of Sample Anomalies for all deviations from the sampling schedule of Table 11.1-1; discussion of environmental sample measurements that exceed the reporting levels of Table 12.5-2 but are not the result of plant effluents; discussion of all analyses in which the LLD required by Table 12.5-3 was not achievable; results of the Land Use Census required by Section 12.5.2; and the results of licensee participation in an interlaboratory comparison program and the corrective actions being taken if the specified program is not being performed as required by Section 12.5.3.

The Annual Radiological Environmental Operating Report shall also include an annual summary of hourly meteorological data collected over the applicable year. This annual summary may be either in the form of an hour-by-hour listing on magnetic tape of wind speed, wind direction, atmospheric stability, and precipitation (if measured), or in the form of joint frequency distributions of wind speed, wind direction, and atmospheric stability. In lieu of submission with the Annual Radiological Environmental Operating Report, the licensee has the option of retaining this summary of required meteorological data on site in a file that shall be provided to the NRC upon request.

* A single submittal may be made for a multiple unit station.

The Annual Radiological Environmental Operating Report shall also include an assessment of the radiation doses due to the radioactive liquid and gaseous effluents released from the Unit or Station during the previous calendar year. This report shall also include an assessment of radiation doses to the most likely exposed MEMBER OF THE PUBLIC from reactor releases and other nearby uranium fuel cycle sources, including doses from primary effluent pathways and direct radiation, for the previous calendar year. The assessment of radiation doses shall be performed in accordance with the methodology and parameters in the ODCM and in compliance with 10 CFR 20 and 40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operation."

12.7.2 Annual Radioactive Effluent Release Report**

The Annual Radioactive Effluent Release Reports shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit as outlined in Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Material in Liquid and Gaseous Effluent from Light-Water-Cooled Nuclear Power Plants," Revision 1, June 1974, with data summarized on a quarterly basis following the format of Appendix B thereof.

The Annual Radioactive Effluent Release Report shall include a list and description of unplanned releases of radioactive material in liquid effluents from the site to UNRESTRICTED AREAS and of unplanned releases of radioactive material in gaseous effluents from the site to areas at or beyond the SITE BOUNDARY during the reporting period.

The Annual Radioactive Effluent Release Report shall include any changes made during the reporting period to the Process Control Program as well as any major changes to Liquid, Gaseous or Solid Radwaste Treatment Systems, pursuant to Section 12.7.4.

The Annual Radioactive Effluent Release Report shall also include the following: an explanation as to why the inoperability of liquid or gaseous effluent monitoring instrumentation was not corrected within the time specified in Section 12.2.1 or 12.2.2, respectively; and description of the events leading to liquid holdup tanks exceeding the limits of the Permanently Defueled Technical Specifications.

12.7.2.1 Exceptions to Regulatory Guide 1.21 Reporting Requirements:

- a. All references to "semiannual" are not applicable. The report will be submitted according to Technical Specifications.
- b. Hourly meteorological data is recorded for all periods throughout the year, and quarterly summaries will be reported. Separate meteorological data for periods of batch releases are not required to be included.
- c. Total body and significant organ doses to the maximally exposed individual from receiving-water-related exposure pathways will be provided. Associated population dose is not required to be included.

- d. Organ doses to the maximally exposed individual in unrestricted areas from radioactive iodine and radioactive material in particulate form from all exposure pathways will be provided. Associated population dose is not required to be included.
- e. Total body doses to the maximally exposed individual in unrestricted areas from direct radiation from the facility should be included in the report. Associated population dose is not required to be included.
- f. Total body doses to the population and average doses to individuals in the population from all receiving-water-related pathways are not required to be included.
- g. Total body doses to the population and average doses to individuals in the population from gaseous effluents to a distance of 50 miles from the site and beyond will not be included.

**** A single submittal may be made for a multiple unit station. The submittal should combine those sections that are common to all units at the station; however, for units with separate radwaste systems, the submittal shall specify the releases of radioactive material from each unit.**

12.7.3 Offsite Dose Calculation Manual (ODCM)**12.7.3.1 Changes to the ODCM:**

- a. Shall be documented and records of reviews performed shall be retained as required by Permanently Defueled Technical Specifications. This documentation shall contain:
 - 1. Sufficient Information to support the change together with the appropriate analyses or evaluations justifying the change(s); and
 - 2. A determination that the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR Part 50 and not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations.
 - 3. Documentation of the fact that the change has been reviewed and found acceptable by a Qualified Technical Review.
- b. Shall become effective after the approval of the Plant Manager on the date specified by the Qualified Technical Review.
- c. Shall be submitted to the Commission in the form of a complete, legible copy of the entire ODCM as a part of or concurrent with the Annual Radioactive Effluent Release Report for the period of the report in which any change to the ODCM was made effective. Each change shall be identified by markings in the margin of the affected pages, clearly indicating the area of the page that was changed, and shall indicate the date (e.g., month/year) the change was implemented.

12.7.4 Major Changes to Liquid and Gaseous Effluent Treatment Systems***

Licensee-initiated major changes to the Effluent Treatment Systems (liquid and gaseous):

- a. Shall be reported to the Commission in the Annual Radioactive Effluent Release Report for the period in which the evaluation was reviewed by a Qualified Technical Review. The discussion of each change shall contain:
 - 1) A summary of the evaluation that led to the determination that the change could be made in accordance with 10 CFR 50.59;
 - 2) Sufficient detailed information to totally support the reason for the change without benefit of additional and supplemental information;
 - 3) A detailed description of the equipment, components, and processes involved and the interfaces with other plant systems.
 - 4) An evaluation of the change which shows the predicted releases of radioactive materials in liquid and gaseous effluents that differ from those previously predicted in the License application and amendments thereto;
 - 5) An evaluation of the change, which shows the expected maximum exposures to a MEMBER OF THE PUBLIC and to the general population that differ from those previously estimated in the License application and amendments thereto;
 - 6) A comparison of the predicted releases of radioactive materials, in liquid and gaseous effluents, to the actual releases for the period prior to when the changes are to be made;
 - 7) An estimate of the exposure to plant operating personnel as a result of the change; and
 - 8) Documentation of the fact that the change was reviewed and found acceptable by a Qualified Technical Review.
- b. Shall become effective upon review and acceptance by the Qualified Technical Review.

*** Licensees may choose to submit the information called for in this standard as part of the biennial DSAR update.

November 20, 2003

Qualified Technical Review = TR/010/2003

*Additional signature letter to comply with Technical Review 5.9.1.a.

To: Mr. Artice Daniels Jr.

Subject; Qualified Technical Review of Chapter 12 Revision 12 to the Offsite Dose Calculation Manual (ODCM).

Pursuant to the ODCM Section 12.7.3 and Technical Specifications 5.6.1 and 5.9.1, the following basis for revisions to the ODCM and the documentation of the Qualified Technical review is attached.

Section 12.7.3 of the ODCM requires a Qualified Technical Review be performed. This review will be performed by at least two qualified individuals with the appropriate ANSI disciplines and approved by the Decommissioned Plant Manager.

Engineering Assigned Disciplines for this Qualified Technical Review are: A, D, E

Disciplines are assigned by JL O'Leary Date 11-20-03

Qualified Technical Reviewers

Albert H. Hays 11/20/03
Signature and Date

A, E, G
Disciplines

Roger W. Bayo 11-20-03
Signature and Date

D, F
Disciplines

Signature and Date

Disciplines

Artice Daniels Jr.
I Concur and Approve

11/20/03
Date

Artice Daniels Jr.
Decommissioning Plant Manager
Zion Station

October 3, 2003

Qualified Technical Review = TR/010/2003

To: Mr. Artice Daniels Jr.

Subject; Qualified Technical Review of Chapter 12 Revision 12 to the Offsite Dose Calculation Manual (ODCM).

Pursuant to the ODCM Section 12.7.3 and Technical Specifications 5.6.1 and 5.9.1, the following basis for revisions to the ODCM and the documentation of the Qualified Technical review is attached.

Section 12.7.3 of the ODCM requires a Qualified Technical Review be performed. This review will be performed by at least two qualified individuals with the appropriate ANSI disciplines and approved by the Decommissioned Plant Manager.

Engineering Assigned Disciplines for this Qualified Technical Review are:

A D E

Disciplines are assigned by AR Wilson Date 10-12-03

Qualified Technical Reviewers

Ken Shaw
Signature and Date

D + F
Disciplines

AA Jattay 10/20/03
Signature and Date

A, E, G.
Disciplines

Signature and Date

Disciplines

Artice Daniels Jr.
I Concur and Approve

10/22/03
Date

Artice Daniels Jr.
Decommissioning Plant Manager
Zion Station

ATTACHMENT C: 50.59 REVIEW COVERSHEET FORM

Station: Zion Station

Activity/Document Number: ODCM Chapter 12 **Revision Number:** 12

Title: Offsite Dose Calculation Manual

NOTE: For 50.59 Evaluations, information on this form will provide the basis for preparing the biennial summary report submitted to the NRC in accordance with the requirements of 10 CFR 50.59(d)(2).

Description of Activity:

(Provide a brief, concise description of what the proposed activity involves.)

This Document set forth the requirements for sampling, collecting, analyzing, and calculating the radiological effluent pathways in the determination of dose to the public. Specific to this revision is the removal of the requirement to perform a Quarterly Functional Test on an area radiation monitor that does not have an associated action other than the purpose it was designed.

Reason for Activity:

(Discuss why the proposed activity is being performed.)

Table 12.2-4 section 3 required a functional test of the area rad monitor be performed on a quarterly basis. The area rad monitors installed do not have the capability to 1. Inject a simulated input or 2. Operate actuation devices. The area monitors provide area dose rates in the vicinity of the Spent Fuel Pool. Modification installed by the station does not provide any function, (i.e. switching Fuel Building ventilation to charcoal mode, starting a pump, or shutting off a damper) no functional test is required.. The station needed to provide a method of transferring data (dose rates in the Fuel Building) to a remote location via a computer network system. This data was requested by the Illinois Emergency Management Agency.

Effect of Activity:

(Discuss how the activity impacts plant operations, design bases, or safety analyses described in the UFSAR.)

No effect on plant activities. This modification was used to replace old rad monitors with newer models that provide digital data that is to be transmitted to the Illinois Emergency Management Agency via a computer network system.

Summary of Conclusion for the Activity's 50.59 Review:

(Provide justification for the conclusion, including sufficient detail to recognize and understand the essential arguments leading to the conclusion. Provide more than a simple statement that a 50.59 Screening, 50.59 Evaluation, or a License Amendment Request, as applicable, is not required.)

