Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

Whiteshell 2027 Licence Renewal Application Supporting Documents

Part A

WLD-508760-160-001

OFFICIAL USE ONLY This Information Asset (IA) and the elements of information contained within it are the property of Atomic Energy of Canada Limited (AECL).

Table of Contents

Redacted_Licensing Basis List for Whiteshell Laboratories 3

Radiation Protection Action Levels 22

Redacted Standard Administrative Levels and Action Levels for WL Air and Liquid Radioactive Effluents 38

Redacted Whiteshell Laboratories Annual Compliance Monitoring Report for 2025 49

Redacted Designated Representatives of the Licensee, Sites Licenses, Certificates & Permits 278

Letter from Minister of Natural Resources providing financial guarantee 314

Redacted The Whiteshell Laboratories Detailed Decommissioning Plan Volume 1 - Program Overview 315

Pollock & Wright Land Surveyors, Title Report for Atomic Energy Canada Ltd. Plant Site Lands 457

Letter from AECL authorizing CNL to carry on licensed activities 606

Fitness for Duty 608

Fitness for Duty - Policy on Managing Alcohol and Drug Use 626

Safety and Health 653

Environment 659

Redacted Whiteshell Laboratories Effluent Verification Monitoring Plan 664

Redacted Whiteshell Laboratories Environmental Monitoring Plan 814

Public Information Program for Canadian Nuclear Laboratories 914

Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

Licensing Basis List for Whiteshell Laboratories

900-514300-LST-006931

Revision 0.1

REDACTED

Approved by:	Sarah Brewer	2026/05/19
	Senior Director, Compliance	Date
Approved by:	Brian Wilcox	2026/05/19
	GM & WL Site Licence Holder	Date

Effective Date: 2026/05/19
Mandatory Review by Date: 2029/05/19

Refer to ATOM for current version. Printed copies should not be considered current without first consulting ATOM.

OFFICIAL USE ONLY This Information Asset (IA) and the elements of information contained within it are the property of Atomic Energy of Canada Limited (AECL).

This page is for Content Controls that apply to this document. If no Content Controls apply, none will be listed.

Intellectual Property NOTICE: The attached documents/files/information includes information owned/developed by CNL which has particular value to CNL's business interests (CNL IP). Access is restricted to authorized persons for authorized purposes only. Third party disclosure or use of CNL IP requires a license or nondisclosure agreement, depending on the nature of the information, failing which such disclosure or use is strictly prohibited.

REDACTED

Revision History

Rev. No.	Date	Details of Revision	Authored By	Reviewed By	Approved By
0.1	2026/04/01	Issued for 'Approval' Minor Changes include: updated documents in the list to new revision numbers and remove documents which were cancelled.	A. Debidyal	B. Barber A. Bilton A. Caron T. Chshyolkova A. Coulas C. De Waele C. Gallagher W. Graydon P. Kompass K. Leroux M. Mitchell J. Owens K. Shorter G. Snell R. Swartz C. Tormey J. Unrau	S. Brewer B. Wilcox
0	2024/12/11	Issued as "Approved for Use."	S. Bessey	A. Bilton T. Chshyolkova A. Dash D. Garrick M. Hammell J. Hayter K. Leroux T. Pehkonen G. Rollins R. Swartz B. Wilcox	S. Brewer
D1	2024/10/21	Issued for "Review and Comment."	S. Bessey	A. Bilton E. Broughton T. Chshyolkova A. Coulas A. Dash G. Dolinar D. Garrick W. Graydon M. Hammell J. Hayter K. Leroux K. Lundie T. Pehkonen G. Rollins G. Snell	

REDACTED

Table of Contents

Section **Page**

1. Scope and Applicability 5
2. Purpose 5
3. Roles and Responsibilities 5
   - 3.1 Designated Representatives of the Licensee 5
   - 3.2 Information Management 5
4. List 5
   - 4.1 Licence Conditions 5
     - 4.1.1 Licence Condition G.1 5
     - 4.1.2 Licence Condition G.2 6
     - 4.1.3 Licence Condition G.3 7
     - 4.1.4 Licence Condition G.4 7
   - 4.2 Safety and Control Areas 8
     - 4.2.1 Management System 8
     - 4.2.2 Human Performance Management 8
     - 4.2.3 Operating Performance 9
     - 4.2.4 Safety Analysis 10
     - 4.2.5 Physical Design 11
     - 4.2.6 Fitness for Service 11
     - 4.2.7 Radiation Protection 11
     - 4.2.8 Conventional Health and Safety 12
     - 4.2.9 Environmental Protection 12
     - 4.2.10 Emergency Management and Fire Protection 13
     - 4.2.11 Waste Management 15
     - 4.2.12 Security 17
     - 4.2.13 Safeguards and Non-Proliferation 17
     - 4.2.14 Packaging and Transport 18

REDACTED

5. References 18

REDACTED

1. Scope and Applicability

This document is to establish alignment between the Licence Conditions Handbook [1] and licensing basis documentation applicable to Whiteshell.

2. Purpose

This document contains a list of all licensing basis documents applicable to Whiteshell Laboratories, including their revision date and notification requirements.

3. Roles and Responsibilities

3.1 Designated Representatives of the Licensee

Designated Representatives of the Licensee are responsible for:

- Ensuring the listed documents are submitted to the CNSC based on Licence Condition G.2: Notification of Changes [1], and *Managing Regulatory Communications and Commitments* [2], and
- Verifying the listed documents are maintained as per *Creation, Capture and Use of Information Assets* [3].

3.2 Information Management

Information Management is responsible for identifying all documents in the Electronic Document Records Management System (EDRMS) that require regulatory notification, as per this document.

4. List

4.1 Licence Conditions

4.1.1 Licence Condition G.1

Licence Condition G.1			
Document Title	**Document Number**	**Revision**[1]	**Expiry / Effective Date**
Amended Application for Renewal of the Nuclear Research and Test Establishment Decommissioning Licence for the Whiteshell Laboratories	WLD-CNNO-24-0010-L	0	*no expiry* 2024-02-15

[1] This data is the current data at the time of publications, check ATOM for the most current information.

REDACTED

4.1.2 Licence Condition G.2

Licence Condition G.2				
Document Title	**Document Number**	**Revision**[1]	**Expiry / Effective Date**	**Notification Requirement**
Cleanup	900-508300-GDI-001	7	2027-04-26 2024-04-26	Annually
Commissioning	900-505250-GDI-001	4.1	2028-11-04 2025-11-04	Annually
Construction	900-505240-GDI-001	1.1	2028-06-16 2025-06-16	Annually
Design Authority and Design Engineering	900-508120-GDI-001	6.1	2026-10-11 2023-11-11	Annually
Emergency Preparedness	900-508730-GDI-001	4.1	2028-11-24 2025-11-24	Annually
Environmental Protection	900-509200-GDI-001	6	2026-09-28 2023-09-29	Annually
Fire Protection	900-508720-GDI-001	3	2027-07-30 2024-07-30	Annually
Fitness for Service	900-508230-GDI-001	2.1	2029-03-21 2024-03-22	Annually
Information Management	900-511300-GDI-001	4.2	2029-03-05 2026-03-05	Annually
Management System	900-514100-GDI-001	3.2	2028-12-18 2025-12-18	Annually
Nuclear Criticality Safety	900-508550-GDI-001	6.1	2029-01-26 2026-01-26	Annually
Nuclear Cyber Security	900-511400-GDI-001	2	2028-09-10 2025-09-10	Annually
Nuclear Materials and Safeguards Management	900-508510-GDI-001	2.1	2026-12-19 2023-12-20	Annually
Occupational Safety and Health	900-510400-GDI-001	1.1	2028-10-17 2025-10-17	Annually
Performance Assurance	900-514000-GDI-001	2	2025-03-07 2022-03-07	Annually
Pressure Boundary	900-508140-GDI-001	5.2	2029-02-15 2026-02-15	Annually

REDACTED

Licence Condition G.2				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Quality	900-514200-GDI-001	5	2027-01-14 2024-01-31	Annually
Radiation Protection	900-508740-GDI-001	3	2026-03-08 2023-03-08	Annually
Safety Analysis	900-508770-GDI-001	7	2028-06-20 2025-06-20	Annually
Security	900-508710-GDI-001	6.1	2026-03-28 2023-03-29	Annually
Training and Development	900-510200-GDI-001	5	2026-10-02 2023-10-03	Annually
Transportation of Dangerous Goods	900-508520-GDI-001	4.2	2029-04-01 2026-04-01	Annually
Waste Management	900-508600-GDI-001	2.2	2027-04-29 2024-04-29	Annually

4.1.3 Licence Condition G.3

Licence Condition G.3			
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**
Submission of Information Regarding Financial Guarantees for all Atomic Energy of Canada Limited Sites Operated by Canadian Nuclear Laboratories	145-CNNO-25-0038-L	0	*no expiry* 2025-08-19

4.1.4 Licence Condition G.4

Licence Condition G.4				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Public Information Program for Canadian Nuclear Laboratories	CW-513430-REPT-001	10	*no expiry* 2024-10-08	N

REDACTED

4.2 Safety and Control Areas

4.2.1 Management System

Management System				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Quality	900-514200-PDD-001	3	2027-05-01 2024-05-10	N
Quality Program Requirements Document	900-514200-PRD-001	4	2027-05-08 2024-06-14	Y
Functional Authorities	900-514100-LST-001	7.3	2028-05-29 2025-05-29	N
Codes, Regulations, Standards and Other Documents	900-514100-LST-002	1.3	2026-11-06 2023-11-17	N
CNL Management System Manual	900-514100-MAN-001	3.2	2028-09-04 2025-09-04	Y
Information Management	900-511300-PDD-001	5	2027-07-11 2024-07-25	N
Information Management (PRD)	900-511300-PRD-001	4	2027-07-11 2024-08-26	Y
Designated Representatives of the Licensee, Site Licenses, Certificates & Permits	900-514300-LST-001	14	2028-08-04 2025-08-04	N
Whiteshell Laboratories Decommissioning Project Quality Assurance Plan	WLD-508300-QAP-001	4	2027-07-25 2024-07-25	N
Integrated Assessment Plan	900-514200-MCP-003171	0	2027-02-14 2024-02-15	N

REDACTED

4.2.2 Human Performance Management

Human Performance Management				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Performance Assurance	900-514000-PDD-001	2	2026-11-28 2023-12-12	N
Performance Assurance (PRD)	900-514000-PRD-001	3	2027-03-08 2024-03-08	Y

Human Performance Management				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Application of the Systematic Approach to Training (SAT) at CNL	900-510200-LST-001	5	2029-02-10 2026-02-10	N
Training and Development	900-510200-PDD-001	5	2026-08-02 2023-08-02	N
Training and Development (PRD)	900-510200-PRD-001	6	2029-04-06 2026-04-06	Y

4.2.3 Operating Performance

Operating Performance				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Construction	900-505240-PDD-001	2.1	2027-03-11 2024-04-15	N
Construction (PRD)	900-505240-PRD-001	3	2028-08-25 2025-08-25	Y
Commissioning	900-505250-PDD-001	2.2	2029-04-01 2026-04-01	N
Commissioning (PRD)	900-505250-PRD-001	2.0	2029-04-03 2026-04-03	Y
Facility Authorization for the Operation of the Concrete Canister Storage Facility at Whiteshell Laboratories	CCSF-00583-FA-001	2	2028-03-08 2023-03-08	Y
Facility Authorization for the Operation of the Shielded Facilities at Whiteshell Laboratories	WLSF-00583-FA-001	6	2030-10-01 2025-10-01	Y
Facility Authorization for the Operation of the Waste Management Area at Whiteshell Laboratories	WLWMA-00583-FA-001	5	2029-06-04 2024-06-04	Y
CNL Reporting to Regulatory Agencies	900-514300-MCP-006	0.3	2026-07-18 2023-07-18	N

REDACTED

4.2.4 Safety Analysis

Safety Analysis				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Safety Analysis	900-508770-PDD-001	6	2028-03-31 2025-03-31	N
Safety Analysis (PRD)	900-508770-PRD-001	6.3	2029-02-27 2026-02-27	Y
Whiteshell Laboratories Concrete Canister Storage Facility Safety Analysis Report	RC-983	1	*no expiry* 2000-01-01	Y
Safety Analysis Report Whiteshell Laboratories Shielded Facilities	WLSF-03500-SAR-001	4	*no expiry* 2015-09-02	Y
Safety Analysis Report for the Whiteshell Laboratories Waste Management Area	WLWMA-508640-SAR-001	3.1	*no expiry* 2026-03-01	Y
Nuclear Safety Note for the Retrieval and Transfer of Fuel Baskets in the CCSF	CCSF-508770-NSN-001	2	*no expiry* 2023-03-06	Y
Nuclear Safety Note Standpipe Retrieval Operation Phase I	222-508770-NSN-003178	0.1	*no expiry* 2024-01-15	Y
Nuclear Safety Note Recoverable Surface Storage and Staging Area	WLWMA-508770-NSN-001	2	*no expiry* 2021-12-08	Y
Nuclear Criticality Safety	900-508550-PDD-001	3	2026-02-28 2023-03-10	N
Nuclear Criticality Safety (PRD)	900-508550-PRD-001	3.1	2026-07-24 2023-09-01	Y
Concrete Canister Storage Facility (CSD-11)	CCSF-123400-CSD-001	4	*no expiry* 2025-04-01	N
Criticality Safety Document (CSD-24) Whiteshell Laboratories Shielded Facility	CSD-24	3	*no expiry* 2008-02-26	Y
Whiteshell Laboratories Waste Management Area (CSD-27)	WLWMA-123400-CSD-001	9	*no expiry* 2025-06-24	Y
Whiteshell Laboratories Cask Loading Facility, [redacted]	WLWMA-123450-CSD-001	0	*no expiry* 2019-06-06	Y