These area radiation monitors provide local readout and there is no action associated with this rad monitor. The area rad monitors were changed out to provide digital readout. The new rad monitors do not have the capability to 1. Inject a simulated input or 2. Operate actuation devices, therefore no functional test is required.

Attachments:

Attach all 50.59 Review forms completed, as appropriate.

(NOTE: if both a Screening and Evaluation are completed, no Screening No. is required.)

Forms Attached: (Check all that apply.)

<input checked="checked" type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

Applicability Review

50.59 Screening

50.59 Screening No. _____

Rev. _____

50.59 Evaluation

50.59 Evaluation No. _____

Rev. _____

ATTACHMENT D: 50.59 APPLICABILITY REVIEW FORM

Activity/Document Number: ODCM CHAPTER 12 Revision Number: 12

Address the questions below for all aspects of the Activity. If the answer is yes for any portion of the Activity, apply the identified process(es) to that portion of the Activity. Note that it is not unusual to have more than one process apply to a given Activity. See Section 4 of the Resource Manual (RM) for additional guidance.

I. Does the proposed Activity involve a change:		
1. Technical Specifications or Operating License (10CFR50.90)?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.1.1 of the RM
2. Conditions of License Quality Assurance program (10CFR50.54(a))? Security Plan (10CFR50.54(p))? Emergency Plan (10CFR50.54(q))?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.1.2 of the RM
3. Codes and Standards IST Program Plan (10CFR50.55a(f))? ISI Program Plan (10CFR50.55a(g))?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.1.3 of the RM
4. ECCS Acceptance Criteria (10CFR50.46)?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.1.4 of the RM
5. Specific Exemptions (10CFR50.12)?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.1.5 of the RM
6. Radiation Protection Program (10CFR20)?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.1.6 of the RM
7. Fire Protection Program (applicable UFSAR or operating license condition)?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.1.7 of the RM
8. Programs controlled by the Operating License or the Technical Specifications (such as the ODCM).	<input type="checkbox"/> NO <input checked="" type="checkbox"/> YES	See Section 4.2.1.7 of the RM
9. Environmental Protection Program	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.1.7 of the RM
10. Other programs controlled by other regulations.	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.1 of the RM
II. Does the proposed Activity involve maintenance which restores SSCs to their original condition or involve a temporary alteration supporting maintenance that will be in effect during at-power operations for 90 days or less?		
	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.2 of the RM
III. Does the proposed Activity involve a change to the:		
1. UFSAR (including documents incorporated by reference) that is excluded from the requirement to perform a 50.59 Review by NEI 96-07 or NEI 98-03?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.3 of the RM
2. Managerial or administrative procedures governing the conduct of facility operations	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.4 of the RM
3. Procedures for performing maintenance activities (subject to 10 CFR 50.65(a)(4))?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.4 of the RM
4. Regulatory commitment not covered by another regulation based change process (see NEI 99-04)?	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.3/4.2.4 of the RM
IV. Does the proposed Activity involve a change to the Independent Spent Fuel Storage Installation (ISFSI) (subject to control by 10 CFR 72.48)?		
	<input checked="" type="checkbox"/> NO <input type="checkbox"/> YES	See Section 4.2.6 of the RM

Check one of the following:

If all aspects of the Activity are controlled by one or more of the above processes, then a 50.59 Screening is not required and the Activity may be implemented in accordance with its governing procedure.

If any portion of the Activity is not controlled by one or more of the above processes, then process a 50.59 Screening for the portion not covered by any of the above processes. The remaining portion of the activity should be implemented in accordance with its governing procedure.

Signoff:

50.59 Screener/50.59 Evaluator:
(Circle One)

Law Schuster
(Print name)

Sign:

[Signature]
(Signature)

Date: 10/9/2003

Summary of the Changes
made to
Zion Station
Offsite Dose Calculation Manual
ODCM

Removed Channel functional test for area radiation monitors ORT-AR21 and ORT-AR22 from Table 12.2-4 "Radioactive Plant Monitoring Instrumentation Surveillance".

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3. Fuel Building Monitoring

C. Area Monitoring

1. ORT-AR21
2. ORT-AR22

Quarterly Functional Test
Quarterly Functional Test

Revision 12

3. Fuel Building Monitoring

C. Area Monitoring

1. ORT-AR21
2. ORT-AR22

N/A
N/A

SPECIAL NOTE

The requirements of Permanently Defueled Technical Specifications shall take precedence over this chapter, should any differences occur.

CHAPTER 12

REVISION 12

CHAPTER 12

RADIOLOGICAL EFFLUENT TECHNICAL STANDARDS
(RETS)
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CHAPTER 12

RADIOACTIVE EFFLUENT TECHNICAL STANDARDS
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12.1 **DEFINITIONS**

- 12.1.1** A BATCH RELEASE is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated and then thoroughly mixed to assure representative sampling.
- 12.1.2** A CHANNEL CALIBRATION, shall be the adjustment, as necessary, of the channel such that it responds with the necessary range and accuracy to known values of input. The CHANNEL CALIBRATION shall encompass the entire channel including the sensors (where possible), alarm interlock and/or trip functions and shall include the CHANNEL FUNCTIONAL TEST. The CHANNEL CALIBRATION may be performed by any series of sequential, overlapping, or total channel steps such that the entire channel is calibrated.
- 12.1.3** A CHANNEL CHECK shall be the qualitative assessment of channel behavior during operation by observation. This determination shall include, where possible, comparison of the channel indication and/or status with other indications and/or status derived from independent INSTRUMENT CHANNELS measuring the same parameter.
- 12.1.4** A CHANNEL FUNCTIONAL CHECK shall be:
- a. Instruments-The injection of a simulated signal(s) into the channel as close to the primary sensor(s) as practicable to verify OPERABILITY, including all channel outputs, as appropriate.
 - b. Logics-The application of input signals, or the operation of relays or switch contacts, in all the combinations required to produce the required decision outputs including the operation of all ACTUATION DEVICES. Where practicable, the test shall include the operation of the ACTUATED EQUIPMENT as well (i.e. pumps will be started, valves operated, etc.).
- 12.1.5** A COMPOSITE SAMPLE is one in which the quantity of liquid sample is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen which is representative of the liquids released.
- 12.1.6** A CONTINUOUS RELEASE is the discharge of liquid or gaseous wastes of a nondiscrete volume (e.g. from a volume or system that has an input flow during the release).
- 12.1.7** CONTINUOUS SAMPLING is uninterrupted sampling with the exception of sampling interruptions of short duration for routine activities (e.g. filter replacements).
- 12.1.8** DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcurie/gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The Thyroid Dose Conversion factors used for this calculation shall be those listed in Table III of TID-14844, "Calculation of Distance Factors for Power and Test Reactor Sites" or Table E-7 of NRC Regulatory Guide 1.109 Rev. 1, dated October, 1977. This definition is not used in the defueled condition. Decay has eliminated all concerns related to radioactive iodine.
- 12.1.9** MEMBER OF THE PUBLIC means any individual except when that individual is receiving an occupational dose.

- 12.1.10 OCCUPATIONAL DOSE means the dose received by an individual in the course of employment in which the individual's assigned duties involve exposure to radiation and/or radioactive material from licensed and unlicensed sources of radiation, whether in the possession of the licensee or other person. Occupational dose does not include dose from background radiation, as a patient from medical practices, from voluntary participation in medical research programs, or as a member of the public.
- 12.1.11 OPERABLE - A system, subsystem, train, component or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s), and when all necessary attendant instrumentation, controls, electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function(s) are also capable of performing their related support function(s).
- 12.1.12 OPERATING is defined as performing the intended function in the intended manner.
- 12.1.13 The OPERATING CYCLE: DELETED
- 12.1.14 An OPERATIONAL MODE: DELETED
- 12.1.15 The PROCESS CONTROL PROGRAM (PCP) shall contain the current formulas, sampling, analyses, test, and determinations to be made to ensure that processing and packaging of solid radioactive wastes based on demonstrated processing of actual or simulated wet solid wastes will be accomplished in such a way as to assure compliance with 10CFR Parts 20, 61, and 71, State regulations, burial ground requirements, and other requirements governing the disposal of solid radioactive waste.
- 12.1.16 PURGE OR PURGING is the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating condition, in such a manner, that replacement air or gas is required to purify the confinement.
- 12.1.17 RATED THERMAL POWER: DELETED
- 12.1.18 The REACTOR PRESSURE: DELETED
- 12.1.19 The SITE BOUNDARY shall be that line beyond which the land is not owned, leased or otherwise controlled by the licensee.
- 12.1.20 SOLIDIFICATION shall be the conversion of radioactive liquid, resin and sludge wastes from liquid systems into a form that meets shipping and burial site requirements.
- 12.1.21 A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a radioactive source.

- 12.1.22 SURVEILLANCE shall be those parts of the sections which prescribe remedial measures required under designated conditions, activities required to demonstrate instrument operability, and activities performed to ensure applicable offsite dose limits are not exceeded.
- 12.1.23 The SURVEILLANCE FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 12.1-1.
- 12.1.24 THERMAL POWER: DELETED
- 12.1.25 UNRESTRICTED AREA means an area, access to which is neither limited nor controlled by the licensee.
- 12.1.26 GASEOUS EFFLUENT TREATMENT SYSTEM shall be any system designed and installed to reduce radioactive material in particulate form in effluents by passing ventilation through HEPA filters for the purpose of removing particulates from the gaseous exhaust stream prior to the release to the environment. Such a system is not considered to have any affect on noble gas effluents. The iodine removal function is no longer used in the defueled condition.
- 12.1.27 VENTING is the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating condition, in such a manner that replacement air or gas is not provided or required during venting. Vent, used in system names, does not imply a venting process.
- 12.1.28 WASTE GAS HOLDUP SYSTEM: DELETED

TABLE 12.1-1
SURVEILLANCE FREQUENCY NOTATIONS

<u>NOTATION</u>		<u>FREQUENCY *</u>
S	(Shiftly)	At least once per 12 hours
D	(Daily)	At least once per 24 hours
W	(Weekly)	At least once per 7 days
M	(Monthly)	At least once per 31 days
Q	(Quarterly)	At least once per 92 days
SA	(Semiannually)	At least once per 184 days
A	(Annually)	At least once per 366 days
R		At least once per 18 months
P	(Prior)	Complete prior to start of release
N/A		Not Applicable

- * Each Surveillance Requirement shall be performed within the specified time interval with a maximum allowable extension not to exceed 25% of the surveillance interval. These frequency notations do not apply to the Radiological Environmental Monitoring Program as described in Section 12.5.