REDACTED

4.2.5 Physical Design

Physical Design				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Design Authority and Design Engineering	900-508120-PDD-001	6	2028-09-05 2025-09-05	N
Design Authority and Design Engineering (PRD)	900-508120-PRD-001	6.1	2029-03-10 2026-03-10	Y
Pressure Boundary	900-508140-PDD-001	5.2	2026-07-03 2023-07-18	N
Pressure Boundary (PRD)	900-508140-PRD-001	5.2	2026-10-10 2023-11-30	Y
WL Pressure Boundary Quality Assurance Plan	WL-508140-QAP-001	2	2027-11-25 2025-06-19	N
Whiteshell Laboratories Code Classification and Design Registration of Pressure-Retaining Systems/ Components	WLD-508140-PRO-001	3.2	2028-12-11 2024-02-12	Y

4.2.6 Fitness for Service

Fitness for Service				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Fitness for Service	900-508230-PDD-001	3	2026-07-18 2023-08-02	N
Fitness for Service (PRD)	900-508230-PRD-001	3	2027-01-21 2024-01-22	Y
Periodic Inspection Plan for Whiteshell Laboratories WMA Concrete Bunkers	WLWMA-106100-MP-004252	0	2030-05-15 2025-05-15	N

4.2.7 Radiation Protection

Radiation Protection				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Radiation Protection	900-508740-PDD-001	3.1	2026-10-24 2023-11-07	N

REDACTED

Radiation Protection				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Radiation Protection (PRD)	900-508740-PRD-001	6	2028-01-23 2025-01-23	Y
Radiation Protection Action Levels	900-508740-LST-002	3	2028-09-15 2025-09-15	Y
Dose Control Points	900-508740-MCP-007	1.1	2027-05-06 2024-05-17	N
ALARA Review and Assessment of Radiation Work	900-508740-MCP-026	2	2027-11-28 2024-11-29	N
Radiation Levels and Limits	900-508740-STD-019	0.2	2028-01-29 2025-03-14	N
Design and Modification Considerations	900-508740-STD-005	0.1	2028-06-12 2025-06-12	N

4.2.8 Conventional Health and Safety

Conventional Health and Safety				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Occupational Safety and Health	900-510400-PDD-001	4	2027-02-14 2024-02-16	N
Occupational Safety and Health (PRD)	900-510400-PRD-001	3	2027-06-14 2024-06-14	Y

4.2.9 Environmental Protection

Environmental Protection				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Environmental Protection	900-509200-PDD-001	4.1	2026-10-05 2023-10-16	N
Environmental Protection (PRD)	900-509200-PRD-001	6	2029-05-15 2026-05-15	Y
Administrative Levels and Action Levels for WL Air and Liquid Radioactive Effluents	900-509200-STD-016	0	2025-12-16 2022-12-16	Y

REDACTED

Environmental Protection				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Whiteshell Laboratories Integrated Monitoring Program Framework	WL-509200-PLA-011067	0	2031-03-06 2026-03-06	N
Whiteshell Laboratories Effluent Verification Monitoring Plan	WL-509200-PLA-001	2	2031-05-04 2026-05-04	Y
Derived Release Limits for CNL's Whiteshell Laboratories	WL-509211-RRD-001	7	2031-01-30 2026-01-30	Y
Environmental Assessment Follow-up Program for Whiteshell Laboratories	03704-001	1	no expiry 2002-06-01	Y

4.2.10 Emergency Management and Fire Protection

Emergency Management and Fire Protection				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Emergency Preparedness	900-508730-PDD-001	3.1	2029-03-16 2026-03-16	N
Emergency Preparedness (PRD)	900-508730-PRD-001	3	2028-01-30 2025-03-10	Y
Whiteshell Laboratories Site Emergency Response Plan	WL-508730-PLA- 001591	0	2026-03-22[4] 2023-05-31	N
Fire Protection	900-508720-PDD-001	4	2026-08-30 2023-09-07	N
Fire Protection (PRD)	900-508720-PRD-001	2	2028-07-02 2025-07-02	Y
Impairment, Notification and Compensatory Measures	900-508720-MCP- 006	3	2029-01-17 2026-01-17	N
CRL and WL Staffing, Equipment, and Apparatus	163-508720-PRO-006150	0.1	2029-11-18 2024-11-19	N
Whiteshell Laboratories Building [redacted] Fire Hazard Assessment and Code Compliance Review	PLC-CNL-P2027-004-FHA-CCR-WL [redacted]	0	2027-12-21 2022-12-22	Y

REDACTED

Emergency Management and Fire Protection				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Building [redacted] Fire Hazard Assessment	151-508720-FHA-009	0	*no expiry*[2] 2020-07-28	Y
Building [redacted] Code Compliance Review	WLWMA-508632-REPT-001	0	*no expiry*[2] 2020-07-28	Y
WL [redacted] Fire Hazard Analysis	4O2205830-720-R0_WL_[redacted]_FHA	0	2027-12-19 2022-12-20	Y
WL [redacted] Code Compliance Review	4O2205830-720-R0_WL_[redacted]_CCR	0	2027-12-19 2022-12-20	Y
Whiteshell Laboratories Waste Management Area Fire Hazard Analysis [redacted]	22-1029-REP02	0	2027-12-19 2022-12-20	Y
Whiteshell Laboratories Waste Management Area Code Compliance Review [redacted]	22-1029-REP03	0	2027-12-19 2022-12-20	Y
Whiteshell Laboratories Waste Management Area Fire Hazard Analysis	PLC-CNL-P2027-001-FHA-WMA	0	2027-07-15 2022-07-15	Y
Whiteshell Laboratories Waste Management Area Code Compliance Review	PLC-CNL-P2027-001-CCR-WMA	0	2027-07-15 2022-07-15	Y
[redacted] Cask Loading Facility Fire Hazard Assessment	WLDP-24800-FHA- 002	0	*no expiry*[3] 2020-01-28	Y
[redacted] Cask Loading Facility - Code Compliance Review	WLDP-24800-REPT- 005	0	*no expiry*[3] 2020-01-21	Y
CCSF Fire Hazard Assessment	CCSF-508720-FHA-10067854	0	2030-01-26 2025-01-27	Y
CCSF Code Compliance Review	CCSF-508720-CCR-10077495	0	2030-11-24 2025-11-25	Y
[redacted] Fire Hazard Assessment	WL-508720-FHA-10069479	0	2030-03-30 2025-03-31	Y

[2] [redacted] not yet a functional building (under re-configuration)

[3] CNSC staff acknowledge the deferment of [redacted] FPAs (WLD-NOCN-25-0040-L); the FHA and CCR for the CLF will not be revised until substantial completion of the project.

REDACTED

Emergency Management and Fire Protection				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
[redacted] Code Compliance Review	WL-508720-REPT-10069480	0	2030-03-30 2025-03-31	Y
[redacted] Fire Hazard Assessment	WL-508720-FHA-10069478	0	2030-03-30 2025-03-31	Y
[redacted] Code Compliance Review	WL-508720-REPT-10069477	0	2030-03-30 2025-03-31	Y
[redacted] Fire Hazard Assessment	WL-508720-FHA-10069475	0	2030-03-30 2025-03-31	Y
[redacted] Code Compliance Review	WL-508720-REPT-10069476	0	2030-03-30 2025-03-31	Y

4.2.11 Waste Management

Waste Management				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Waste Management	900-508600-PDD-001	5	2026-06-05 2023-06-30	N
Waste Management (PRD)	900-508600-PRD-001	5	2029-05-11 2026-05-11	Y
Cleanup	900-508300-PDD-001	5	2026-06-30 2023-06-30	N
Cleanup (PRD)	900-508300-PRD-001	6	2028-07-28 2025-07-28	Y
Whiteshell Laboratories Detailed Decommissioning Plan: Volume 1 - Program Overview	WLDP-02000-DDP-001	2	*no expiry*[4] 2021-12-07	Y
Whiteshell Laboratories Detailed Decommissioning Plan: Volume 2 -Shielded Facilities	WLDP-21400-DDP-001	2	*no expiry*[4] 2016-11-03	Y
Whiteshell Laboratories Detailed Decommissioning Plan: Volume 7	WLDP-22500-DDP-001	1	*no expiry*[4] 2017-11-17	Y

[4] New versions have been submitted to CNSC staff for review; these documents are being worked through / Regulatory Hold, status

REDACTED

Waste Management				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
-Concrete Canister Storage Facility				
Whiteshell Laboratories Detailed Decommissioning Plan: Volume 9 –Building [redacted]	WLDP-23500-DDP-001	1	*no expiry*[4] 2024-03-25	Y
Whiteshell Laboratories Detailed Decommissioning Plan: Volume 9 –Building [redacted] - Addendum	WLDP-23500-DDP-001 AD	2	*no expiry*[5] 2018-03-08	Y
Whiteshell Laboratories Detailed Decommissioning Plan: Volume 8 -WMA Part 3: LLW Liabilities	WLDP-24400-DDP-001	5	2026-04-09[6] 2021-03-22	Y
Whiteshell Laboratories Detailed Decommissioning Plan: Volume 6 -Whiteshell Reactor #1 - Building [redacted]	WLDP-26400-DDP-001	3	*no expiry*[4] 2015-02-11	Y
Volume 12 - WL Licensed Site Supporting and General Infrastructure - Part 1: South-Side Buildings	RC-2143_12_PART_1	1	*no expiry* 2006-03-06	Y
Volume 12 - WL Licensed Site Supporting and General Infrastructure: North-Side Buildings	WLDP-32000-DDP-001	0	*no expiry* 2009-03-30	Y
Volume 12 - Whiteshell Laboratories Licensed Site Supporting and General Infrastructure - Part 3: Outer Area Buildings and Facilities	WLDP-330200-DDP-001	1	*no expiry* 2008-08-08	Y
Volume 12 - Whiteshell Laboratories Licensed Site Supporting and General Infrastructure - Part 4: Site Services	WLDP-34000-DDP-001	1	*no expiry* 2013-01-03	Y
Volume 12 - Whiteshell Laboratories Licensed Site Supporting and General Infrastructure - Part 5: Site	WLDP-35000-DDP-001	1	*no expiry*[4] 2012-05-25	Y

[5] This document will be superseded by the revised [redacted] DDP above that is with CNSC once accepted by CNSC.

[6] Scope was renewed with limited scope; CNL concluded that a revision of the DDP is not required at this time, (WLDP-24400-021-000, 2026 Jan 06)

REDACTED

Waste Management				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Affected Lands and Contaminated Structures				
Whiteshell Laboratories Detailed Decommissioning Plan: Volume 11 - Health and Safety Facilities Buildings [redacted]	WLDP-37000-DDP-001	2	*no expiry* 2020-09-15	Y
Storage with Surveillance Plan for Whiteshell Laboratories Building [redacted] Whiteshell Reactor 1	WLD-508330-SWS-000024	2.2	2030-09-16 2025-10-18	Y

4.2.12 Security

Security				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Security	900-508710-PDD-001	6	2029-04-10 2026-04-10	N
Security (PRD)	900-508710-PRD-001	5	2028-08-29 2025-08-29	Y
Nuclear Cyber Security	900-511400-PDD-001	4	2028-03-31 2025-03-31	N
Nuclear Cyber Security (PRD)	900-511400-PRD-001	5	2028-05-05 2025-05-05	Y
Whiteshell Site Security Report	EPS-14000-RPT-18	17	*no expiry* 2025-04-14	Y
Tiered Response Force (TRF)	119-508710-PLA-010	5	2029-11-18 2024-11-18	Y

4.2.13 Safeguards and Non-Proliferation

Safeguards and Non-Proliferation				
Document Title	**Document Number**	**Revision[1]**	**Expiry / Effective Date**	**Notification Requirement**
Nuclear Materials and Safeguards Management	900-508510-PDD-001	4	2025-10-24 2022-10-24	N
Nuclear Materials and Safeguards Management (PRD)	900-508510-PRD-001	4	2025-09-30 2022-09-30	Y

REDACTED

4.2.14 Packaging and Transport

Packing and Transport				
Document Title	**Document Number**	**Revision**[1]	**Expiry / Effective Date**	**Notification Requirement**
Transportation of Dangerous Goods	900-508520-PDD-001	3.2	2029-04-01 2026-04-01	N
Transportation of Dangerous Goods (PRD)	900-508520-PRD-001	3.2	2029-05-01 2026-05-01	Y

5. References

[1] *Whiteshell Laboratories Nuclear Research and Test Establishment Decommissioning Licence NRTEDL-W5-8.00/2027*, Licence Conditions Handbook, NRTEDL-LCH-08.00/2027 Revision 0/WLD-508760-HBK-003 Revision 0, Canadian Nuclear Safety Commission, January 01, 2025, 68649040

[2] *Managing Regulatory Communications and Commitments*, 900-514300-MCP-005, Revision 3.1, Canadian Nuclear Laboratories, March 26, 2024, 50978336

[3] *Creations, Capture and Use of Information Assets*, 900-511300-STD-003, Revision 5, Canadian Nuclear Laboratories, October 17, 2025, 50746207

REDACTED

Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

Radiation Protection Action Levels

900-508740-LST-002

Revision 3.0

Approved by:	Marc Jones	2025/07/28
	Manager, Corporate Radiation P	Date

Effective Date: 2025/09/15
Expiry Date: 2028/09/15

Refer to ATOM for current version. Printed copies should not be considered current without first consulting ATOM.