12.2 INSTRUMENTATION**12.2.1 Radioactive Liquid Plant Monitoring Instrumentation****Operability Requirements**

- 12.2.1.A The radioactive liquid plant monitoring instrumentation channels shown in Table 12.2-1 shall be OPERABLE AND, the radioactive liquid effluent monitoring instrumentation channels shall have their alarm/trip setpoints set to ensure that the limits of Section 12.3.1.A are met.**

Applicability: As indicated in Table 12.2-3.

Action

- 1. With a radioactive liquid effluent monitoring instrument channel trip setpoint less conservative than the value necessary to prevent violating the limits of Section 12.3.1.A, immediately suspend the release of radioactive liquid effluents monitored by the affected channel or declare the channel inoperable.**
- 2. With one or more radioactive liquid plant monitoring instrumentation channels inoperable, initiate the SURVEILLANCE requirement delineated in Table 12.2-1.**

Surveillance Requirements

- 12.2.1.B.1 The liquid effluent monitor setpoints shall be determined in accordance with procedures as described in the ODCM.**
- 12.2.1.B.2 Each radioactive liquid plant monitoring instrumentation channel shall be demonstrated OPERABLE by performance of a CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST at the frequencies shown in Table 12.2-2.**

Bases

- 12.2.1.C The radioactive liquid plant monitoring instrumentation is provided to indicate abnormal radiological conditions within the plant, AND,**

The radioactive liquid effluent instrumentation is provided to monitor and control, as applicable, the release of radioactive materials in liquid effluents. The alarm/trip setpoints for these instruments shall be calculated in accordance with the procedures in the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of RETS. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63 and 64 of Appendix A to 10CFR Part 50.

TABLE 12.2-1

RADIOACTIVE LIQUID PLANT MONITORING INSTRUMENTATION

<u>INSTRUMENT</u>	<u>MINIMUM CHANNELS OPERABLE</u>	<u>SURVEILLANCE #</u>	<u>APPLICABLE CONDITION</u>
1. Liquid Effluent Monitors Providing Automatic Termination of Release			
A. Boric Acid Monitor Tank (BAMT)			
1. OR-PR05	See SURVEILLANCE 1	1	Liquid Release through this Pathway
B. Turbine Bldg.			
1. OR-PR25	1	2	Liquid Release through this Pathway
2. Effluent Continuous Composite Sampler			
A. Turbine Building Fire Sump	1	2	All Times
3. Effluent Flow Rate Monitor			
A. Boric Acid Monitor Tank			
1. OFI-WD005	1	3	Liquid Release through this Pathway
4. Plant System Monitors			
NONE			

TABLE 12.2-1RADIOACTIVE LIQUID PLANT MONITORING INSTRUMENTATION
(Cont'd)

SURVEILLANCE 1	<p>If the monitor is inoperable, effluent releases from the tank may continue for up to 14 days, provided that prior to initiating the release:</p> <ol style="list-style-type: none"><li data-bbox="460 502 1445 566">1. At least two independent samples of the tank's contents are analyzed, in accordance with Section 12.3.1.B.1, and<li data-bbox="460 593 1445 689">2. At least two technically qualified members of the facility staff independently verify the release-rate calculations and discharge flow path valving; <p>Otherwise, suspend release of radioactive effluents via this pathway.</p>
SURVEILLANCE 2	<p>With the number of channels OPERABLE less the minimum number required, effluent releases via this pathway may continue, provided that at least once per day grab samples are analyzed for gross radioactivity (beta /gamma or isotopic) at a lower limit of detection (LLD) as specified in Table 12.3-2. Restore the channel to operable status within 30 days or conduct a station review to determine a plan of action to restore the channel to operable status.</p>
SURVEILLANCE 3	<p>With the number of channels OPERABLE less than the minimum number required, effluent releases via this pathway may continue, for up to 30 days provided the flow rate is estimated at least once per 4 hours during actual releases. Pump curves may be used to estimate flow.</p>

TABLE 12.2-2RADIOACTIVE LIQUID PLANT MONITORING INSTRUMENTATION SURVEILLANCE

<u>INSTRUMENT</u>	<u>CHANNEL CHECK</u>	<u>SOURCE CHECK</u>	<u>CHANNEL CALIBRATION(1)</u>	<u>CHANNEL FUNCTIONAL TEST (2)</u>
1. Liquid Effluent Monitors Providing Automatic Termination Of Release				
A. Boric Acid Monitor Tank (BAMT)				
1. 0R-PR05	P	P	R	Q
B. Turbine Bldg.				
1. 0R-PR25	D	M	R	Q
2. Effluent Continuous Composite Sampler				
A. Turbine Building Fire Sump	D	N/A	N/A	N/A
3. Effluent Flow Rate Monitor				
A. Boric Acid Monitor Tank (BAMT)				
1. OFI-WD005	D(3)	N/A	R(4)	N/A
4. Plant System Monitors NONE				

(1) CHANNEL CALIBRATION shall include performance of a CHANNEL FUNCTIONAL TEST.

(2) The CHANNEL FUNCTIONAL TEST shall also demonstrate that any automatic isolation of this pathway occurs and that control room alarm annunciation occurs if any of the following conditions exist. (if the capability is installed):

- a) Instrument indicates levels above the alarm setpoints.
- b) Circuit failure.
- c) Instrument indicates a downscale failure.
- d) Instrument controls not set in operate mode.

(3) CHANNEL CHECK shall consist of verifying indications of flow during periods of release. CHANNEL CHECK shall be made at least once daily on any day on which continuous, periodic, or BATCH RELEASES are made.

(4) Does not include flow sensor.

12.2.2 Radioactive Plant Monitoring Instrumentation

Operability Requirements

- 12.2.2.A The radioactive plant monitoring instrumentation channels shown in Table 12.2-3 shall be OPERABLE, AND, the radioactive gaseous effluent monitoring instrumentation shall have their alarm/trip setpoints set in accordance with the method prescribed in the ODCM to ensure that the limits of Section 12.4.1.A are met.

Applicability: As indicated in Table 12.2-3.

Action

1. With a radioactive gaseous effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above Section, immediately suspend the release of radioactive gaseous effluents monitored by the affected channel or declare the channel inoperable.
2. With one or more radioactive plant monitoring instrumentation channels inoperable, initiate the SURVEILLANCE requirement as delineated in Table 12.2-3.

Surveillance Requirements

- 12.2.2.B.1 The effluent monitor setpoints shall be determined in accordance with procedures as described in the ODCM.
- 12.2.2.B.2 Each radioactive plant monitoring instrumentation channel shall be demonstrated OPERABLE, when in its APPLICABLE CONDITION, by performance of a CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST at the frequencies shown in Table 12.2-4.

Bases

- 12.2.2.C The radioactive plant monitoring instrumentation is provided to indicate abnormal radiological conditions within the plant, AND,
- The radioactive gaseous effluent instrumentation is provided to monitor, record and control, as applicable, the release of radioactive materials in gaseous effluents during actual or potential releases. The alarm/trip setpoints for these instruments shall be calculated in accordance with the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of 10CFR Part 20.
- An Auxiliary Building (AB) ventilation stack is considered available as a release path from radiologically controlled areas of the Auxiliary Building when any AB exhaust fan is discharging to that stack, or any one of the AB exhaust fan dampers is open on that stack.
- An Auxiliary Building ventilation stack is unavailable as a release path from radiologically controlled areas of the Auxiliary Building when all AB exhaust fan dampers for that stack are mechanically blocked closed.

TABLE 12.2-3RADIOACTIVE PLANT MONITORING INSTRUMENTATION

<u>INSTRUMENT</u>	<u>MINIMUM CHANNELS OPERABLE</u>	<u>SURVEILLANCE</u>	<u>APPLICABLE CONDITION</u>
1. <u>Effluent Containment Purge or Vent</u>			
A. Particulate Monitor			
1. 1R-PR40A (Channel 1)	1	6 ¹ , 7 ²	Venting or Purging
2. 2R-PR40A (Channel 1)	1	6 ¹ , 7 ²	Venting or Purging
2. <u>Aux Building Effluent Monitoring</u>			
A. Gas Activity Monitor			
1. 1R-PR49E (Channel 5)	1	10	*
2. 2R-PR49E (Channel 5)	1	10	**
B. Particulate Monitor			
1. 1R-PR49A (Channel 1)	1	11	*
2. 2R-PR49A (Channel 1)	1	11	**
C. Flow Rate Monitor			
1. 1LP-084	1	8	*
2. 2LP-084	1	8	**
* Whenever the Unit 1 stack is available as a release path from the Auxiliary Building.			
** Whenever the Unit 2 stack is available as a release path from the Auxiliary Building.			
3. <u>Fuel Building Monitoring</u>			
A. Gas Activity Monitor			
1. 0RT-PR30A	1	10	All Times
B. Particulate Monitor			
1. 0RT-PR30B	1	11	All Times
C. Area Monitoring			
1. 0RT-AR21	1	12	When fuel is present
2. 0RT-AR22	1	14	When fuel is present
3. 0RT-AR13	1	13	When fuel building crane is operated with a load on either hook in the bypass mode

¹ During VENTING² During PURGING

TABLE 12.2-3RADIOACTIVE PLANT MONITORING INSTRUMENTATION
(Cont'd)

<u>INSTRUMENT</u>	<u>MINIMUM CHANNELS OPERABLE</u>	<u>SURVEILLANCE</u>	<u>APPLICABLE CONDITION</u>
4. <u>Emergency Monitoring</u>			
A. Ventilation			
1. 1RIA-PR49 (Channel 7)	1	9	*
2. 2RIA-PR49 (Channel 7)	1	9	**
3. 1RIA-PR49 (Channel 9)	1	9	*
4. 2RIA-PR49 (Channel 9)	1	9	**

- * Whenever the Unit 1 stack is available as a release path from the Auxiliary Building.
** Whenever the Unit 2 stack is available as a release path from the Auxiliary Building.

TABLE 12.2-3RADIOACTIVE PLANT MONITORING INSTRUMENTATION
(Cont'd)TABLE NOTATIONS

SURVEILLANCE 6 -	With the number of channels OPERABLE less than the minimum number required, effluent releases via this pathway may continue for up to 30 days provided grab samples are obtained and analyzed for gross activity at least once per day.
SURVEILLANCE 7 -	With the number of channels OPERABLE less than the minimum number required, and no redundant monitor OPERABLE in this flow path, immediately suspend PURGING of radioactive effluents via this pathway.
SURVEILLANCE 8 -	Effluent releases via this pathway may continue provided the effluent flow rate is estimated at least once per day while a release is in progress. Restore the inoperable panel to OPERABLE status within 30 days OR conduct a station review to determine a plan of action to restore the panel to OPERABLE status.
SURVEILLANCE 9 -	With the number of channels OPERABLE less than the minimum number required, restore the inoperable monitor to OPERABLE status within 30 days OR conduct a station review to determine a plan of action to restore the channel to OPERABLE status.
SURVEILLANCE 10 -	With the number of OPERABLE channels less than the minimum number required, restore the channel to OPERABLE status within 30 days or conduct a station review to determine a plan of action to restore the channel to OPERABLE status. Effluent releases via this pathway may continue provided grab samples are obtained and analyzed for gross activity at least once per day, OR for the case when the associated LP-084 panel is inoperable, continuous sampling is maintained with a pump and Operations performs a Channel Check Daily. Compensatory sampling does not return the monitor to an OPERABLE status.
SURVEILLANCE 11 -	With the number of OPERABLE channels less than the minimum number required, restore the channel to OPERABLE status within 30 days or conduct a station review to determine a plan of action to restore the channel to OPERABLE status. Effluent releases via this pathway may continue provided samples are continuously collected as required in Table 12.4-1. For the case when the associated LP-084 panel is inoperable, continuous sampling can be maintained with a pump and Operations shall perform a Channel Check Daily. Compensatory sampling does not return the monitor to an OPERABLE status.
SURVEILLANCE 12-	With the number of channels OPERABLE less than the minimum required, stop all movement of fuel within the spent fuel pool and crane operation with loads over the spent fuel pool <u>AND</u> perform area surveys of the monitored area at least once per day.
SURVEILLANCE 13	With the number of channels OPERABLE less than the minimum required, stop operation of overhead crane in bypass after placing loads in safe condition.
SURVEILLANCE 14	Perform area surveys of the monitored area at least once per day.

TABLE 12.2-4RADIOACTIVE PLANT MONITORING INSTRUMENTATION SURVEILLANCE

	<u>CHANNEL CHECK</u>	<u>SOURCE CHECK</u>	<u>CHANNEL CALIBRATION (1)</u>	<u>CHANNEL FUNCTIONAL TEST (2)</u>
1. <u>Effluent Containment Purge or Vent</u>				
A. Particulate Monitor				
1. 1R-PR40A (Channel 1)	D	M	R	Q
2. 2R-PR40A (Channel 1)	D	M	R	Q
2. <u>Aux Building Effluent Monitoring</u>				
A. Gas Activity Monitor				
1. 1R-PR49E (Channel 5)	D	M	R	Q
2. 2R-PR49E (Channel 5)	D	M	R	Q
B. Particulate Monitor				
1. 1R-PR49A (Channel 1)	D	M	R	Q
2. 2R-PR49A (Channel 1)	D	M	R	Q
C. Flow Rate Monitor				
1. 1LP-084	D	N/A	R	Q
2. 2LP-084	D	N/A	R	Q
3. <u>Fuel Building Monitoring</u>				
A. Gas Activity Monitor				
1. 0RT-PR30A	D	M	A	N/A
B. Particulate Monitor				
1. 0RT-PR30B	D	M	A	N/A
C. Area Monitoring				
1. 0RT-AR21	D	M(4)	R	N/A
2. 0RT-AR22	D	M	R	N/A
3. 0RT-AR13	D	M(3)	R	Q

TABLE 12.2-4RADIOACTIVE PLANT MONITORING INSTRUMENTATION SURVEILLANCE
(Cont'd)

<u>INSTRUMENT</u>	<u>CHANNEL CHECK</u>	<u>SOURCE CHECK</u>	<u>CHANNEL CALIBRATION (1)</u>	<u>CHANNEL FUNCTIONAL TEST (2)</u>
4. <u>Emergency Monitoring</u>				
A. Ventilation				
1. 1RIA-PR49 (Channel 7)	N/A	N/A	R	Q
2. 2RIA-PR49 (Channel 7)	N/A	N/A	R	Q
3. 1RIA-PR49 (Channel 9)	N/A	N/A	R	Q
4. 2RIA-PR49 (Channel 9)	N/A	N/A	R	Q

Table 12.2-4RADIOACTIVE PLANT MONITORING INSTRUMENTATION SURVEILLANCE
(Cont'd)TABLE NOTATIONS

- (1) CHANNEL CALIBRATION shall include performance of a CHANNEL FUNCTIONAL TEST.
- (2) The CHANNEL FUNCTIONAL TEST shall also demonstrate that any automatic isolation occurs; and that Control Room alarm annunciation occurs if any of the following conditions exist (if the capability is installed):
 - a) Instrument indicates measured levels above the alarm setpoint.
 - b) Circuit failure.
 - c) Instrument indicates a downscale failure.
 - d) Instrument controls not set in "operate" mode.
- (3) Daily during operations of overhead crane in bypass mode with a load suspended from the hook.
- (4) Daily during fuel handling operations or load handling operations in or above the spent fuel pool.

12.3 LIQUID EFFLUENTS**12.3.1 Concentration****Operability Requirements**

12.3.1.A.1 The concentration of radioactive material released from the site to UNRESTRICTED AREAS (see Zion Station ODCM Annex, Appendix F, Figure F-1) shall be limited to 10 times the concentrations specified in Appendix B, Table 2, Column 2 to 10CFR20.1001-20.2402, for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentrations shall be limited to the values listed in Table 12.3-1.

12.3.1.A.2 During the release of radioactive liquid wastes, the combination of dilution water flow and waste water discharge flow shall be established to ensure the discharge concentration limits of 12.3.1.A.1. are not exceeded.

Applicability: At all times.

Action

1. With the concentration of radioactive materials released from the site to UNRESTRICTED AREAS exceeding the limits specified in Section 12.3.1.A.1. immediately decrease the release rate of radioactive materials and/or increase the dilution flow rate to restore the concentration to within the above limits.

Surveillance Requirements

12.3.1.B.1 The radioactivity content of each batch of radioactive liquid waste shall be determined prior to release by sampling and analysis in accordance with Table 12.3-2. The results of pre-release analyses shall be used with the calculational methods in the ODCM to assure that the concentration at the point of release is maintained within the limits of Section 12.3.1.A.1.

12.3.1.B.2 Post-release analyses of samples composited from BATCH RELEASES shall be performed in accordance with Table 12.3-2. The results of the previous post-release analyses shall be used with the calculational methods in the ODCM to assure that the concentrations at the point of release were maintained within the limits of Section 12.3.1.A.1.

12.3.1.B.3 The radioactivity concentration of liquids discharged from continuous release points shall be determined by collection and analysis of samples in accordance with Table 12.3-2. The results of the analysis shall be used with the calculational methods in the ODCM to assure that the concentrations at the point of release were maintained within the limits of Section 12.3.1.A.1.

12.3.1.B.4 Appropriate discharge and dilutions flows for each batch radioactive liquid release shall be determined with the calculational methods in the ODCM to assure that the concentration at the point of release is maintained within the limits of Section 12.3.1.A.1.

Bases

- 12.3.1.C This Section is provided to ensure that the concentration of radioactive materials released in liquid waste effluents from the site to UNRESTRICTED AREAS will be less than ten (10) times the concentration levels specified in Appendix B, Table 2, Column 2 to 10CFR 20.1001-20.2402. This limitation provides additional assurance that the levels of radioactive materials in bodies of water outside the site will result in exposures within (1) the Section II.A design objectives of Appendix I, 10 CFR 50, to a MEMBER OF THE PUBLIC, and (2) the limits of 10CFR20.1301.

TABLE 12.3-1ALLOWABLE CONCENTRATION OF DISSOLVED OR ENTRAINED NOBLE GASES
RELEASED FROM THE SITE TO UNRESTRICTED AREAS IN LIQUID EFFLUENTS

<u>NUCLIDE</u>	<u>A(μCi/ml)*</u>
Kr-85m	2×10^{-4}
Kr-85	5×10^{-4}
Kr-87	4×10^{-5}
Kr-88	9×10^{-5}
Ar-41	7×10^{-5}
Xe-131m	7×10^{-4}
Xe-133m	5×10^{-4}
Xe-133	6×10^{-4}
Xe-135m	2×10^{-4}
Xe-135	2×10^{-4}

* Computed from Equation 20 of ICRP Publication 2(1959), adjusted for infinite cloud submersion in water, and R = 0.01 rem/week, density = 1.0 g/cc and Pw/Pt = 1.0.

TABLE 12.3-2RADIOACTIVE LIQUID EFFLUENT SAMPLING AND ANALYSIS SURVEILLANCE

LIQUID RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) ($\mu\text{Ci/ml}$) (a,e)
A. Boric Acid Monitor Tank	Prior to Each Release (c)	Prior to Each Release	Principal Gamma Emitters (e)	5E-7
	P One Batch/M(c)	M	Dissolved and Entrained Gases (Gamma Emitters)	1E-5
	P Each Batch (c)	M Composite (b)	Tritium	1E-5
			Gross Alpha	1E-7
	P Each Batch (c)	Q Composite (b)	Sr-89, Sr-90	5E-8
			Fe-55	1E-6
B. Turbine Building Fire Sump (f)	Continuous During Release (d)	W	Principal Gamma Emitters(e)	5E-7
			Dissolved and Entrained Gases (Gamma Emitters)	1E-5
	Continuous (d)	M Composite (b)	Tritium	1E-5
			Gross Alpha	1E-7
	Continuous (d)	Q Composite (b)	Sr-89, Sr-90	5E-8
			Fe-55	1E-6
C. Waste Neutralizing Tank	Prior to each Release	Prior to each Release	Principal Gamma Emitters (e)	5E-7
	P Each Batch (c)	M Composite (b)	Tritium	1E-5
			Gross Alpha	1E-7

TABLE 12.3-2RADIOACTIVE LIQUID EFFLUENT SAMPLING AND ANALYSIS SURVEILLANCE
(Cont'd)TABLE NOTATIONS

- a. The LLD is the smallest concentration of radioactive material in a sample that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$LLD = \frac{4.66 s_b}{A \cdot E \cdot V \cdot 2.22 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

Where:

LLD is the lower limit of detection as defined above in picocuries (pCi) per unit mass or volume,

s_b is the square root of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute),

A is the number of gamma rays emitted per disintegration for gamma ray radionuclide analysis ($A = 1.0$) for gross alpha, strontium, and tritium measurement.

E is the counting efficiency (as counts per gamma),

V is the sample size (in units of mass or volume),

2.22 is the number of disintegrations per minute per picocurie,

Y is the fractional radiochemical yield when applicable (otherwise $Y = 1.0$)

λ is the radioactive decay constant for the particular radionuclide, and

Δt is the elapsed time between midpoint of sample collection and time of counting (for plant effluents, not environmental sample).