OFFICIAL USE ONLY This Information Asset (IA) and the elements of information contained within it are the property of Atomic Energy of Canada Limited (AECL).

Lien - See ATOM

This page is for Content Controls that apply to this document. If no Content Controls apply, none will be listed.

Intellectual Property NOTICE: The attached documents/files/information includes information owned/developed by CNL which has particular value to CNL's business interests (CNL IP). Access is restricted to authorized persons for authorized purposes only. Third party disclosure or use of CNL IP requires a license or nondisclosure agreement, depending on the nature of the information, failing which such disclosure or use is strictly prohibited.

Lien - See ATOM

Revision History

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
3	2025/07/22	Issued as “Approved for Use”.	W. McIntyre	M. Jones O. Kamaev	M. Jones
3D1	2025/07/09	Issued for “Review and Comment”. Major Changes: • Updated and clarified Action Levels (Sections 4.1, 4.3, 4.4, 4.5) • Edited and updated references. • This revision represents the mandatory 5-year action level review for all CNL licences as outlined in the respective review memos [1]-[6]. • Edited table layout to ensure consistency.	W. McIntyre	A. Dash A. Masters A. Onikosi B. Carr M. Jones O. Kamaev S. Lawrence	
2	2024/07/29	Issued as “Approved for Use”	J. Brown	M. Jones	M. Jones
2D1	2024/07/05	Issued for “Review and Comment”. Major Change: • PHAI sites amalgamated into a single license and tables removed accordingly (Sections 5.2,5.3, 5.7,5.11 in previous revision). • Updated license references.	J. Brown	A. Coulas A. Masters A. Onikosi L. Rasmussen	
1	2021/04/01	Issued as “Approved for Use” Minor changes to incorporate responses to CNSC staff in RADP-CNNO-21-0002-L	C. Russell	V. Lim	S. Holder
0	2020/08/01	Issued as “Approved for Use” Partially supersedes: 900-508740-MCP-006 Replaces Appendices A through E	C. Russell	V. Lim	S. Holder
D1	2016/03/31	Issued for “Review and Comment”	C. Russell	M. Jones V. Lim L. Rasmussen	

Licensee ATOM

Table of Contents

Section **Page**

1. Scope and Applicability 4
2. Purpose 4
3. Roles and Responsibilities 4
   - 3.1 Radiation Protection Functional Support Manager 4
   - 3.2 Radiation Protection Program Manager 4
4. List 4
   - 4.1 Nuclear Research and Test Establishment Operating Licence - Chalk River Laboratories (NRTEOL-01.01/2028) [8], [9] 5
   - 4.2 Nuclear Substance and Radiation Device Licence – La Prade (No. 15193-4-26.2) [10] 5
   - 4.3 Waste Facility Decommissioning Licence - Nuclear Power Demonstration (WFDL-W4-342.00/2034) [11], [12] 6
   - 4.4 Waste Facility Decommissioning Licence - Douglas Point (WFDL-W4-332.03/2030) [13], [14] 7
   - 4.5 Waste Facility Decommissioning Licence - Gentilly-1 (WFDL-W4-331.00/2034) [15], [16] 9
   - 4.6 Waste Substance Licence – Unspecified Locations (WNSL-W2-2202.0/2026) [17] 10
   - 4.7 Waste Nuclear Substance Licence – Port Hope Area Initiative – Waste Management Project (WNSL-W1-2310.00/2032) [18], [19] 11
   - 4.8 Nuclear Research and Test Establishment Decommissioning Licence – Whiteshell Laboratories (NRTEDL-W5-8.00/2027) [20], [21] 12
5. Definitions and Acronyms 13
   - 5.1 Definitions 13
   - 5.2 Acronyms 13
6. References 14

Lien : See ATOM

1. Scope and Applicability

This document contains all radiation protection action levels for the Canadian Nuclear Laboratories (CNL) as agreed to by the Canadian Nuclear Safety Commission (CNSC). Action Level is defined in the *Radiation Protection Regulations* [1].

Individual action levels (AL) are specific to a particular licence and only apply to activities covered by that licence. For example, action levels for the Whiteshell Laboratories do not apply to the Chalk River Laboratories.

Action levels that apply to air or liquid effluent released from CNL sites are excluded because they are considered part of the Environmental Protection Program referred to in licenses.

2. Purpose

The purpose of the document is to codify and present in one place, all radiation protection action levels across all licenses granted to CNL by the CNSC.

3. Roles and Responsibilities

3.1 Radiation Protection Functional Support Manager

The radiation protection functional support manager is responsible for updating this list to the current action levels in effect under the various licences held by CNL.

3.2 Radiation Protection Program Manager

The various radiation protection program managers are responsible for notifying the functional support manager when action levels are changed.

4. List

The following sections contain the action levels for the various licences held by CNL.

Lien - See ATOM

4.1 Nuclear Research and Test Establishment Operating Licence - Chalk River Laboratories (NRTEOL-01.01/2028) [8], [9]

Parameter	Quarterly (mSv)	Annual (mSv)
Effective Dose (NEW)	5	10
Effective Dose (Pregnant NEW)	0.5	0.75 [1]
Effective Dose (Other Worker)	0.5	0.75
Shallow Dose (NEW) [2]	10	15
Shallow Dose (Other Worker) [2]	0.5	1
Internal Committed Effective Dose	N/A	1
Extremity Dose [3]	50	100
Lens of an Eye	N/A	10
Localized Area of Skin Equivalent Dose [4]	50 mSv per single event	

Notes:

1. Balance of pregnancy, not annual.
2. Shallow dose is effective dose to the skin but does not include dose due to a localized area contamination event.
3. The extremity dose action level applies in situations where an extremity TLD has measured a dose exceeding the respective extremity dose values.
4. Localized area of skin equivalent dose is the dose received by the skin averaged over the 1 cm^2 area that received the highest dose during a single skin contamination incident.

4.2 Nuclear Substance and Radiation Device Licence – La Prade (No. 15193-4-26.2) [10]

No action levels have been specified in this licence.

Lien - See ATOM

4.3 Waste Facility Decommissioning Licence - Nuclear Power Demonstration (WFDL-W4-342.00/2034) [11], [12]

Parameter	Quarterly (mSv) [1]	Annual (mSv) [1]
Effective Dose (NEW)	3	9
Effective Dose (Pregnant NEW**)**	0.3	0.7 [2]
Effective Dose (Other Worker)	0.3	0.7
Equivalent Dose to the Skin (Shallow Dose)	30	90
Committed Effective Dose (Internal exposure)	N/A	1
Extremity Dose [3]	50	100
Equivalent Dose the Skin [4,5] (Skin Contamination)	50 mSv Single Exposure Event	

Notes:

1. Planned work for which exposures are anticipated that will or could exceed the Action Levels given in this table, shall not be undertaken without prior authorisation from the Radiation Protection Program Manager with concurrence from the RP Functional Support Manager.
2. Balance of pregnancy, not annual.
3. The extremity dose action level applies in situations where an extremity TLD has measured a dose exceeding the respective extremity dose values.
4. Applies to dose from a single skin contamination event, excluding dose to the skin and extremity monitored by a dosimeter.
5. When the skin is unevenly irradiated, the averaging area shall not be less than 1 cm^2, even in the case of a hot particle. When the skin is unevenly irradiated, the equivalent dose received by the skin is the average equivalent dose over the 1 cm^2 area that received the highest equivalent dose.

Lien - See ATOM

4.4 Waste Facility Decommissioning Licence - Douglas Point (WFDL-W4-332.03/2030) [13], [14]

Parameter	Quarterly (mSv) [1]	Annual (mSv) [1]
Effective Dose (NEW)	N/A	5
Effective Dose (Pregnant NEW**)**	0.3	0.7 [2]
Effective Dose (Other Worker)	0.3	0.7
Equivalent Dose to the Skin (Shallow Dose)	N/A	50
External Dose to the Whole Body	0.5 mSv Single Exposure Event [3]	
Equivalent Dose to the hand or foot (Extremity Dose)	50 mSv Single Exposure Event [4]	100
Committed Effective Dose (Internal exposure)	1 mSv Single Exposure Event [5] or 1 mSv Chronic Exposure [6]	
Equivalent Dose the Skin (Skin Contamination)	50 mSv Single Exposure Event [7, 8]	

Notes:

1. Planned work for which exposures are anticipated that will or could exceed the Action Levels given in this table, shall not be undertaken without prior authorization from the Radiation Protection Program Manager.
2. Balance of pregnancy, not annual.
3. Unplanned exposure to the whole body resulting from a work activity during a day shift (i.e. 8 to 12 hour shift). The exposure is taken to be 0.5 mSv greater than what is established as an appropriate margin for the conduct of the work as measured on the Personal Alarming Dosimeter (e.g. 0.5 mSv greater than Personal Alarming Dosimeter Dose Alarm).
4. Applies to an unplanned exposure from a single extremity TLD measurement dose result.
5. Applies to an unplanned acute intake for which the exposure can be treated as instantaneous for the purpose of assessing the resulting committed dose.

Lien - See ATOM

6. Applies to intakes received over an extended period of time which is not treated as a single instantaneous intake for the purposes of assess the resulting committed dose. The chronic intakes action level does not include the sum of separate assessed doses from multiple unplanned acute intake events.
7. Applies to dose from a single skin contamination event, excluding dose to the skin and extremity monitored by a dosimeter.
8. When the skin is unevenly irradiated, the averaging area shall not be less than 1 cm^2, even in the case of a hot particle. When the skin is unevenly irradiated, the equivalent dose received by the skin is the average equivalent dose over the 1 cm^2 area that received the highest equivalent dose.

Lien - See ATOM

4.5 Waste Facility Decommissioning Licence - Gentilly-1 (WFDL-W4-331.00/2034) [15], [16]

Parameter	Quarterly (mSv) [1]	Annual (mSv) [1]
Effective Dose (NEW)	N/A	5
Effective Dose (Pregnant NEW**)**	0.3	0.7 [2]
Effective Dose (Other Worker)	0.3	0.7
Equivalent Dose to the Skin (Shallow Dose)	N/A	50
External Dose to the Whole Body	0.5 mSv Single Exposure Event [3]	
Equivalent Dose to the hand or foot (Extremity Dose)	50 mSv Single Exposure Event [4]	100
Committed Effective Dose (Internal exposure)	1 mSv Single Exposure Event [5] or 1 mSv Chronic Exposure [6]	
Equivalent Dose the Skin (Skin Contamination)	50 mSv Single Exposure Event [7, 8]	

Notes:

1. Planned work for which exposures are anticipated that will or could exceed the Action Levels given in this table, shall not be undertaken without prior authorization from the Radiation Protection Program Manager.
2. Balance of pregnancy, not annual.
3. Unplanned exposure to the whole body resulting from a work activity during a day shift (i.e. 8 to 12 hour shift). The exposure is taken to be 0.5 mSv greater than what is established as an appropriate margin for the conduct of the work as measured on the Personal Alarming Dosimeter (e.g. 0.5 mSv greater than Personal Alarming Dosimeter Dose Alarm).
4. Applies to an unplanned exposure from a single extremity TLD measurement dose result.
5. Applies to an unplanned acute intake for which the exposure can be treated as instantaneous for the purpose of assessing the resulting committed dose.

Lien - See ATOM

6. Applies to intakes received over an extended period of time which is not treated as a single instantaneous intake for the purposes of assess the resulting committed dose. The chronic intakes action level does not include the sum of separate assessed doses from multiple unplanned acute intake events.
7. Applies to dose from a single skin contamination event, excluding dose to the skin and extremity monitored by a dosimeter.
8. When the skin is unevenly irradiated, the averaging area shall not be less than 1 cm^2, even in the case of a hot particle. When the skin is unevenly irradiated, the equivalent dose received by the skin is the average equivalent dose over the 1 cm^2 area that received the highest equivalent dose.