The value of s_b used in the calculation of the LLD for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. In calculating the LLD for a radionuclide determined by gamma ray spectrometry, the background shall include the typical contributions of other radionuclides normally present in the samples. Typical values of E, V, Y, and Δt shall be used in the calculation. The background count rate is calculated from the background counts that are determined to be within \pm one FWHM (Full Width at Half Maximum) energy band about the energy of the gamma ray peak used for the quantitative analysis for that radionuclide.

TABLE 12.3-2RADIOACTIVE LIQUID EFFLUENT SAMPLING AND ANALYSIS SURVEILLANCE
(Cont'd)TABLE NOTATIONS

For certain mixtures of gamma emitters, it may not be possible to measure radionuclides in concentrations near their sensitivity limits when other nuclides are present in the sample in much greater concentrations. Under these circumstances, it will be more appropriate to calculate the concentrations of such radionuclides using observed ratios with those radionuclides which are measurable.

- b. A COMPOSITE SAMPLE is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen which is representative of the liquids released.
- 1) To be representative of the quantities and concentrations of radioactive materials in liquid effluents, all samples taken for the composite shall be thoroughly mixed in order for the composite sample to be representative of the effluent release.
 - 2) The weekly and monthly Proportional Composite samples are not required provided that (1) the analysis required for each of these composite samples has been run on each batch discharged, and (2) a monthly record of radionuclides discharged (isotope and quantity) is maintained.
- c. A BATCH RELEASE is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated, and then thoroughly mixed to assure representative sampling.
- d. A CONTINUOUS RELEASE is the discharge of liquid wastes of a nondiscrete volume; e.g., from a volume of system that has an input flow during the continuous release.
- e. The principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Mn-54, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141. Ce-144 shall also be measured, but with an LLD of 5E-06. This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides, shall also be identified and reported. Nuclides which are below the LLD for the analyses shall be reported as "less than" the nuclide's LLD, and shall not be reported as being present at the LLD level for that nuclide. The "less than" values shall not be used in the required dose calculations.
- f. If the fire sump composite sampler is inoperable, grab samples shall be taken from the turbine building fire sump once per day.

12.3.2 Dose**Operability Requirements**

12.3.2.A The dose or dose commitment to a MEMBER OF THE PUBLIC above background from radioactive materials in liquid effluents released from each unit to UNRESTRICTED AREAS (see Zion Station ODCM Annex, Appendix F, Figure F-1) shall be limited:

1. During any calendar quarter to less than or equal to 1.5 mrem to the total body and to less than or equal to 5 mrem to any organ, and
2. During any calendar year to less than or equal to 3 mrem to the total body and to less than or equal to 10 mrem to any organ.

Applicability: At all times.

Action

1. With the calculated dose from the release of radioactive materials in liquid effluents exceeding twice the limits specified in Section 12.3.2.A, limit the subsequent releases such that the dose or dose commitment to a MEMBER OF THE PUBLIC from all uranium fuel cycle sources is limited to less than or equal to 25 mrem to the total body or any organ (except thyroid, which is limited to less than or equal to 75 mrem) over 12 consecutive months. Demonstrate that radiation exposures to all MEMBERS OF THE PUBLIC from all uranium fuel cycle sources (including all effluent pathways and direct radiation) are less than the 40CFR Part 190 and 40CFR Part 141 Standard, otherwise obtain a variance from the Commission to permit releases which exceed the 40CFR Part 141 or 190 Standard. The radiation exposure analysis shall use methods prescribed in the ODCM.

Surveillance Requirements

12.3.2.B Cumulative dose contributions from liquid effluents for the current calendar quarter and the current calendar year shall be determined in accordance with the methodologies and parameters of the ODCM at least once per 31 days.

Bases

12.3.2.C

This Section is provided to implement the requirements of Sections II.A, III.A and IV.A of Appendix I, 10CFR Part 50. The limiting Condition of Operation implements the guides set forth in Section II.A of Appendix I. The ACTION statements provide the required OPERATING flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in liquid effluents will be kept "as low as is reasonably achievable." Also, for fresh water sites with drinking water supplies, which can be potentially affected by plant operations, there is reasonable assurance that the operation of the facility will not result in radionuclide concentrations in the finished drinking water that are excess of the requirements of 40CFR 141. The dose calculations in the ODCM implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data, such that the actual exposure of an individual through appropriate pathways is unlikely to be substantially underestimated. The equations specified in the ODCM for calculating the dose due to the actual release rate of radioactive materials in liquid effluents are consistent with the methodology provided in Regulatory Guide 1.109; Calculation of Annual Doses to Man from Routine Releases of Radioactive Effluents for the Purpose of Evaluating Compliance with 10CFR Part 50, Appendix I, Revision 1, October 1977 and Regulatory Guides 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," April 1977.

This Section applies to the release of liquid effluents from each unit at the site. For shared radwaste treatment systems, the liquid effluents from the shared systems are proportioned among the units sharing the system.

12.3.3 Liquid Radwaste Treatment System

Operability Requirements

- 12.3.3.A The Liquid Radwaste Treatment System shall be OPERABLE* and appropriate portions of the system shall be used to reduce the radioactive materials in liquid effluents prior to discharge when the projected doses due to liquid effluent, from each unit, to UNRESTRICTED AREAS (see Zion Station ODCM Annex, Appendix F, Figure F-1) would exceed 0.06 mrem to the total body or 0.20 to any organ in a 31-day period.

* The liquid Radwaste Treatment System shall be considered OPERABLE, if liquid waste can be held up and/or discharged within applicable limits.

Applicability: At all times.

Action With the Liquid Radwaste Treatment System inoperable for more than 30 days or with radioactive liquid waste being discharged without treatment and in excess of the above limits, return the system to OPERABLE status and place the appropriate portions of the system in use.

Surveillance Requirements

- 12.3.3.B Doses due to liquid releases from the site to UNRESTRICTED AREAS, shall be projected at least once per 31 days in accordance with the methodologies and parameters of the ODCM when the Liquid Radwaste Treatment System is not being fully utilized.

Bases

- 12.3.3.C The OPERABILITY of the Liquid Radwaste Treatment System ensures that the system will be available for use whenever liquid effluents require treatment prior to release to the environment. The requirement that the appropriate portions of this system be used when specified, provides assurance that the releases of radioactive materials in liquid effluents will be kept "as low as is reasonably achievable." This Section implements the requirements of 10CFR Part 50.36a, General Design Criterion of Appendix A to 10CFR Part 50 and the design objective given in Section II.D of Appendix I to 10CFR Part 50. The specified limits governing the use of appropriate portions of the Liquid Radwaste Treatment System were specified as a 2% fraction of the dose design objectives set forth in Section II.A of Appendix I, 10CFR Part 50, for liquid effluents.

12.4 GASEOUS EFFLUENTS**12.4.1 Dose Rate****Operating Requirements**

12.4.1.A The dose rate due to radioactive materials released in gaseous effluents from the site to areas at or beyond the SITE BOUNDARY (see Zion Station ODCM Annex, Appendix F, Figure F-1), shall be limited to the following:

1. For noble gases: Less than or equal to 500 mrem/yr to the whole body and less than or equal to 3000 mrem/yr to the skin, and
2. For Iodine-131, Iodine-133, tritium and all radionuclides in particulate form with half-lives greater than 8 days: Less than or equal to 1500 mrem/yr to any organ.

Applicability: At all times.

Action

With a release exceeding the above limits, immediately reduce the release rate to within the above limits.

Surveillance Requirements

12.4.1.B The dose rate due to radioactive materials in gaseous effluents shall be determined to be within the prescribed limits in accordance with the methods and procedures of the ODCM by obtaining representative samples and performing analyses in accordance with the sampling and analysis program specified in Table 12.4-1.

Bases

12.4.1.C This Section is provided to ensure that radioactive material discharged in gaseous effluents will not result in the exposure of a Member of the Public in an Unrestricted Area, either at or beyond the Site Boundary in excess of the design objectives of appendix I to 10 CFR part 50. This section is provided to ensure that gaseous effluents from all units on the site will be appropriately controlled. It provides operational flexibility for releasing gaseous effluents to satisfy the Section II.A and II. design objectives of appendix I to 10 CFR part 50. The specified release-rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to an individual at or beyond the SITE BOUNDARY to 500 mrem/year to the total body or to less than or equal to 3000 mrem/year to the skin. These release-rate limits also restrict, at all times, the corresponding organ dose rate above background to a child via the inhalation pathway to less than or equal to 1500 mrem/year. For purposes of calculating dose resulting from airborne releases, the stack is considered a ground-level release.

The Sampling and Analysis Program requirements prescribed in Table 12.4-1 are established to provide representative and appropriate sampling of the radiologically controlled areas. The method and frequency of sampling is based on the effluent flowrate. Continuous Releases are defined for areas with forced ventilation release points. Unventilated Building Releases are defined for areas with no specific release point.

TABLE 12.4-1RADIOACTIVE GASEOUS EFFLUENT SAMPLING AND ANALYSIS PROGRAM

GASEOUS RELEASE TYPE	SAMPLING METHOD	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) ($\mu\text{Ci/cc}$) (f)
A. Deleted				
B. Containment Vent and Purge	Grab (b)	Prior to Each Release	Noble Gases	1E-4
			Principal Gamma Emitters (d)	
			Tritium	1E-6
C. Continuous Releases ⁽¹⁾ Aux Building Ventilation Stack for both (2) units <u>And</u> Fuel Building Ventilation	Grab (b)	Monthly	Noble Gases	1E-4
			Principal Gamma Emitters (d)	
			Tritium	1E-6
	Continuous (b)(h)	Weekly(c)	Particulate	1E-11
	Composite	Quarterly	Principal Gamma Emitters (e)	
			Sr-89 Particulate	1E-11
			Sr-90 Particulate	1E-11
			Gross Alpha	1E-11
	Continuous (g)(h) Noble Gas Monitor	N.A.	Noble Gases, Gross Beta or Gamma	1E-6

(1) The requirements listed in this table for Continuous Releases are applicable for release paths that are available.

TABLE 12.4-1RADIOACTIVE GASEOUS EFFLUENT SAMPLING AND ANALYSIS PROGRAM
(Cont'd)

GASEOUS RELEASE TYPE	SAMPLING METHOD	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) ($\mu\text{Ci/cc}$) (f)
D. Unventilated Building Releases ⁽²⁾ Aux Building Above Ground Elevations(i) <u>And</u> Fuel Building (j)	Grab	Daily	Noble Gases Principal Gamma Emitters (d)	1E-4
			Tritium	1E-6
	Continuous (h)	Daily(c)	Particulate Principal Gamma Emitters (e)	1E-11
	Composite	Quarterly	Sr-89 Particulate	1E-11
			Sr-90 Particulate	1E-11
			Gross Alpha	1E-11

(2) The requirements listed in this table for Unventilated Building Releases are applicable for buildings with the normal ventilation release paths isolated.

TABLE 12.4-1RADIOACTIVE GASEOUS EFFLUENT SAMPLING AND ANALYSIS PROGRAM
(Cont'd)TABLE NOTATIONS

- a. Deleted
- b. The ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period in Section 12.4.1.
- c. The particulate filter(s) shall be saved for a quarterly composite analysis for Sr-89 and Sr-90.
- d. For gaseous emissions, the principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138. Other peaks which are measurable and identifiable by gamma-ray spectrometry, together with the above nuclides, shall also be identified and reported when an actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being at the LLD level for that nuclide.
- e. For particulate emissions, the principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Mn-54, Co-60, Zn-65, Co-58, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. Other peaks which are measurable and identifiable by gamma-ray spectrometry, together with the above nuclides, shall also be identified and reported when an actual analysis is performed on a sample. Nuclides which are below the LLD for the analyses shall not be reported as being at the LLD level for that nuclide.
- f. The LLD is defined in Notation a of Table 12.3-2.
- g. Refer to Table 12.2-3 for required actions when the noble gas monitor is not in service.
- h. Sampling interruptions of short duration for routine activities, e.g. filter replacement, do not constitute a deviation from the requirements for continuous sampling.
- i. The effluent flowrate for Unventilated Building Releases from the Aux Bldg shall be estimated by $F_{AB} \text{ (cfm)} = 72900 \sqrt{dP}$ (in of water). When the Aux Bldg pressure can not be determined, the maximum flowrate of one exhaust fan, 67000 cfm, shall be used as the effluent flowrate.
- j. The effluent flowrate for Unventilated Building Releases from the Fuel Bldg shall be estimated by $F_{FB} \text{ (cfm)} = 24300 \sqrt{dP}$ (in of water). When the Fuel Bldg pressure can not be determined, the maximum flowrate of the exhaust fan, 15000 cfm, shall be used as the effluent flowrate.

12.4.2 Dose - Noble Gases

Operability Requirements

12.4.2.A The air dose due to noble gases released in gaseous effluents from each unit to areas at or beyond the SITE BOUNDARY (see Zion Station ODCM Annex, Appendix F, Figure F-1) shall be limited to the following:

1. During any calendar quarter: Less than or equal to 5 mrad for gamma radiation and less than or equal to 10 mrad for beta radiation, and
2. During any calendar year: Less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation.

Applicability: At all times

Action

1. With the calculated air dose from gaseous effluents exceeding the above limits, define the corrective action(s) to be taken to ensure that future releases are in compliance with Section 12.4.2.A.
2. With the calculated air dose from radioactive noble gases in gaseous effluents exceeding twice the limits of Section 12.4.2.A:
 - a. Limit subsequent releases such that the dose or dose commitment to a MEMBER OF THE PUBLIC from all uranium fuel cycle sources is limited to less than or equal to 25 mrem to the total body or any organ (except the thyroid, which is limited to less than or equal to 75 mrem) over 12 consecutive months.
 - b. Prepare an analysis which demonstrates that radiation exposures to all MEMBERS OF THE PUBLIC from all uranium fuel cycle sources (including all effluents pathways and direct radiation) are less than the 40 CFR Part 190 Standard.

Surveillance Requirements

12.4.2.B Cumulative dose contributions for the current calendar quarter and current calendar year for noble gases shall be determined in accordance with the methodologies and parameters of the ODCM at least once every 31 days.

Bases

12.4.2.C

This Section implements the requirements of Sections II.B, III.A and IV.A of Appendix I, 10CFR Part 50. The Operability Requirements implement the guides set forth in Section II.B of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in gaseous effluents will be kept "as low as is reasonably achievable." The Surveillance Requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I is to be shown by calculation procedures based on models and data such that the actual exposure of an individual through the appropriate pathways is unlikely to be substantially underestimated.

12.4.3 Dose - I-131, I-133, Tritium, and Radioactive Material in Particulate Form**Operability Requirements**

12.4.3.A The dose to a MEMBER OF THE PUBLIC from I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released from each unit to areas at or beyond the SITE BOUNDARY (see Zion Station ODCM Annex, Appendix F, Figure F-1) shall be limited to the following:

1. During any calendar quarter: Less than or equal to 7.5 mrem to any organ, and
2. During any calendar year: Less than or equal to 15 mrem to any organ.

Applicability: At all times.

Action

With the calculated dose from the release of Iodine-131, Iodine-133, tritium and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents exceeding twice the limits of Section 12.4.3.A:

1. Limit subsequent releases such that the dose or dose commitment to a MEMBER OF THE PUBLIC from all uranium fuel cycle sources to less than or equal to 25 mrem to the total body or organ (except the thyroid which is limited to less than or equal to 75 mrem) over 12 consecutive months.
2. Prepare an analysis which demonstrates that radiation exposures to all MEMBERS OF THE PUBLIC from all uranium fuel cycle sources (including all effluent pathways and direct radiation) are less than the 40CFR Part 190 Standard. Otherwise, request a variance from the Commission to permit release which exceeds the 40CFR Part 190 Standard. The radiation exposure analysis shall use the methods prescribed in the ODCM.

Surveillance Requirements

12.4.3.B Cumulative dose contribution for the current calendar quarter and current calendar year for I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days shall be determined in accordance with the methodologies and parameters in the ODCM at least once per 31 days.

Bases

12.4.3.C

This Section implements the requirements of Sections II.C, III.A and IV.A of Appendix I, 10CFR Part 50. The Operability Requirements are the guides set forth in Section II.C of Appendix I. The ACTION statements provide the required operating flexibility and at the same time, implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable." The ODCM calculation methods specified in the Surveillance Requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I is to be shown by calculational procedures based on models and data such that the actual exposure of an individual through appropriate pathways is unlikely to be substantially underestimated. The release-rate specifications for radioiodines, radioactive material in particulate form and radioiodines other than noble gases are dependent on the existing radionuclide pathways to man, at or beyond the SITE BOUNDARY. The pathways which are examined in the development of these calculations are: 1) individual inhalation of airborne radionuclides, 2) disposition of radionuclides onto green leafy vegetation with subsequent consumption by man, 3) deposition onto grassy areas where milk animals and meat producing animals graze with consumption of the milk and meat by man.

12.4.4 Gaseous Effluent Treatment System**Operability Requirements**

12.4.4.A The GASEOUS EFFLUENT TREATMENT SYSTEM shall be OPERABLE* and appropriate portions of these systems shall be used to reduce radioactive materials in gaseous effluents when the projected doses in 31 days due to gaseous effluent releases, from each unit, to areas at or beyond the SITE BOUNDARY (see Zion Station ODCM Annex, Appendix F, Figure F-1) would exceed:

1. 0.2 mrad to air from gamma radiation, or
2. 0.4 mrad to air from beta radiation, or
3. 0.3 mrem to any organ.

* The installed GASEOUS EFFLUENT TREATMENT SYSTEM shall be considered OPERABLE by meeting Sections 12.4.1, 12.4.2 and/or 12.4.3, as applicable.

Applicability: At all times.

Action: With the Gaseous Effluent Treatment System inoperable for more than 30 days or with radioactive gaseous waste being discharged without treatment and in excess of the above limits, return the system to OPERABLE status and place the appropriate portions of the system in use.

Surveillance Requirements

12.4.4.B Doses due to gaseous releases from each unit to areas at or beyond the SITE BOUNDARY shall be projected at least once per 31 days in accordance with the methodologies and parameters in the ODCM when the Gaseous Effluent Treatment Systems are not being fully utilized.

Bases

12.4.4.C The OPERABILITY of the GASEOUS EFFLUENT TREATMENT SYSTEM ensures that the system will be available for use whenever gaseous effluents require treatment prior to release to the environment.

The requirement that the appropriate portions of this system be used when specified provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as is reasonably achievable." This section implements the requirement of 10CFR50.36a, General Design Criterion 60 of Appendix A to 10CFR50 and the design objective given in Section II.D of Appendix I to 10CFR50. The specified limits governing the use of appropriate portions of the Gaseous Effluent Treatment System were specified as a 2% fraction of the dose design objectives set forth in Section II.B and II.C of Appendix I, 10CFR50, for gaseous effluents.

12.5 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM**12.5.1 Monitoring Program****Operability Requirements**

12.5.1.A The Radiological Environmental Monitoring Program shall be conducted as specified in Table 12.5-1.

Applicability: At all times.

Action

1. With the Radiological Environmental Monitoring Program not being conducted as specified in Table 12.5-1, prepare and submit to the Commission, in the Annual Radiological Environmental Operating Report, a description of the reasons for not conducting a program as required and the plans for preventing a recurrence.

Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of sampling equipment, if a person who participates in the program goes out of business or no longer can provide sample, or contractor omission which is corrected as soon as discovered. If the equipment malfunctions, corrective actions shall be completed as soon as practical. If a person/business supplying samples goes out of business, a replacement supplier shall be found as soon as possible. All deviations from the sampling schedule shall be described in the Annual Radiological Environmental Operating Report.

2. With the level of radioactivity as a result of plant effluents in an environmental sampling medium at a specified location exceeding the reporting levels of Table 12.5-2 when averaged over any calendar quarter, prepare and submit to the Commission within 30 days a Special Report which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to reduce radioactive effluents so that the potential annual dose* to a MEMBER OF THE PUBLIC is less than the calendar year limits of Section 12.3.2, 12.4.2, or 12.4.3. When more than one of the radionuclides in Table 12.5.2 are detected in the sampling medium, this report shall be submitted if:

$$\frac{\text{concentration (1)}}{\text{reporting level (1)}} + \frac{\text{concentration (2)}}{\text{reporting level (2)}} + \dots \geq 1.0$$

When radionuclides other than those in Table 12.5-2 are detected and are the result of plant effluents, this report shall be submitted if the potential annual dose to a MEMBER OF THE PUBLIC from all radionuclides is equal to or greater than the calendar year limits of Section 12.3.2, 12.4.2, or 12.4.3. This report is not required if the measured level of radioactivity was not the result of plant effluents; however, in such a event, the condition shall be reported and described in the Annual Radiological Environmental Operating Report.

*The methodology and parameters used to estimate the potential dose to a MEMBER OF THE PUBLIC shall be indicated in the report.

3. If the sample type or sampling location(s) required by Table 12.5-1 become(s) permanently unavailable, identify suitable alternative sampling media for the pathway of interest and/or specific locations for obtaining replacement samples and add them to the Radiological Environmental Monitoring Program as soon as practicable. The specific locations from which samples were unavailable may then be deleted from the program.