4.6 Waste Substance Licence – Unspecified Locations (WNSL-W2-2202.0/2026) [17]

As per the appendix B to the licence [17]:

"*The CNL company-wide action level for effective dose is 20 mSv per year. The CNL company-wide action level for effective dose is 6 mSv per 3-month period".*

The action levels for this licence will remain as stated until the licence is amended, reissued, or revoked.

Lien - See ATOM

4.7 Waste Nuclear Substance Licence – Port Hope Area Initiative – Waste Management Project (WNSL-W1-2310.00/2032) [18], [19]

Parameter	Four weeks or monthly [1] (mSv)	Thirteen weeks or quarterly (mSv)	Annual (mSv)
Effective Dose (NEW)	1	3	6
Effective Dose (Pregnant NEW) [2]	0.3	0.5	1 [3]
Skin Dose (NEW) [4]	1	3	6
Extremity Dose (NEW)	10	30	60
Internal Committed Effective Dose (NEW)	N/A	N/A	1

Note:

1. It is understood that some dosimetry providers provide “monthly” dosimetry instead of 4 weeks. For the purpose of ALs, a one-month dosimetry period is considered to have the same AL as “per four-week monitoring period”.
2. ALs referred are effective dose limits to the pregnant worker. The balance of the pregnancy is defined as the period from the moment the management is informed, in writing, of the pregnancy to the end of the pregnancy.
3. Balance of pregnancy, not annual.
4. When skin is unevenly irradiated, the equivalent dose received by the skin is the average equivalent dose over the 1 cm² area that received the highest equivalent dose. When the contamination is relatively uniform over the skin the averaging area of 100 cm² may be used for operational convenience but not if it significantly lowers the average dose.

Lien - See ATOM

4.8 Nuclear Research and Test Establishment Decommissioning Licence – Whiteshell Laboratories (NRTEDL-W5-8.00/2027) [20], [21]

Parameter	Quarterly (mSv) [1]	Annual (mSv) [1]
Effective Dose [2] (NEW)	0.5 mSv Single Exposure Event [3]	6
Effective Dose (Pregnant NEW)	0.3	0.7 [4]
Effective Dose (Other Worker)	0.3	0.7
Equivalent Dose to the Skin (Shallow Dose)	N/A	60
Equivalent Dose to the hand or foot (Extremity Dose)	50 mSv Single Exposure Event [5]	100
Committed Effective Dose (Internal exposure)	1 mSv Single Exposure Event [6] or Chronic Exposure [7]	
Equivalent Dose the Skin (Unmonitored local skin exposure)	50 mSv Single Exposure Event [8, 9]	

Notes:

1. Planned work for which exposures are anticipated that will or could exceed the Action Levels given in this table, shall not be undertaken without prior authorization from the Radiation Protection Program Manager.
2. External dose to the whole body.
3. Unplanned exposure to the whole body resulting from a work activity during a day shift (i.e. 8 to 12 hour shift). The exposure is taken to be 0.5 mSv greater than what is established as an appropriate margin for the conduct of the work (e.g. 0.5 mSv greater than Personal Alarming Dosimeter Dose Alarm or Radiological Control Hold Point- Back Out).
4. Balance of pregnancy, not annual.
5. Applies to an unplanned exposure from a single extremity TLD measurement dose result.
6. Applies to an unplanned acute intake for which the exposure can be treated as instantaneous for the purpose of assessing the resulting committed dose.
7. Applies to intakes received over an extended period of time which is not treated as a single instantaneous intake for the purposes of assess the resulting committed dose. The chronic intakes action level does not include the sum of separate assessed doses from multiple unplanned acute intake events.

Lien - See ATOM

8. Applies to dose from a single skin contamination or unmonitored local skin exposure event, excluding monitored skin and extremity doses.
9. When the skin is unevenly irradiated, the averaging area shall not be less than 1 cm^2, even in the case of a hot particle. When the skin is unevenly irradiated, the equivalent dose received by the skin is the average equivalent dose over the 1 cm^2 area that received the highest equivalent dose.

5. Definitions and Acronyms

This document relies primarily on word meaning as found in common dictionaries. The current *Glossary of Controlled Terms and Acronyms* [22] contains specific meanings for those words that require further clarification.

5.1 Definitions

Balance of Pregnancy	The period from the moment CNL is informed, in writing, of the pregnancy to the end of the pregnancy.
Dosimetry Period	The span over which a radiation dose is summed, unless varied in accordance with sections 13(5) or 14(2) of the *Radiation Protection Regulations* [1].
Extremity Dose	The highest equivalent skin dose received by the most exposed 1 cm^2 of the hands below the elbow or the leg below the knee [23].
Localized Area of Skin Absorbed Dose	The dose received by the layer of cells within the skin that are 7 mg/cm^2 below the surface and averaged over the 1 cm^2 area that received the highest dose.
Other Worker	A worker who has not been designated as a nuclear energy worker and is subject to the prescribed dose limit for the general public [24].
Pregnant NEW	A nuclear energy worker (NEW) who has given written notification to the licensee of their pregnancy. This does not include a NEW that is pregnant but has not given notification of their pregnancy.
Shallow Dose	Skin dose excluding *Localized Area of Skin Absorbed Dose*.

5.2 Acronyms

AL	Action Level(s)

Lien - See ATOM

6. References

[1] 2025 Action Level Review for Chalk River Laboratories – Canadian Nuclear Laboratories Ltd., RADP-508740-021-000, RP 25-0496, 72234204.

[2] Review of the Radiation Protection Program Exposure Action Levels for the Nuclear Power Demonstration Waste Facility (NPDWF) – Canadian Nuclear Laboratories Ltd., RADP-508740-021-000, RP 25-0479, 72703090.

[3] 2025 Action Level Review for Douglas Point Waste Facility - Canadian Nuclear Laboratories Ltd., RADP-508740-021-000, RP-25-0905, 72344398.

[4] 2025 Action Level Review for Gentilly-1 Waste Facility - Canadian Nuclear Laboratories Ltd., RADP-508740-021-000, RP-25-0906, 72344025.

[5] Port Hope Area Initiative [PHAI] Action Levels – 5 Years Review – Canadian Nuclear Laboratories Ltd., RADP-508740-021-000, JV-2025-002, 71937049.

[6] WL Action Levels – 5 Year Review – Canadian Nuclear Laboratories Ltd., RADP-508740-021-000, RP-2025-002, 7006394.

[7] *Radiation Protection Regulations*, SOR/2000-203, Minister of Justice, Canada.

[8] *Nuclear Research and Test Establishment Operating Licence – Chalk River Laboratories*, (NRTEOL-01.01/2028), CRL-508760-130-0005, 63716013.

[9] *Chalk River Laboratories Nuclear Research and Test Establishment Operating Licence, NRTEOL-01.01/2028*, *Licence Conditions Handbook, NRTEOL-LCH-01.01/2028*, CRL-508760-HBK-002, 63980175.

[10] *Nuclear Substance and Radiation Device Licence – La Prade*, 15193-4-26.2, 62228184.

[11] *Waste Facility Decommissioning Licence – Nuclear Power Demonstration*, (WFDL-W4-342.00/2034), 64-508760-130-000-0019, 53827009.

[12] *Nuclear Power Demonstration Waste Facility Prototype Waste Facilities – Waste Facility Decommissioning Licence, WFDL-W4-342.00/2034, Licence Conditions Handbook, WFDL-LCH-W4-342.00/2034, 64-508760-HBK-001*, 61892027.

[13] *Waste Facility Decommissioning Licence – Douglas Point Waste Facility (WFDL-W4-332.03/2030)*, 22-00500-130-000-0001, 54145276.

[14] *Prototype Waste Facilities – Waste Facility Decommissioning Licence Douglas Point Facility WFDL-W4-332.03/2030*, Licence Conditions Handbook, WFDL-LCH-W4-332.03/2030, 22-508760-HBK-002, 54682168.

[15] *Waste Facility Decommissioning Licence – Gentilly-1 Waste Facility*, (WFDL-W4-331.00/2034), 61-508760-130-000-0005, 53820503.

[16] *Prototype Waste Facilities – Waste Facility Decommissioning License, Gentilly-1 Waste Facility*, WFDL-W4-331.00/2034, Licence Conditions Handbook, WFDL-LCH-W4-331.00/2034, 61-00580-HBK-001, 50152177.

[17] *Waste Nuclear Substance Licence – Unspecified Locations (WNSL-W2-2202.0/2026)*, 236-NOCN-20-0001-L, 53827508.

Lien - See ATOM

[18] *Waste Nuclear Substance Licence – Canadian Nuclear Laboratories Ltd. – Port Hope Area Initiative – Waste Management Project* (WNSL-W1-2310.00/2032), 58944762.

[19] *Port Hope Area Initiative Waste Management Project Waste Nuclear Substance Licence WNSL-W1-2310.00/2032, Licence Conditions Handbook, LCH-WNSL-W1-2310.00/2032, 4500-508760-HBK-001*, 59045644.

[20] *Nuclear Research and Test Establishment Decommissioning Licence – Whiteshell Laboratories*, (NRTEDL-W5-8.00/2027), WLD-508760-130-000, 68653202.

[21] *Whiteshell Laboratories Nuclear Research and Test Establishment Decommissioning Licence*, *NRTEDL-W5-8.00/2027, Licence Conditions Handbook, NRTEDL-LCH-08.00/2027, WLD-508760-HBK-003*, 68649040.

[22] *Glossary of Controlled Terms and Acronyms*, https://cnllnc.sharepoint.com/sites/TermsandDefinitions

[23] *Dosimetry, Volume I: Ascertaining Occupational Dose*, REGDOC-2.7.2, Canadian Nuclear Safety Commission, July 2021.

[24] *Glossary of CNSC Terminology*, REGDOC-3.6, Canadian Nuclear Safety Commission, July 2024.

Lien - See ATOM

Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

Standard

Administrative Levels and Action Levels for WL Air and Liquid Radioactive Effluents

MANAGEMENT SYSTEM DOCUMENT

900-509200-STD-016

Revision 0

Information Use

REDACTED

Approved by: George Dolinar
Functional Support Manager Environmental Protection

2022/10/24
Date

Effective date: 2022/12/16

Mandatory Review by Date: 2025/12/16

[redacted]This document and the information contained in it is the property of Atomic Energy of Canada Limited (AECL). No use, disclosure, exploitation or transfer of any information contained herein is permitted in the absence of an agreement with AECL, and the document may not be released without the written consent of AECL.
© Canadian Nuclear Laboratories

This page is for Content Controls that apply to this document. If no Content Controls apply, none will be listed.

Intellectual Property NOTICE: The attached documents/files/information includes information owned/developed by CNL which has particular value to CNL's business interests (CNL IP). Access is restricted to authorized persons for authorized purposes only. Third party disclosure or use of CNL IP requires a license or nondisclosure agreement, depending on the nature of the information, failing which such disclosure or use is strictly prohibited.

REDACTED

Revision History

Rev. No.	Date	Details of Rev.	Prepared By	Reviewed By	Approved By
0	2022/12/16	Issued as “Approved for Use”	K. Ross	R. Bilinsky	G. Dolinar
D1	2021/03/25	Issued for “Review and Comment” Cancels and Supersedes WL-509200-PRO-001	K. Ross	R. Bilinsky C. De Waele A. Dash	

REDACTED

Table of Contents

Section **Page**

1. Scope and Applicability 5
2. Purpose 5
3. Requirements 5
4. Definitions and Acronyms 5
   - 4.1 Definitions 5
   - 4.2 Acronyms 6
5. Roles and Responsibilities 6
6. Standards 6
   - 6.1 Methodology for Setting Administrative Levels 6
   - 6.2 Methodology for Setting Action Levels 8
   - 6.3 Review Process 8
7. Documented Information 8
8. References 9

Appendix A Administrative Levels and Action Levels for Airborne Radioactive Effluents 10

Appendix B Administrative Levels and Action Levels for Liquid Radioactive Effluents 11

REDACTED

1. Scope and Applicability

This document specifies the Administrative Level (AdL) values and Action Level (AL) values for all radiological air and liquid effluent verification monitoring final discharge points that are a part of the WL Radiological Effluent Verification Monitoring Program (EVMP). This document applies to Whiteshell Laboratories only.

This document does not cover responsibilities of Facility Managers/Authorities (or equivalent), the Environmental Protection Designated Representative of the Licence (DROL), the Environmental Protection Program Manager, or the Environmental Specialist(s). These are covered in *Management and Monitoring of Emissions* [1].

This document does not cover the use or rules around the recording or reporting of calculated exceedances based on unavailable equipment or failed calibration of effluent verification monitoring equipment.

2. Purpose

This document provides relevant stakeholders with the AdL and AL values for all final discharge points that are part of the WL Radiological Effluent Verification Monitoring Program for use in routine monitoring and evaluation of effluent verification monitoring results. The levels in this document were developed in compliance with the Canadian Standards Association N288.8 document Establishing and implementing action levels for releases to the environment from nuclear facilities [2]. In addition, this document describes the methodology used to set the AL and AdL values.

3. Requirements

For requirements regarding the following:

- Planned emissions in excess of AdLs or ALs; and
- Reporting of exceedances of AdLs and ALs

Refer to 900-509200-STD-009, *Management and Monitoring of Emissions* [1].

4. Definitions and Acronyms

4.1 Definitions

This document relies primarily on word meaning as found in common dictionaries. The current *Glossary of Controlled Terms and Acronyms* [3] contains specific meanings for those words that require further clarification.

For definitions of Administrative Level and Action Level, refer to the *Environmental Protection Program Document Description* [4].

REDACTED

4.2 Acronyms

The current *Glossary of Controlled Terms and Acronyms* [3] contains specific meanings for those acronyms that require further clarification.

5. Roles and Responsibilities

For a description of responsibilities of Facility Managers/Authorities (or equivalent), the CNL Environmental DROL, the WL Environmental Protection Program Manager, and Environmental Specialists concerning AdLs and ALs, refer to *Management and Monitoring of Emissions* [1].

6. Standards

6.1 Methodology for Setting Administrative Levels

The purpose of AdLs is to provide warning of above normal emissions with the intent of aiding in the application of the As Low As Reasonably Achievable (ALARA) process. Hence, AdLs are established for indicator parameters representative of key radionuclides in the effluent stream at levels close to normal or predicted emissions. They are calculated for each final discharge point using a combination of statistical parameters applied to a chosen set of historical emission data:

1. A minimum of three years emission levels that are deemed representative of near-future emissions are used as the data set on which the AdL is based. The resulting data set must be comprised of a minimum of 36 data points to ensure a data set of adequate size. In the case where three years of operational performance is not available, the AdL is set based on less than three years of operational performance if this history is deemed representative of near-future emissions, or on best estimates/predictions based on professional experience and judgement. The choice of a representative data set is made in consultation with facility staff to ensure that the resulting AdL reflects actual future operating conditions.
2. If item 1) above yields a data set that includes both detects and non-detects, the following truncating guidelines are considered. Note that there are varying approaches to truncating the data to ensure that the calculated statistical parameters appropriately reflect emission levels of a facility in operational mode. The following guidance ensures that the AdL is set at a level that differs from background and is representative of actual emissions resulting from a facility during operation:
    i. Emission levels that do not differ statistically from analytical/instrument background, i.e., that are below the Critical Level (L_C), are removed from the data set as they most likely represent periods of inactivity and are not representative of regular operation.
    ii. When it is unfeasible to differentiate periods of inactivity from periods of regular operation, then this $<L_C$ data is <u>not</u> removed from the data set. Experience and

REDACTED

past reviews of emission data reveals that it becomes unfeasible to differentiate between inactivity and regular operation when more than 75% of the data set is comprised of $<L_C$ data. For facilities that experience low emissions, retaining the $<L_C$ data makes for a data set that is representative of regular operations (the $<L_C$ measurements occur during operation).

3. Any data points within the data set that represent abnormal emission events are removed to yield a data set that is most representative of normal emission levels. This is done as follows:
    i. Any data point that is known to be the result of an abnormal emission event is removed from the data set.
    ii. Any data point remaining within the data set after carrying out i) above that is judged suspect, is inconsistent with the rest of the data and cannot be explained by an intermittent or temporary operation, is deemed to be an outlier, and is also removed. The mean and standard deviation are recalculated on the updated data set. If the removed suspect data point differs from the new mean by more than three standard deviations, then it is rejected as an outlier, otherwise it is reinstated in the data set.
4. It is imperative that the number of false positives, i.e., where an AdL exceedance is not related to an abnormal emission event but is instead due to normal operation, is kept to a minimum. To this effect, the AdLs are set as follows:
    i. The AdL is set at the upper limit of the 99.7% confidence interval for the data set. It is expected that AdL exceedances will occur occasionally due to normal variation; an acceptably low percentage of the data points, 0.15% ([100%-99.7%]/2), is expected to represent these false positive AL exceedances. To calculate the upper limit of the 99.7% confidence interval, the statistical distribution of the data set is first determined, and an appropriate calculation method specific to the distribution is chosen.
    ii. Environmental or emission data most often follows a normal or log-normal distribution. If the data does not fit a normal (or log-normal) distribution, this may be due to working with a 'combined' data set, i.e., a data set that represents more than one distinct process each reflecting a different situational condition. For example, a facility's emissions may be duplicitous in that they vary according to intermittent campaign schedules or varying types of work based on customer requests. This results in a data set that effectively captures a combination of various operational modes. Interferences from other emission sources can also result in a combined data set. If the varying sources of emissions have different distributions parameters (e.g., one has consistently low emissions with little variability, and another has intermittent emissions with high variability), the combined data will not follow a normal (or log-normal) distribution.
    Because using such combined data sets decreases the fit of the emission data to the normal (or log-normal) distribution, this in turn affects the accuracy of the

REDACTED

99.7% confidence interval and thus the AdL. In this case, a coverage factor can be applied to the calculated AdL to decrease the number of false positives. This decision is made based on a review of historical operational performance, upcoming campaigns and work, potential for interferences, and professional judgement.

iii. Finally, a risk-based lower cap on the AdL is applied to afford operational flexibility for those final discharge points that have historically operated at very low emissions close to background. The historical data although representative of past emissions, could be unrepresentative of the operational envelope of the facility. Therefore, the caps address the situation where a very small change in operation could trigger an exceedance that is unwarranted. The determination of the level for the lower cap is based on the professional judgement of the Environmental Protection Program Manager.

6.2 Methodology for Setting Action Levels

ALs represent a level of emission that is significantly below the Derived Release Limits (DRLs) [5], below the Site Target (0.3 x DRL) and higher than the AdLs, and is sufficiently low and close to operational performance such that the requirement to keep doses ALARA is not jeopardized if this level is reached. In line with this requirement, individual ALs shall be set-to five times the respective AdLs, except in cases where a calculated AL is more than 50% of the respective site annual dose limit when the above methodology is applied, in which case the AL shall be set at a value equal to 50% of the site annual does limit.

Note: Changes to ALs will require notification to the CNSC.

6.3 Review Process

The AdLs should be reviewed at least once every three years or more frequently if warranted.

7. Documented Information

Creation, Capture and Use of Information Assets [6] provides current information on the storage, preservation, turnover and retention requirement for records.

The calculations and methodology of decision making for each station/parameter combination are recorded on individual Excel spreadsheets and are uploaded to ATOM once the AdLs have been approved for use by both EnvP and the facility. Records associated with this process include:

1. Excel spreadsheets used in the calculation of the levels [7].

These are considered permanent records and are stored in ATOM using the following identifier (191-509211-055-000).

REDACTED

8. References

[1] *Management and Monitoring of Emissions,* 900-509200-STD-009, 40788125

[2] *Establishing and implementing action levels for releases to the environment from nuclear facilities*, CAN/CSA N288.8-17, 2017.

[3] *Glossary of Controlled Terms and Acronyms*, http://terms_definitions/.

[4] *Environmental Protection Program Description Document,* 900-509200-PDD-001, 40812070

[5] *Derived Release Limits for CNL's Whiteshell Laboratories*, WL-509211-RRD-001, 53626314

[6] *Creation, Capture and Use of Information Assets*, 900-511300-STD-003, 50746207

[7] K. Ross, L. Wilson (2021). Excel Workbook, *Calculations of Admin and Action Levels*, 191-509211-055-000, 58271772

REDACTED

Appendix A Administrative Levels and Action Levels for Airborne Radioactive Effluents[1]

Building	Source Description	Sampling Station	EmLine Station Code	Parameter	Administrative Level (Bq/wk)	Action Level (Bq/wk)
WR-1 Stack, [redacted]	WR-1 structure & building ventilation exhaust to reactor stack	Stack	WR1	Tritium	5.66E+09	2.83E+10
				Gross Alpha	6.69E+03	3.34E+04
				Gross Beta	3.01E+04	1.51E+05
HCF, [redacted][3]	Hot C (HCF), [redacted]	Stack	HCF	Gross Alpha	3.40E+03	1.70E+04
				Gross Beta	1.56E+04	7.79E+04
IFTF[redacted]	IFTF (Compactor Location), [redacted]	Stack	IFTF	Gross Alpha	3.23E+03	1.61E+04
				Gross Beta	4.74E+04	2.37E+05

REDACTED

[1] All AdLs and ALs are based on the past at least ten years of operational history, i.e. years 2009-2019. Exceptions to this are specified where applicable. The [redacted] facility is no longer in operation and is in the process of being decommissioned.

[2] The current alpha and beta emissions from this facility are very low (near DL). Decommissioning plans involve work in the facility that could result in higher releases. Hence, the past eleven years of emissions data was not deemed representative of upcoming emissions and a coverage factor of 5 was applied to allow for the anticipated increase in emissions. If an action level was reached the dose (alpha 0.000019 mSv and beta 0.000025 mSv) as a result of the emissions would still be below 0.0005 mSv/a.

[3] The current alpha emissions from this facility are very low (near DL). Decommissioning plans involve work in the facility that could result in higher releases. Hence, the past eleven years of emissions data was not deemed representative of upcoming potential emissions and coverage factors of 5 was applied to the alpha emissions to allow for the anticipated increase in emissions. If an action level was reached the dose (alpha 0.00001 mSv) as a result of the emissions would still be below 0.0005 mSv/a.

[4] A coverage factor of five was applied to alpha emissions and ten for beta emissions to allow for the anticipated increase in emissions due to the effect that various decommissioning activities have on facility emission. If an action level was reached the dose (alpha 0.000009 mSv and beta 0.00007 mSv) as a result of the emissions would still be below 0.0005 mSv/a.

Appendix B Administrative Levels and Action Levels for Liquid Radioactive Effluents

Discharged To	Sampling Station	EmLine Station Code	Parameter	Administrative Level (Bq/month)	Action Level (Bq/month)
Winnipeg River	Process Outfall (includes effluent from [redacted] and [redacted] LLLW tanks and storm drains)	OFS	Gross Alpha[5]	1.18E+07	1.18E+08
			Gross Beta[6]	9.39E+07	4.70E+08
			Tritium	7.29E+09	3.30E+10
Winnipeg River	Sewage Lagoon (includes effluent from domestic waste water and inactive laundry facility)	SL2	Gross Alpha[7]	1.24E+07	6.21E+07
			Gross Beta[8]	3.88E+07	1.94E+08

REDACTED

[5] AL was increased by a factor of two to allow space between the AdL and AL, value does not exceed 50% of the Annual Site Dose Limit. Gross alpha assumed to be Pu-238 (most limiting and occasionally detected), emissions data indicates significant contributions of the gross alpha are from uranium and its progeny. Gross beta is assumed to be Sr-90.

[6] AL was increased by a factor of two to allow space between the AdL and AL, value does not exceed 50% of the Annual Site Dose Limit. Gross beta is assumed to be Sr-90.

[7] Gross alpha assumed to be Pu-238 (most limiting and occasionally detected), emissions data indicates significant contributions of the gross alpha are from uranium and its progeny. Gross beta is assumed to be Sr-90.

[8] Gross beta is assumed to be Sr-90 (most limiting and occasionally detected)

Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

Whiteshell Laboratories Annual Compliance Monitoring Report for 2025

WL-514300-ACMR-010774

Revision 0

REDACTED

Authored by:	Randall Swartz	2026/04/27	
	Manager, Licensing & End State	Date	
Reviewed by:	Sarah Brewer	2026/04/27	
	Senior Director, Compliance	Date	
Approved by:	Brian Wilcox	2026/04/27	
	GM & WL Site Licence Holder	Date	

This page is for Content Controls that apply to this document. If no Content Controls apply, none will be listed.

REDACTED

Revision History

Rev. No.	Date	Details of Rev.	Prepared By	Reviewed By	Approved By
0	2026/04/23	Issued for “Approval”.	R. Swartz	S. Brewer	B. Wilcox
D2	2026/03/23	Issued for “Review and Comment”.	R. Swartz	S. Brewer C. Gallagher K. Leroux B. Wilcox	
D1	2026/02/23	Issued for “Review and Comment”.	R. Swartz	N. Astbury B. Barber T. Beres R. Bilinsky A. Bilton M. Boileau D. Campbell C. Clark A. Coulas N. Deighton S. Deighton J. DeRuiter C. De Waele K. Duncan A. El Aghoury S. Epps K. Erlandson D. Garrick M. Geiger D. Grant W. Graydon J. Hayter C. Horne P. Kompass T. Lackman S. Lawrence N. Leblanc K. Leroux K. Lundie B. MacDonald	

REDACTED

				M. MacKay A. Masters S. Melnyk S. Mistry M. Mitchell A. Nash T. Rosentreter B. Scott S. Scott B. Sharpe K. Shorter G. Snell R. Swartz A. Talebitaher C. Tormey D. Treadwell J. Unrau A. Van Aert K. Weisenberg L. Wojciechowski	

REDACTED

EXECUTIVE SUMMARY

This Annual Compliance Monitoring Report (ACMR) for the 2025 calendar year has been prepared as per licence condition 3.2 of the Whiteshell Laboratories (WL) Licence NRTEDL-W5-8.00/2027 and Canadian Nuclear Safety Commission (CNSC) REGDOC-3.1.2, *Reporting Requirements, Volume I: Non-Power Reactor Class I Facilities and Uranium Mines and Mills* as a summary report of annual compliance monitoring and operational performance.