Prepare and submit a controlled version of the ODCM within 180 days including a revised figure(s) and table reflecting the new location(s) with supporting information identifying the cause of the unavailability of samples and justifying the selection of new location(s) for obtaining samples.

Surveillance Requirements

- 12.5.1.B.1 The Radiological Environmental Monitoring samples shall be collected from the locations specified in the ODCM and analyzed pursuant to Table 12.5-1 and the detection capabilities required by Table 12.5-3.

Bases

- 12.5.1.C The Radiological Environmental Monitoring Program required by this section provides representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures of MEMBERS OF THE PUBLIC resulting from the station operation. This monitoring program implements Section IV.B.2 of Appendix I to 10CFR50 and thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and modeling of the environmental exposure pathways. Guidance for this monitoring program is provided by the Radiological Assessment Branch Technical Position on Environmental Monitoring. The specified monitoring program is based on baseline/historical conditions for direct radiation measurements, soil, biota, and sediments established over years of operational experience and current site conditions/operating activities. The REMP need only be re-evaluated for major changes to site conditions/configuration (e.g., prior to site decommissioning, if a significant release occurs, changing baseline data...). Program changes may be initiated at any time based on operational experience.

The required detection capabilities for environmental sample analyses are tabulated in terms of the lower limits of detection (LLD). The LLDs required by Table 12.5-3 are considered optimum for routine environmental measurements in industrial laboratories. It should be recognized that the LLD is defined as a before the fact limit representing the capability of a measurement system and not as an after the fact limit for a particular measurement.

Detailed discussion of the LLD, and other detection limits, can be found in HASL Procedures Manual, HASL-300 (revised annually), Currie, LA., "Limits for Qualitative Detection and Quantitative Determination-Application to Radiochemistry," Anal. Chem. **40**, 586-93 (1968), and Gartwell, J.K., "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

Interpretations

- 12.5.1.D** Table 12.5-1 requires "one sample of each community drinking water supply downstream of the plant within 10 kilometers (6.2 miles)." Drinking water supply is defined as water taken from river, lakes, or reservoirs (not well water) which is used for drinking. Since Lake Michigan has no designated downstream or upstream direction, two drinking water locations (one north/one south) within 10 kilometers shall be sampled as drinking water indicator locations, and two other locations (one north/one south) beyond 10 kilometers shall be sampled as control locations.

TABLE 12.5-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/ OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS ⁽¹⁾	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
1. <u>Airborne</u>	<p>Samples from a total of three locations:</p> <p>a. Indicator- Near Field</p> <p>Three samples from locations within 4 km (2.5 mi) in different sectors.</p>	Continuous sampler operation with particulate sample collection weekly (or more frequently if required due to dust loading).	<p><u>Particulate Sampler:</u></p> <p>Gross beta analysis following weekly filter change⁽³⁾ and gamma isotopic analysis⁽⁴⁾ quarterly on composite filters by location on near field samples.</p>

TABLE 12.5-1 (Continued)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/ OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS ⁽¹⁾	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
2. <u>Direct Radiation</u> ⁽⁵⁾	<p>Seventeen routine monitoring stations with thermoluminescent dosimeters (TLD), placed with at least one monitoring location in each meteorological sector, as follows:</p> <p>a. Indicator- Inner Ring (100 Series TLD) in the general area of the SITE BOUNDARY (0.1 to 1.5 mi);</p> <p>b. Other</p> <p>One at each Airborne location given in part 1.a.</p> <p>Other TLDs may be placed at special interest locations beyond the Restricted Area where either a MEMBER OF THE PUBLIC or Commonwealth Edison employees have routine access. (300 Series TLD)</p>	Quarterly	Gamma dose on each TLD quarterly.

TABLE 12.5-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/ OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS ⁽¹⁾	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
3. <u>Waterborne</u>	<p>a. <u>Drinking Water Indicator</u>⁽⁶⁾</p> <p>One Sample from each community drinking water supply that could be affected by the station discharge within 10 km (6.2 mi) of discharge (north/south).</p> <p>b. <u>Control</u>⁽⁶⁾</p> <p>One sample upstream and downstream (north/south) of discharge.</p> <p>c. <u>Sediments</u></p> <p>At least one sample within 10 km (6.2 mi) of discharge</p>	<p>Weekly grab samples.</p> <p>Weekly grab samples.</p> <p>Semiannually.</p>	<p>Gross beta and gamma isotopic analyses⁽⁴⁾ on monthly composite; tritium analysis on quarterly composite.</p> <p>Gross beta and gamma isotopic analyses⁽⁴⁾ on monthly composite; tritium analysis on quarterly composite.</p> <p>Gamma isotopic analysis⁽⁴⁾ semiannually.</p>

TABLE 12.5-1 (Continued)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/ OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS ⁽¹⁾	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
4. Ingestion	<p>a. <u>Fish Indicator</u></p> <p>Representative samples of commercially and recreationally important species in discharge area.</p>	Semiannually	Gamma isotopic analysis ⁽⁴⁾ on edible portions.
	<p>b. <u>Control</u></p> <p>Representative samples of commercially and recreationally important species not influenced by plant discharge.</p>	Semiannually	Gamma isotopic analysis ⁽⁴⁾ on edible portions.

TABLE 12.5-1 (Continued)
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM
TABLE NOTATIONS

- (1) Specific parameters of distance and direction from the centerline of the midpoint of the two units and additional description where pertinent, shall be provided for each and every sample location in Table 11-1 of the ODCM Station Annexes. Refer to NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants," October 1978, and to Radiological Assessment Branch Technical Position, Revision 1, November 1979.
- (2) Deleted – No longer applicable.
- (3) Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thorium daughter decay. If gross beta activity in any individual air particulate sample is greater than 10 times the 1999 mean of control samples, then, a gamma isotopic analysis shall be performed on that elevated individual sample.
- (4) Gamma isotopic analysis means the identification and quantification of gamma emitting radionuclides that may be attributable to the effluents from the station.
- (5) One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. Film badges shall not be used as dosimeters for measuring direct radiation. The number of locations is not an absolute number. The number of direct radiation monitoring stations may be reduced according to geographical limitations; e.g., If a station is adjacent to a lake (i.e. Zion), some sectors may be over water thereby reducing the number of dosimeters which could be placed at the indicated distances. The frequency of analysis or readout for TLD systems will depend upon the characteristics of the specific system used and should be selected to obtain optimum dose information with minimal fading.
- (6) Refer to Section 12.5.1.D for interpretation on the applicability of "downstream" and "upstream" . If no community drinking water supply exists within 6.2 miles of the discharge, surface water sampling shall be performed.
- (7) Deleted – No longer applicable.
- (8) Deleted – No longer applicable.
- (9) DELETED
- (10) Deleted – No longer applicable.

TABLE 12.5-2

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES*

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GASES (pCi/m ³)	FISH (pCi/kg, wet)
H-3	20,000 ⁽¹⁾		
Mn-54	1,000		30,000
Fe-59	400		10,000
Co-58	1,000		30,000
Co-60	300		10,000
Zn-65	300		20,000
Zr-Nb-95	400		
Cs-134	30	10	1,000
Cs-137	50	20	2,000
Ba-La-140	200		

(1) For drinking water samples. This is 40 CFR Part 141 value. If no drinking water pathway exists, a value of 30,000 pCi/l may be used.

* This table contains reporting levels for analyses beyond the requirements of Table 12.5-1.

TABLE 12.5-3

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS⁽¹⁾

LOWER LIMIT OF DETECTION (LLD)⁽²⁾⁽³⁾

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GASES (pCi/m ³)	FISH (pCi/kg, wet)	SEDIMENT (pCi/kg, dry)
Gross Beta	4	0.01	1000	
H-3	2,000 ⁽⁷⁾			
Mn-54	15		130	
Co-58,60	15		130	
Zn-65	30		260	
Zr-Nb-95	15			
Cs-134	15	0.01	100	150
Cs-137	18	0.01	100	180

TABLE 12.5-3 (Continued)
DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS
TABLE NOTATIONS

- (1) This table contains lower limits of detection for analyses beyond the requirements of Table 12.5-1. This table does not imply that only these nuclides are to be detected and reported; other peaks which are measurable and identifiable in the analyses required by Table 12.5-1 shall be reported in the Annual Radiological Environmental Operating Report.
- (2) Required detection capabilities for thermoluminescent dosimeters used for environmental measurements shall be in accordance with the recommendations of Regulatory Guide 4.13.
- (3) The Lower Limit of Detection (LLD) is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation, the LLD is defined as follows:

$$LLD = \frac{4.66 S_b + 3/t_b}{(E)(V)(2.22)(Y)(\exp(-\lambda\Delta t))}$$

$$LLD \sim \frac{4.66 S_b}{(E)(V)(2.22)(Y)(\exp(-\lambda\Delta t))}$$

Where: $4.66 S_b \gg 3/t_b$

LLD = the "a priori" Lower Limit of Detection (picocuries per unit mass or volume),

s_b = the standard deviation of the background counting rate or of the counting rate of a blank sample, as appropriate (counts per minute),

$$= \frac{\sqrt{\text{Total Counts}}}{t_b}$$

E = the counting efficiency(counts per disintegration),

V = the sample size (units of mass or volume),

2.22 = the number of disintegrations per minute per picocurie,

Y = the fractional radiochemical yield, when applicable,

λ = the radioactive decay constant for the particular radionuclide (sec^{-1}),

t_b = counting time of the background or blank (minutes), and

TABLE 12.5-3 (Continued)
DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS
TABLE NOTATIONS

Δt = the elapsed time between sample collection, or end of the sample collection period, and the time of counting (sec).

Typical values of E, V, Y, and Δt should be used in the calculation.

It should be recognized that the LLD is defined as a before the fact limit representing the capability of a measurement system and not as an after the fact limit for a particular measurement.

Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally, background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Operating Report.

- (4) Deleted – No longer applicable.
- (5) Deleted – No longer applicable.
- (6) Deleted – No longer applicable.
- (7) This is the minimum required LLD, however, environmental samples analyzed off-site will be required to use 200 pCi/l.

12.5.2 LAND USE CENSUS

Operability Requirements

- 12.5.2.A A Land Use Census shall be conducted and shall identify within a distance of 10 km (6.2 mi) the location, in each of the following meteorological sectors, A, J, K, L, M, N, P, Q, and R**, the nearest residence. For dose calculation, a garden will be assumed at the nearest residence.

Applicability: At all times.