Whiteshell Laboratories is situated on the traditional lands of Treaties 1 and 3, and near Treaty 5. This land is the home of the Anicinabe, Ojibway Anishinaabe and the National Homeland of the Red River Métis. We recognize that many other Indigenous Peoples across the region and Canada also consider this area their home.

At Canadian Nuclear Laboratories (CNL), we recognize the unique history, spiritual beliefs, cultural practices, and languages of Indigenous Peoples in Canada, and we appreciate the responsibility they have as stewards of the environment. We remain firmly committed to being an active participant in Canada's journey towards healing and reconciliation.

This document provides CNL compliance monitoring and performance information for 2025 and is organized by CNSC's fourteen (14) Safety and Control Areas (SCA). This report provides site-specific information to supplement information in the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025*, which provides programmatic updates and performance of the fourteen (14) SCAs and CNL's Public Information and Disclosure program as applicable to all CNL sites.

The following is a list of overall performance highlights at WL for 2025:

- All licensed activities continue to be carried out safely and securely.
- No members of the public received a radiation dose that exceeded any regulatory limit.
- No worker received a radiation dose in excess of any of the respective radiation dose limits for Nuclear Energy Workers, as defined by the *Radiation Protection Regulations*.
- All releases of radioactive material were below their respective Derived Release Limits.

Canadian Nuclear Laboratories recognizes the importance of, and places value on, ongoing engagement with Indigenous Nations, communities, and organizations. Canadian Nuclear Laboratories works collaboratively with Sagkeeng Anicinabe Nation, the Manitoba Métis Federation (MMF) as the National Government of the Red River Métis, Black River First Nation, Hollow Water First Nation, Brokenhead Ojibway Nation, Wabaseemoong Independent Nations, and Grand Council Treaty #3. Major project updates are shared with Iskatewizaagegan #39 Independent First Nation, Shoal Lake 40 First Nation, and Northwest Angle #33 First Nation, with opportunities for further engagement available to those communities at their discretion. Canadian Nuclear Laboratories and Peguis First Nation have begun to develop a Contribution Agreement to support dialogue and engagement on the WL Restoration Project.

REDACTED

Environmental protection and environmental monitoring activities continue to be a priority for all Indigenous Nations, communities, and organizations. In 2025, CNL facilitated Indigenous involvement in environmental monitoring at the WL site through year-round collaboration with Sagkeeng Anicinabe Nation's Niigan Aki Program, and inviting representatives from the MMF, Black River First Nation, and Hollow Water First Nation to participate in additional on-site environmental monitoring and protection activities.

Canadian Nuclear Laboratories remains interested in developing Long-Term Relationship Agreements with Indigenous Nations, communities and organizations that will support their capacity to participate meaningfully in the WL Restoration Project. Recent focus has been on the Whiteshell Reactor – 1 (WR-1) Environmental Impact Statement, environmental monitoring, waste management, and the WL site restoration plan. Economic reconciliation related to the WL site is also a priority shared by Indigenous Nations, communities, and organizations. Canadian Nuclear Laboratories is committed to developing relationships and supporting agreements based on the distinct interests expressed by the Nations, communities, and organizations.

The following is a summary of key 2025 initiatives and improvements at WL, which are further described in the relevant SCA sections of this report.

Management System

Whiteshell Laboratories has continued its focus on the implementation of the Management System, as well as the WL Quality Assurance Plan for decommissioning. In 2025 WL participated in external and internal audits, self-assessments, management reviews, and regulatory inspections including:

- One external ISO-14001:2015 surveillance audit and other multi-site audits captured in *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025*;
- One internal audit dedicated to decommissioning at the WL site and other multi-site audits captured in *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025*;
- Twenty-six self-assessments;
- One management review; and
- Five CNSC and two International Atomic Energy Agency (IAEA) inspections.

Whiteshell Laboratories demonstrated a strong reporting culture in 2025, indicated by 463 event reports to document and remediate problems, identify opportunities for improvement, and to highlight trends.

Human Performance Management

Whiteshell Laboratories continues to engage WL staff in plan of the day and plan of the week meetings, sharing operating experience, safety pauses, and celebrating significant work achievements, helping to enhance a positive safety culture.

The following training program improvements were made in 2025:

REDACTED

- Provided training and support to all WL managers and supervisors on using CNL's Learning Management System reporting to improve visibility of assigned training, due dates, and qualification status.
- Revised and updated the Firefighter Job and Task Analysis to align role expectations, required knowledge and skills, and qualification pathways with a Systematic Approach to Training.
- Created a WL specific Emergency Operations Centre Commander Task Analysis, establishing a defined role profile and training requirements consistent with SAT application.

Whiteshell Laboratories continued to maintain a sufficient number of qualified workers to carry on the licensed activities safely and in accordance with the *Nuclear Safety and Control Act* and the regulations made under the Act.

Operating Performance

Whiteshell Laboratories decommissions and operates its facilities according to prescribed programs and procedures. The Facility Authorization for the operation of the Shielded Facilities was revised and approved for use.

Safety Analysis

Safety Analysis Reports and Facility Authorizations continue to be in place for WL's nuclear facilities, helping meet health, safety, security, environmental, and regulatory requirements. The Safety Analysis Report for the WL Waste Management Area was revised. Criticality safety documents for both the Concrete Canister Storage Facility and the Waste Management Area were revised.

Physical Design

In 2025, the Design Authority and Design Engineering Program ensured that items important to safety listed in the safety related system list for all nuclear facilities at WL site met and maintained their design basis, and any changes made were controlled through the *Engineering Change Control Process*.

The current Certificate of Authorization from Inspection and Technical Services Manitoba is valid until 2027 November. The Certificate of Authorization permits CNL to perform Pressure Boundary work as described in the revised *Pressure Boundary Quality Assurance Plan*.

Fitness for Service

The Periodic Inspection Plan, previously developed to confirm the ongoing fitness for service of the concrete storage facilities at the Waste Management Area, continued implementation with no significant issues identified. Regular preventive or corrective maintenance and testing of WL's safety-related systems were carried out to ensure the systems were fit for service - a total of 3,418 mandatory and regulatory preventative maintenance activities were completed. A new Computer Maintenance Management System was rolled out to staff in 2025. An aging

REDACTED

management plan was issued and the first phases of the plan was initiated, including maintenance categorization of systems important to safety.

Radiation Protection

No worker received an equivalent or effective dose (including committed) in excess of any of the respective dose limits for radiation workers as defined in the *Radiation Protection Regulations*, and average individual doses remain a small fraction of these limits. The maximum dose to a person working at WL was 0.47 mSv, and collective doses for the WL site remained below 20 person-mSv (p-mSv) (18.79 p-mSv). No member of the public received a radiation dose that exceeded the regulatory limit.

Conventional Health and Safety

Safety advisories are regularly issued to staff as part of WL's safety communication program to share both emerging safety issues and to support ongoing sharing of information. There were 59 site health and safety inspections completed at WL to proactively identify and assess potential hazards across the site. In 2025 there were three lost-time injuries and three hazardous occurrences that were reported to Employment and Social Development Canada at WL. An all-day, all-staff event called "Own Safety" was held again in October to recognize the importance of taking personal responsibility for safety and health on and off the job.

Environmental Protection

Radiological emissions were 0.00012% of the derived release limit for air emissions and 0.40% of the derived release limit for liquids. The results of the radiological and non-radiological effluent monitoring program demonstrate that controls for the release of potentially hazardous substances currently in place at WL continue to provide substantial protection of the environment, and confirm that the WL site is operating in a manner that also protects workers and the public. Whiteshell Laboratories maintained its CSA/ISO-14001 (2015) registration.

Emergency Management and Fire Protection

Canadian Nuclear Laboratories self-identified deficiencies in 2023 in compliance with the Fire Protection Program. Canadian Nuclear Laboratories is now compliant, addressing any open notices of non-compliance through corrective actions and compensatory measures, with oversight through the implementation of quarterly Fire Protection Oversite Plan assessments. Accomplishments included additional staffing in both firefighting and program specialists, and training of 24 firefighters as hazardous Material Technicians. Additionally, there was development and approval of an alternative and permanent solution for providing a fire water supply to the WMA using a water tanker and water shuttling process. CNL is awaiting delivery of a 4,500-gallon tanker, expected in mid-2026. All drills and exercises, consisting of several types of exercises, from flash drills to communications drills, lunch and learn sessions, and functional exercises, were conducted as per the WL 5 Year Exercise and Drill Plan, ensuring ongoing alignment with regulatory expectations. There were no emergency events requiring activation of the Emergency Operations Centre.

REDACTED

Waste Management

Whiteshell Laboratories continued to reuse or recycle as much material as was practicable. Radioactive, clearable, and hazardous wastes were generated from both ongoing operational activities and decommissioning projects, including removal of approximately 1,800 polychlorinated biphenyl (PCB)-containing light ballasts, consolidation of 35 m^3 of low-level and 3.1 m^3 of intermediate-level radioactive waste to Chalk River Laboratories, 622.6 m^3 of low-level waste to an off-site processing facility, 18.8 m^3 of hazardous waste to an off-site processing facility, and 1,921.5 m^3 of clean and recycled waste shipped off site. The *Affected Lands and Contaminated Structures Detailed Decommissioning Plan* was revised and submitted to the CNSC, and interim end-state reports for the Building 100 SLOWPOKE Demonstration Reactor and Building 300 Stage 6 were accepted by the CNSC.

Security

Nuclear Security Officers continued to meet the physical and psychological fitness requirements for Security Officers as required by the WL licence. An internal security compliance inspection was conducted, resulting in two recommendations, and a CNSC inspection resulted in one non-compliance and three recommendations, with actions underway to address the findings. A CNSC force on force exercise was conducted in November 2025 (final exercise report has not been released yet).

Safeguards and Non-Proliferation

There were two IAEA inspection activities completed at WL in 2025. These activities included seals changes, human surveillance, and implementation and/or maintenance of IAEA safeguards monitoring equipment. No issues were identified from the two IAEA Safeguards inspections conducted at WL.

Packaging and Transport

The transport and packaging Functional Support Area enabled hazard reduction activities at WL site supporting the movements of Low, Intermediate and High-Level Waste to CRL. All WL Transportation of Dangerous Goods shipments in 2025 were compliant to program requirements.

Other matters of regulatory interest

In 2025, CNL focused on ensuring public awareness of the ongoing WL Restoration Project at the WL site, including remediation options for the Low-Level Waste Trenches, fuel consolidation and waste transportation, the WL Site Restoration Plan, and the ongoing environmental assessment for the decommissioning of the WR-1 reactor.

Through routine meetings, community engagement, and monitoring involvement, CNL also worked to deepen relationships with Indigenous Nations with rights and interests on and around the WL site.

The third Regional Gathering of Leaders was held to gather further feedback on the WL Site Restoration Plan and hold conversations on what opportunities are possible for the future at

REDACTED

the site. The full day event brought 149 representatives, including youth and elders, from eight Indigenous Nations, eight municipalities, two school divisions, two post secondary institutions, and four Chambers of Commerce, around this year's theme of "Shaping Our Shared Future." Canadian Nuclear Laboratories also hosted more than 20 tours of the WL Restoration Project, in-school presentations, and facilitated on-site Indigenous-led monitoring.

Facilities (operating nuclear facilities, permanently shut-down facilities, facilities being decommissioned and the non-nuclear facilities)

All the licensed activities in these facilities continue to be carried out safely and securely with acceptable radiation doses to personnel and releases to the environment. Fuel consolidation activities began, with retrieval and shipment to Chalk River Laboratories of three fuel baskets from the Concrete Canister Storage Facility in 2025. Progress continued for the off-site fabrication of standpipe/bunker remediation equipment, and equipment has been installed and is being commissioned at the WMA for future waste extraction activities, monitoring equipment, and the future Cask Loading Facility. Non-automated retrieval of selected standpipe contents continued. Two Facility Authorities completed training and qualification replacing the previous Facility Authorities, one for the Waste Management Area/Concrete Canister Storage Facility, and the other for the main campus facilities.

In the 2025 calendar year, WL continued to carry out our program of work with an unwavering commitment to safe operations. During this period, WL successfully protected the health and safety of persons, the environment, national security, and international obligations, while implementing improvements to strengthen our performance into the future. This enabled WL to perform its main mission on behalf of Canadians – restoring and protecting the environment.

ACKNOWLEDGEMENT

The "Author" of this document would like to thank the many Whiteshell Laboratories authors and reviewers from Functional Support Areas and Facilities for their production of the individual sections of the report.

REDACTED

Table of Contents

SECTION **PAGE**

EXECUTIVE SUMMARY iv

Introduction 21

1 Management System 24

1.1 Management System Program 24
1.2 Audits, Inspections and Self-Assessments 24
1.3 Problem Identification and Resolution 28
1.3.1 Trending of Events Related to Operational Activities 28
1.4 Management Reviews 29
1.5 Safety Culture 29

2 Human Performance Management 30

2.1 Human Performance Program 30
2.2 Hours of Work Exceedances 31
2.3 Training Program 32
2.3.1 Required Training 33
2.4 Analysis of Trends 36
2.4.1 Contractor Training 38
2.4.2 Training Evaluations Summary 38

3 Operating Performance 40

3.1 Operating Program 40
3.2 Reporting Requirements 40
3.2.1 Reportable Events to the Canadian Nuclear Safety Commission 41
3.2.2 Reportable Events to Other Regulators 42

4 Safety Analysis 43

4.1 Safety Analysis Program 43

REDACTED

4.2 Nuclear Criticality Safety Program 43

5 Physical Design 45

5.1 Design Program 45
5.1.1 Items Important to Safety 45
5.2 Pressure Boundary Program 45

6 Fitness for Service 47

6.1 Fitness for Service Program 47
6.1.1 Planned Maintenance, Testing & Inspections 47
6.1.2 Equipment Fitness for Service/Equipment Performance 48
6.1.3 Condition of Structures 48
6.1.4 Aging Management Program 49

7 Radiation Protection 50

7.1 Radiation Protection Program 50
7.1.1 ALARA Initiatives and Activities 50
7.1.2 Contamination Control 50
7.1.3 Dose Control 51
7.1.4 Sealed Sources 52
7.2 Dosimetry 52
7.2.1 Interpretation of Reported Dose Quantities 52
7.2.2 Radiation Doses to Personnel 53
7.2.2.1 Discussion of Dose Data 59
7.2.2.2 Radiation Dose Changes or Trends 59
7.2.3 Program Exceedances 60

8 Conventional Health and Safety 61

8.1 Conventional Health and Safety Program 61
8.1.1 Site Safety and Health Committee 61
8.1.2 Inspections 62
8.1.3 Hazardous Occurrence Investigation Reports and Lost Time Injuries 62

REDACTED

9 Environmental Protection 64

9.1 Environmental Protection Program 64
9.2 Quality Assurance 65
9.3 Supplementary Studies 73
9.4 Effluent Monitoring - Radiological 73
9.4.1 Effluent Monitoring 74
9.4.1.1 Site-Effluent Verification monitoring System and Results Evaluation 74
9.4.2 Airborne Effluent Monitoring 77
9.4.2.1 Monitoring Points, Schedules and Parameters 77
9.4.2.2 Monitoring Results 79
9.4.3 Liquid Effluent Monitoring 82
9.4.3.1 Monitoring Points, Schedules and Parameters 82
9.4.3.2 Monitoring Results 84
9.4.4 Unavailability of Effluent Verification Monitoring 89
9.4.5 Overall Performance 90
9.5 Effluent Monitoring – Non-Radiological 91
9.5.1 Liquid Effluent Monitoring 91
9.5.1.1 Monitoring Points, Schedules, and Parameters 91
9.5.1.2 Analytical Protocol and Results Evaluation 93
9.5.1.3 Unavailability of Effluent Verification Monitoring 95
9.5.1.4 Monitoring Results 95
9.5.1.4.1 Averages Summary Tables 95
9.5.1.4.2 Monthly Guideline Acceptance 107
9.5.1.4.3 Monthly Guideline Plots 109
9.5.1.4.4 Monitoring of Intake Water from Winnipeg River 111
9.5.1.4.5 Monitoring of Liquid Effluents to the Winnipeg River 112
9.5.1.4.5.1 Lagoon 112
9.5.1.4.5.2 Process Outfall 113
9.5.1.4.5.3 Drainage Ditches 114
9.5.1.4.6 Internal Liquid Discharge Monitoring 115

REDACTED

9.5.1.5 Loading Calculations 116
9.5.2 Airborne Effluent Monitoring 119
9.5.2.1 Fuel Use for Building Heating 119
9.5.2.2 Reporting Under the National Pollutant Release Inventory 120
9.5.2.3 Greenhouse Gas Emissions 121
9.5.2.4 Halocarbons 122
9.5.3 Overall Performance 122
9.6 Regulatory Limit Exceedances and Contamination Incidents 123

10 Emergency Management and Fire Protection 124

10.1 Emergency Preparedness Program 124
10.1.1 Drills and Exercises 124
10.1.2 Training 124
10.1.3 Status of Emergency Resources and Facilities 124
10.1.3.1 Emergency Operations Centre 125
10.1.3.2 Radiological Assessment Team/Mobile Nuclear Laboratory 125
10.1.4 External Collaboration 126
10.1.5 Unplanned Emergency Events 127
10.2 Fire Protection Program 127
10.2.1 Fire Response Drills 130
10.2.2 External Collaborations 130
10.2.3 Third Party Audits & Inspections 131
10.2.4 Fire Hazard Analysis 131

11 Waste Management 132

11.1 Waste Management Program 132
11.1.1 Waste Management Operations 133
11.1.1.1 Radioactive Waste Management 133
11.1.1.2 Non-Radioactive Waste Management 136
11.2 Decommissioning Plan 139
11.2.1 Land Use Program 139

REDACTED

11.2.2 Decommissioning and Demolition Program 139
11.2.2.1 Storage with Surveillance 139
11.2.2.2 Decommissioning Planning 140
11.2.2.3 Detailed End State Reporting 143
12 Security 145
12.1 Security Program 145
12.1.1 Security Events 145
12.1.2 Cyber Security 146
13 Safeguards and Non-Proliferation 147
13.1 Safeguards Program 147
13.1.1 International Atomic Energy Agency Activities 147
14 Packaging and Transport 148
14.1 Packaging and Transport Program 148
14.1.1 Shipments 148
14.1.2 Annual Report of Radiation Detections in Packaging and Transport 148
15 Other Matters of Regulatory Interest 149
15.1 Public Information and Disclosure Program 149
15.1.1 Outreach and Stakeholder Engagement 149
15.1.2 Public Engagement 150
15.1.3 Traditional and Online Communications 150
15.1.3.1 Media Releases 151
15.1.4 Education 153
15.1.5 Ongoing Projects 153
15.2 Indigenous Engagement 154
15.3 Environmental Monitoring Activities with Indigenous Communities 164
16 Acronyms 166
17 References 170

REDACTED

Appendix A Concrete Canister Storage Facility 175

Appendix B Active Liquid Waste Treatment Centre 187

Appendix C Shielded Facilities 188

Appendix D Waste Management Area 191

Appendix E Auxiliary Operation Facilities 213

Appendix F Whiteshell Reactor – 1 Facility 217

Appendix G Non-nuclear Facilities 220

FIGURES

Figure 1: Maximum Individual Effective Dose and Whiteshell Laboratories Collective Dose from 2021 to 2025 60

Figure 2: Effluent Discharge Paths to the Winnipeg River 75

Figure 3: Trends for Airborne and Liquid Emissions from Whiteshell Laboratories for 2020 to 2025 77

Figure 4: Radioactivity on Outfall Releases and Discharge from Active Liquid Waste Treatment Tanks for 2025 87

Figure 5: Non-radiological Monitored Effluent Parameters above CNL Monthly Guidelines 109

Figure 6: Monthly Average Iron Concentrations of Effluents from the Low-Level Liquid Waste Treatment Systems for 2025 110

Figure 7: Monthly Average Phosphorus Concentration of Effluents from the Low-Level Liquid Waste Treatment Systems for 2025 110

Figure 8: Monthly Average Total Suspended Solids Concentration of Effluents from the Low-Level Liquid Waste Treatment Systems for 2025 111

Figure 9: Estimated Monthly 2025 Intake Raw Pumped Water for Whiteshell Laboratories Usage 111

Figure 10: Annual Heating Energy Use from Fossil Fuels (per heating degree day) 120

Figure 11: Surface Water Drainage Sample Locations 176

Figure 12: Groundwater Sample Locations 201

Figure 13: Whiteshell Laboratories Landfill Area Showing Approximate Locations of Monitored Dugouts 225

REDACTED

TABLES

Table 1: External Audits 25

Table 2: Internal Quality Audits 25

Table 3: Canadian Nuclear Safety Commission Inspections Conducted at Whiteshell Laboratories in 2025 25

Table 4: International Atomic Energy Agency Inspections Conducted at Whiteshell Laboratories in 2025 26

Table 5: List of Self-Assessments Conducted at Whiteshell Laboratories in 2025 27

Table 6: Trend ImpActs Raised at Whiteshell Laboratories in 2025 28

Table 7: Number of ImpActs Raised at Whiteshell Laboratories in 2025 29

Table 8: Hours of Work Exceedances for Nuclear Security Officers and Tiered Response Force at Whiteshell Laboratories 31

Table 9: Status of Federally/Provincially Legislated Training at Whiteshell Laboratories in 2025 34

Table 10: Status of CNL Employee and Manager/Supervisor Required Training at Whiteshell Laboratories in 2025 35

Table 11: Whiteshell Laboratories Operating Performance Licensing Basis Document Submissions in 2025 40

Table 12: Reportable Events to the Canadian Nuclear Safety Commission at Whiteshell Laboratories in 2025 41

Table 13: Number of Reportable Events over the Last 5 Years 42

Table 14: Whiteshell Laboratories Safety Analysis Program Licensing Basis Document Submissions in 2025 43

Table 15: Whiteshell Laboratories Nuclear Criticality Safety Program Licensing Basis Document Submissions in 2025 44

Table 16: Whiteshell Laboratories Pressure Boundary Program Licensing Basis Document Submissions in 2025 46

Table 17: Whiteshell Laboratories Fitness for Service Program Licensing Basis Document Submissions in 2025 47

Table 18: Contamination Events 51

Table 19: Whiteshell Laboratories Personal Alarming Dosimeter Dose Summary 52

Table 20: Distribution of Effective Dose for Whiteshell Laboratories 55

REDACTED

Table 21: Distribution of Equivalent Dose to the Skin for Whiteshell Laboratories 56

Table 22: Distribution of Equivalent Dose to the Hands and Feet for Whiteshell Laboratories .. 57

Table 23: Summary of Dose Components Received as a Result of Licensed Activities for 2025[a] 58

Table 24: Whiteshell Laboratories External Whole-Body Dose Performance 2021 to 2025 59

Table 25: Summary of Whiteshell Laboratories Injury Rate Data 62

Table 26: Summary of Whiteshell Laboratories Lost Time Injuries in 2025 63

Table 27: Whiteshell Laboratories Environmental Protection Licensing Basis Document Submissions in 2025 65

Table 28: Whiteshell Laboratories' Summary of Quality Verification Tests Performed 66

Table 29: Whiteshell Laboratories' Summary of Field Quality Verification Tests Performed 66

Table 30: Environmental Research Association Inter-Laboratory Comparison Program for CNL Whiteshell Laboratories – 2025 71

Table 31: Proficiency Testing Canada Accreditation Inter-laboratory Comparison Program CNL Whiteshell Laboratories – 2025 72

Table 32: Radiological Air Effluent Monitoring Schedule – 2025 78

Table 33: Radionuclides in Air Effluents from Whiteshell Laboratories Facilities – 2020 to 202581

Table 34: Radiological Liquid Effluent Monitoring Schedule – 2025 82

Table 35: Radionuclides in Liquid Effluents from Whiteshell Laboratories – 2020 to 2025 86

Table 36: Annual Mean Radioactivity Surface Water Drainage Ditches Near WL Waste Management Area – 2020 to 2025 88

Table 37: Effluents Monitoring Equipment Unavailability – 2025 90

Table 38: Schedule for Non-radiological Monitoring at Whiteshell Laboratories 92

Table 39: Listing of Analytical Test Groups 94

Table 40: Water Quality Averages Summary for Site Intake 97

Table 41: Effluent Averages Summary for Lagoon 99

Table 42: Effluent Averages Summary for Outfall 101

Table 43: Effluent Averages Summary for Ditches 8, 9 and Control 103

Table 44: Effluent Averages Summary for the Low-Level Liquid Waste Treatment Systems 106

Table 45: Parameters that Failed to Conform to CNL Monthly Guidelines 108

Table 46: Loading for the Current Year and Previous Five Years 117

Table 47: Fuel Use for Building Heating from Whiteshell Laboratories 119

REDACTED

Table 48: Stationary Combustion Data and Emissions from Whiteshell Laboratories 121

Table 49: Whiteshell Laboratories Site Greenhouse Gas Emissions 121

Table 50: Halocarbon Losses from Whiteshell Laboratories 122

Table 51: Whiteshell Laboratories Fire Protection Program Licensing Basis Document Submissions in 2025 129

Table 52: Radioactive Waste by Storage Location 134

Table 53: Low-Level Waste Generated by Facility 134

Table 54: Intermediate-Level Waste Generated by Facility 135

Table 55: Radioactive Wastes Transported to Chalk River Laboratories and Off Site for Disposition 136