Action:

With a Land Use Census identifying location(s) that yields a calculated dose or dose commitment, via the same exposure pathway 20% greater than at a location from which samples are currently being obtained in accordance with Section 12.5.1, add the new location(s) within 30 days to the Radiological Environmental Monitoring Program given in Chapter 11 of the ODCM Station Annexes. The sampling location(s), excluding the control location, having the lowest calculated dose or dose commitment(s), via the same exposure pathway, may be deleted from this monitoring program after October 31 of the year in which this Land Use Census was conducted. Submit in the next Annual Radiological Environmental Operating Report documentation for a change in the ODCM including revised figure(s) and table(s) for the ODCM reflecting the new location(s) with information supporting the change in sampling locations.

** The nearest industrial facility shall also be documented if closer than the nearest residence.

Surveillance Requirements

- 12.5.2.B The Land Use Census shall be conducted, between June 1 and October 1, at least once per calendar year using that information that will provide the best results, such as by a door-to-door survey or aerial survey. The result of the Land Use Census shall be included in the Annual Radiological Environmental Operating Report.

Bases

- 12.5.2.C This specification is provided to ensure that changes in the use of areas at and beyond the SITE BOUNDARY are identified and that modifications to the Radiological Environmental Monitoring Program given in the ODCM are made if required by the results of this census.

This census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR Part 50. An annual garden census will not be required since the licensee will assume that there is a garden at the nearest residence in each sector for dose calculations.

12.5.3 INTERLABORATORY COMPARISON PROGRAM

Operability Requirements

- 12.5.3.A Analyses shall be performed on radioactive materials supplied as part of an interlaboratory comparison program that correspond to samples required by Table 12.5.1.

Applicability: At all times.

Action:

1. With analyses not being performed as required above, report the corrective actions taken to prevent a recurrence to the Commission in the Annual Radiological Environmental Operating Report.

Surveillance Requirements

- 12.5.3.B A summary of the results obtained as part of the above required interlaboratory comparison program shall be included in the Annual Radiological Environmental Operating Report.

Bases

- 12.5.3.C The requirement for participation in an interlaboratory comparison program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental samples matrices are performed as part of the quality assurance program for environmental monitoring in order to demonstrate that the results are valid for the purposes of Section IV.B.2 of Appendix I to 10 CFR Part 50.

12.6 PROCESS CONTROL PROGRAM (PCP)**12.6.1 PCP Program Requirements**

Contains the requirements and methodology for the current formulas, sampling, analyses, tests, and determinations performed to ensure the processing and packaging of solid radioactive wastes based on actual or simulated wet solid wastes is accomplished in compliance with:

- 10CFR Parts 20, 61, and 71
- State Regulations
- Burial Site Requirements
- Other Requirements Governing the Shipping and Burial of Radioactive Waste

12.6.2 Changes to the PCP

Changes to the PCP include those changes that affect the process or methodology, by which wastes are solidified, packaged to meet burial site form requirements, classified, or dewatered.

12.6.2.1. Shall be documented and records of reviews performed shall be retained, and

Shall contain sufficient information to support the change together with the appropriate analyses or evaluations justifying the change(s), and

Shall contain a determination that the change will maintain the overall conformance of the solidified waste product to existing requirements of Federal, State, or other applicable regulations, and

Shall become effective after review and acceptance by the Onsite Review and Investigative Function and the approval of the Decommissioning Plant Manager.

12.7 REPORTING REQUIREMENTS

12.7.1 Annual Radiological Environmental Operating Report*

Routine Annual Radiological Environmental Operating Report covering the operation of the Unit(s) during the previous calendar year shall be submitted according to the Permanently Defueled Technical Specifications. The Annual Radiological Environmental Operating Report shall include summaries, interpretations, and an analysis of trends of the results of the radiological environmental surveillance activities for the report period, including, as found appropriate, a comparison of preoperational studies with operational controls or with previous environmental surveillance reports, and an assessment of the observed impacts of the plant operation on the environment.

The Annual Radiological Environmental Operating Report shall include the results of all radiological environmental samples and of all environmental radiation measurements taken during the period pursuant to the locations specified in the tables and figures in the Chapter 11 of the ODCM Station Annexes, as well as summarized and tabulated results of these analyses and measurements in the format of the table in the Radiological Assessment Branch Technical Position, Revision 1, November 1979. In the event that some individual results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report.

The reports shall also include the following: a summary description of the Radiological Environmental Monitoring Program; legible maps covering all sampling locations keyed to a table giving distances and directions from the midpoint between the two units; reasons for not conducting the Radiological Environmental Monitoring Program as required by Section 12.5.1, and discussion for all deviations from the sampling schedule of Table 11.1-1; a Table of Missed Samples and a Table of Sample Anomalies for all deviations from the sampling schedule of Table 11.1-1; discussion of environmental sample measurements that exceed the reporting levels of Table 12.5-2 but are not the result of plant effluents; discussion of all analyses in which the LLD required by Table 12.5-3 was not achievable; results of the Land Use Census required by Section 12.5.2; and the results of licensee participation in an interlaboratory comparison program and the corrective actions being taken if the specified program is not being performed as required by Section 12.5.3.

The Annual Radiological Environmental Operating Report shall also include an annual summary of hourly meteorological data collected over the applicable year. This annual summary may be either in the form of an hour-by-hour listing on magnetic tape of wind speed, wind direction, atmospheric stability, and precipitation (if measured), or in the form of joint frequency distributions of wind speed, wind direction, and atmospheric stability. In lieu of submission with the Annual Radiological Environmental Operating Report, the licensee has the option of retaining this summary of required meteorological data on site in a file that shall be provided to the NRC upon request.

* A single submittal may be made for a multiple unit station.

The Annual Radiological Environmental Operating Report shall also include an assessment of the radiation doses due to the radioactive liquid and gaseous effluents released from the Unit or Station during the previous calendar year. This report shall also include an assessment of radiation doses to the most likely exposed MEMBER OF THE PUBLIC from reactor releases and other nearby uranium fuel cycle sources, including doses from primary effluent pathways and direct radiation, for the previous calendar year. The assessment of radiation doses shall be performed in accordance with the methodology and parameters in the ODCM and in compliance with 10 CFR 20 and 40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operation."

12.7.2 Annual Radioactive Effluent Release Report**

The Annual Radioactive Effluent Release Reports shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit as outlined in Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Material in Liquid and Gaseous Effluent from Light-Water-Cooled Nuclear Power Plants," Revision 1, June 1974, with data summarized on a quarterly basis following the format of Appendix B thereof.

The Annual Radioactive Effluent Release Report shall include a list and description of unplanned releases of radioactive material in liquid effluents from the site to UNRESTRICTED AREAS and of unplanned releases of radioactive material in gaseous effluents from the site to areas at or beyond the SITE BOUNDARY during the reporting period.

The Annual Radioactive Effluent Release Report shall include any changes made during the reporting period to the Process Control Program as well as any major changes to Liquid, Gaseous or Solid Radwaste Treatment Systems, pursuant to Section 12.7.4.

The Annual Radioactive Effluent Release Report shall also include the following: an explanation as to why the inoperability of liquid or gaseous effluent monitoring instrumentation was not corrected within the time specified in Section 12.2.1 or 12.2.2, respectively; and description of the events leading to liquid holdup tanks exceeding the limits of the Permanently Defueled Technical Specifications.

12.7.2.1 Exceptions to Regulatory Guide 1.21 Reporting Requirements:

- a. All references to "semiannual" are not applicable. The report will be submitted according to Technical Specifications.
- b. Hourly meteorological data is recorded for all periods throughout the year, and quarterly summaries will be reported. Separate meteorological data for periods of batch releases are not required to be included.
- c. Total body and significant organ doses to the maximally exposed individual from receiving-water-related exposure pathways will be provided. Associated population dose is not required to be included.

- d. Organ doses to the maximally exposed individual in unrestricted areas from radioactive iodine and radioactive material in particulate form from all exposure pathways will be provided. Associated population dose is not required to be included.
- e. Total body doses to the maximally exposed individual in unrestricted areas from direct radiation from the facility should be included in the report. Associated population dose is not required to be included.
- f. Total body doses to the population and average doses to individuals in the population from all receiving-water-related pathways are not required to be included.
- g. Total body doses to the population and average doses to individuals in the population from gaseous effluents to a distance of 50 miles from the site and beyond will not be included.

**** A single submittal may be made for a multiple unit station. The submittal should combine those sections that are common to all units at the station; however, for units with separate radwaste systems, the submittal shall specify the releases of radioactive material from each unit.**

12.7.3 Offsite Dose Calculation Manual (ODCM)**12.7.3.1 Changes to the ODCM:**

- a. Shall be documented and records of reviews performed shall be retained as required by Permanently Defueled Technical Specifications. This documentation shall contain:
 - 1. Sufficient Information to support the change together with the appropriate analyses or evaluations justifying the change(s); and
 - 2. A determination that the change will maintain the level of radioactive effluent control required by 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR Part 50 and not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations.
 - 3. Documentation of the fact that the change has been reviewed and found acceptable by a Qualified Technical Review.
- b. Shall become effective after the approval of the Plant Manager on the date specified by the Qualified Technical Review.
- c. Shall be submitted to the Commission in the form of a complete, legible copy of the entire ODCM as a part of or concurrent with the Annual Radioactive Effluent Release Report for the period of the report in which any change to the ODCM was made effective. Each change shall be identified by markings in the margin of the affected pages, clearly indicating the area of the page that was changed, and shall indicate the date (e.g., month/year) the change was implemented.

12.7.4 Major Changes to Liquid and Gaseous Effluent Treatment Systems***

Licensee-initiated major changes to the Effluent Treatment Systems (liquid and gaseous):

- a. Shall be reported to the Commission in the Annual Radioactive Effluent Release Report for the period in which the evaluation was reviewed by a Qualified Technical Review. The discussion of each change shall contain:
 - 1) A summary of the evaluation that led to the determination that the change could be made in accordance with 10 CFR 50.59;
 - 2) Sufficient detailed information to totally support the reason for the change without benefit of additional and supplemental information;
 - 3) A detailed description of the equipment, components, and processes involved and the interfaces with other plant systems.
 - 4) An evaluation of the change which shows the predicted releases of radioactive materials in liquid and gaseous effluents that differ from those previously predicted in the License application and amendments thereto;
 - 5) An evaluation of the change, which shows the expected maximum exposures to a MEMBER OF THE PUBLIC and to the general population that differ from those previously estimated in the License application and amendments thereto;
 - 6) A comparison of the predicted releases of radioactive materials, in liquid and gaseous effluents, to the actual releases for the period prior to when the changes are to be made;
 - 7) An estimate of the exposure to plant operating personnel as a result of the change; and
 - 8) Documentation of the fact that the change was reviewed and found acceptable by a Qualified Technical Review.
- b. Shall become effective upon review and acceptance by the Qualified Technical Review.

*** Licensees may choose to submit the information called for in this standard as part of the biennial DSAR update.