Table 56: Clean Waste Shipped Offsite 137

Table 57: Hazardous Waste Dispositioned Offsite 138

Table 58: Non-Radioactive Hazardous Waste Shipped Offsite 138

Table 59: Whiteshell Laboratories Decommissioning Plan Program Licensing Basis Document Submissions in 2025 139

Table 60: Summary of Whiteshell Laboratories Storage with Surveillance Plans in 2025 140

Table 61: Summary of Whiteshell Laboratories Detailed Decommissioning Plans in 2025 140

Table 62: Summary of Whiteshell Laboratories Decommissioning and Demolition Status by Facility in 2025 143

Table 63: Summary of Whiteshell Laboratories Decommissioning and Demolition Interim/End-State Reports in 2025 143

Table 64: Whiteshell Laboratories Security Program Licensing Basis Document Submissions in 2025 145

Table 65: Examples of Public Engagements for Whiteshell Laboratories in 2025 150

Table 66: Community Information Bulletins 151

Table 67: Examples of Whiteshell Laboratories-Related Earned Media in 2025 152

Table 68: Examples of Municipal Engagement 153

Table 69: Examples of On-Site School Tours and Presentations 153

Table 70: Identified Indigenous Communities 155

Table 71: Examples of Indigenous Engagement Activities for 2025 158

Table 72: 2025 Indigenous Engagement Activities at the Whiteshell Laboratories Site 162

REDACTED

Table 73: Gross Beta Activity of Surface Water Sample from Ditches around the Canister and Waste Management Area 178

Table 74: Gross Alpha Activity of Surface Water Sampled from Ditches around the Canister and Waste Management Area 179

Table 75: Tritium Activity of Surface Water Samples from Ditches around the Canister and Waste Management Area 180

Table 76: Uranium in Surface Water Samples from Ditches around the Canister and Waste Management Area 181

Table 77: Facility Changes 182

Table 78: Summary of Average Gamma Radiation for Near Contact Measurements from Fuelled Canisters (mrem/h) 183

Table 79: Summary of Average Beta Radiation Measurements from Fuelled Canisters (Bq/filter) 185

Table 80: Additions to Low-Level Waste Inventory 192

Table 81: Gross Beta Activity of Surface Water Samples from Ditches around the Concrete Canister Storage Facility and Waste Management Area 195

Table 82: Gross Alpha Activity of Surface Water Samples from Ditches around the Concrete Canister Storage Facility and Waste Management Area 196

Table 83: Uranium of Surface Water Samples from Ditches around the Concrete Canister Storage Facility and Waste Management Area 197

Table 84: Tritium Activity of Surface Water Samples from Ditches around the Concrete Canister Storage Facility and Waste Management Area 198

Table 85: Cesium-137 Results from Sample Locations 19 A, B, and C at the Waste Management Area 199

Table 86: Technetium-99 Results from Surface Water Samples from Ditches around the Concrete Canister Storage Facility and Waste Management Area 200

Table 87: Cesium-137 Activity of Near Field Wells Adjacent to Intermediate-Level Waste Bunkers 203

Table 88: Strontium 90 Activity of Near Field Wells Adjacent to Intermediate-Level Waste Bunkers 204

Table 89: Tritium Activity of Near Field Wells Adjacent to Intermediate-Level Waste Bunkers 205

Table 90: Monitoring Data Water Table Wells and Deep Wells 206

Table 91: Monitoring Data High-Level Liquid Waste Tank Tray Water 207

Table 92: Perimeter Fence Monitoring Data 208

REDACTED

Table 93: Waste Management Area Vegetation Monitoring Data 209

Table 94: Waste Management Area Facility Changes 209

Table 95: Historical Records of Low-Level Liquid Waste Processed 215

Table 96: Building 100 and Building 300 Low-Level Liquid Waste Treatment System Radioactive Releases 216

Table 97: Whiteshell Reactor – 1 Facility Changes 218

Table 98: Operating Summary of Non-nuclear Facilities 220

Table 99: Gross Alpha Results from the Landfill Dugouts 226

Table 100: Gross Beta Results from the Landfill Dugouts 226

Table 101: Tritium Results from the Landfill Dugouts 226

Table 102: Strontium-90 and Technetium-99 Results from the Landfill Dugouts in 2025 227

Table 103: Boron Results from the Landfill Dugout 15 228

REDACTED

Introduction

Whiteshell Laboratories (WL) was established by Atomic Energy of Canada Limited (AECL) in the early 1960s to carry out nuclear research and development activities. The site is a Class 1B nuclear facility which encompasses an area of 4,375 ha. The WL site is located near Pinawa, Manitoba, approximately 100 km northeast of Winnipeg, on the eastern bank of the Winnipeg River. Atomic Energy of Canada Limited made a business decision in 1997 to discontinue most of the research programs and operations at WL. Subsequently, AECL received government concurrence in 1998 to proceed with actions to achieve closure of WL. This work transitioned to Canadian Nuclear Laboratories (CNL), which is carrying out the work to achieve site remediation on behalf of the site owner, AECL.

Activities on site include operations, decommissioning, and waste management. The site remediation follows the general plan laid out in the *Comprehensive Study Repor*t [1] supporting the approval of the environmental assessment of the WL Decommissioning Project. The exception to this is the change in strategy for Whiteshell Reactor – 1 (WR-1) (see the Decommissioning Strategies Section below).

Name: *Whiteshell Laboratories*

Location: *1 Ara Mooradian Way*
Pinawa, Manitoba
R0E 1L0

REDACTED

Licence Information and Reporting Period

This Annual Compliance Monitoring Report (ACMR) is produced to comply with licence condition 3.2 of WL Licence NRTEDL-W5-8.00/2027 [2], in accordance with the compliance verification criteria Compliance Monitoring: Annual Report of the *Licence Conditions Handbook for Whiteshell Laboratories,* referred to in this ACMR as the "Licence Conditions Handbook" [3], and Section 3 Annual Compliance Monitoring Report of Canadian Nuclear Safety Commission (CNSC) Regulatory Document (REGDOC)-3.1.2, *Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills* [4]. Information included in this report is for the period of 2025 January 01 to December 31.

This report provides site-specific information to supplement information in the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* [5], which provides corporate updates to 14 Safety and Control Areas (SCAs) as they are applied across all of CNL.

The intent of this report is to provide sufficient detail to demonstrate how CNL programs implemented at WL are meeting the regulatory requirements as specified in the licence [2] and the Licence Conditions Handbook for WL [3].

Changes to Organizational Structure

As discussed in the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* [5], CNL operates with a Government-Owned, Contractor-Operated model where CNL

is responsible for the operation of the facilities while the contractor provides management of CNL. On 2025 December 11, a new contractor, Nuclear Laboratory Partners of Canada (NLPC), formally assumed management of CNL.

In 2025 December, a new Facility Authority and Designated Representative of the Licensee (DROL) for the Shielded Facilities, WR-1 Reactor, and Research and Development (Building 300) at WL was qualified, and a new Facility Authority and DROL for the Concrete Canister Storage Facility and Waste Management Area at WL was qualified [6].

Facilities Included in this Report

Appendix A through Appendix G of the report provide information that is pertinent to the nuclear and non-nuclear facilities (including operating and permanently shut down facilities, and facilities being decommissioned).

The nuclear facilities included in this report are as follows: Concrete Canister Storage Facility (CCSF), Active Liquid Waste Treatment Centre (ALWTC), Shielded Facilities (SF; consist of Hot Cell Facility (HCF) and Immobilized Fuel Test Facility (IFTF)), Waste Management Area (WMA), Research and Development (R&D) Facilities Complex (Building 300), Health and Safety Facilities (Building 402 and Building 305), and the WR-1 reactor.

Summary of Licensed Activities

There were no new licensed activities in 2025. The current WL licence [2] expires on 2027 December 31.

Development, Investment, and/or Decommissioning Strategies

Whiteshell Laboratories continued to support safe operations and long-term risk reduction through targeted infrastructure upgrades and decommissioning activities.

Key infrastructure improvements included the removal of approximately 1,800 legacy light ballasts containing polychlorinated biphenyls (PCBs), reducing environmental and occupational risk. Upgrades were completed to portions of the Building 100 fire-detection system, and Fire Water Pump No. 3 was refurbished, upgraded, and returned to service, improving fire-protection reliability across the site. In addition, approximately 160 fire dampers were identified, inspected, and assessed to confirm fire-separation integrity. Building 100 electrical breaker maintenance was also completed, addressing a reliability and safety risk.

Facility condition improvements continued with roof replacements for several buildings, including Buildings 100, 300, and 412. These projects mitigated water ingress risks, protected safety-related equipment, and extended the service life of the facilities. Site-wide asset sustainment was further supported by upgrades to a Computer Maintenance Management System to improve work planning, asset tracking, and preventive maintenance execution. The construction of a new road around the Protected Areas was also completed and improves access control and emergency response capability throughout the site.

REDACTED

In parallel with sustainment initiatives, work continued toward decommissioning of the WL site. Activities included the packaging and transportation of active waste off site for approved storage or disposal, consistent with regulatory requirements and the Comprehensive Study Report [1] end states. The only significant proposed deviation from the approved end states is the in situ decommissioning (in situ disposal) of the WR-1 reactor. Progress continued on the associated environmental assessment and regulatory approval processes required to support this proposed change.

The Environmental Impact Statement for the WR-1 in situ decommissioning option has been reviewed by the Federal/Provincial Indigenous Review Team, led by the CNSC. Canadian Nuclear Laboratories is actively responding to review comments and continues meaningful engagement with Indigenous Nations to address interests, concerns, and knowledge related to the project. This ongoing engagement remains a core component of the decision-making process as regulatory reviews advance.

Financial Guarantees

The CNSC was previously provided a letter from the Honorable G. Rickford [7], advising that as an agent of His Majesty in Right of Canada, AECL's liabilities associated with the decommissioning of WL are ultimately liabilities of His Majesty in Right of Canada (note: AECL retains ownership of the lands, assets, and liabilities associated with CNL's licences). This financial guarantee remains valid and in effect, as confirmed in 2025 in correspondence between CNL and CNSC [8] [9].

REDACTED

1 Management System

1.1 Management System Program

Whiteshell Laboratories adheres to CNL's Management System, Quality, and Information Management Functional Support Areas (FSA). Refer to Section 1 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* [5] for details including a list of management system document submissions applicable to WL.

The *Whiteshell Laboratories Decommissioning Project Quality Assurance Plan* [10] supports the *Canadian Nuclear Laboratories Management System Manual* [11] and summarizes the processes and practices applicable to WL licensed activities, while still retaining compliance to Canadian Standards Association (CSA) N286-12 *Management system requirements for nuclear facilities* [12] and CSA N286.6-98 *Decommissioning Quality Assurance for Nuclear Power Plants* [13].

There were no revisions to the WL SCA Management System documents submitted to CNSC staff during the reporting period.

The quality assurance plan for Environmental Management and the WL organization document were revised in 2025 to address outstanding actions arising from previous management reviews and self-assessments.

1.2 Audits, Inspections and Self-Assessments

As per the requirements of the *Management System* [11], both SCAs and Facilities conduct various audits, inspections, and self-assessments to ensure that the management system is functioning according to expectations and that any policy, programmatic, or procedural deficiencies are identified and appropriate actions taken to resolve them. CNL utilizes its Integrated Assessment Plan [14] to provide a collection of the internal and external assessment activities that are planned to be carried out for a specific year. The plan incorporates a three-year rolling plan for assessment activities and helps to ensure all SCAs are assessed during the cycle and allows CNL to plan targeted assessments based on data sources.

1.2.1 Audits

Refer to Section 1.2 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* [5] for a list of all CNL-wide audits for reporting year 2025.

All actions resulting from audits, inspections, reviews, and self-assessments are managed and tracked through CNL's Problem Identification and Resolution Process.

1.2.1.1 External Audits

The external audits conducted at WL in 2025 are summarized in Table 1.

REDACTED

Table 1: External Audits

Title	Type of Audit	No. of Non-Conformances Raised	No. of Actions Raised[a]	No. of Actions Completed
ISO 14001:2015 Surveillance (S1) & Stage 2 – Addition of Site Audit Audit by: Intertek 2025 May 12-14 for WL, May 27 to 29 for CRL, May 21 to 22 for Port Granby	ISO 14001:2015 Environmental Management System Surveillance 1 (at WL and CRL) and Stage 2 – Addition of Site (at Port Granby) Audit	0 (WL)	2 (WL)	2 (WL)

a The actions raised may also include opportunities for improvement.

1.2.1.2 Internal Quality Audits

The internal audits completed by the Quality Audits & Supplier Quality branch in 2025 are summarized in Table 2.

Table 2: Internal Quality Audits

Title	Audit Scope	No. of Non-Conformances Raised	No. of Actions Raised[a]	No. of Actions Completed
WL Decommissioning Project	Current activities and conditions at WL were observed with attention to project process implementation and assessment activities	9	12	8

a The actions raised may also include opportunities for improvement.

REDACTED

1.2.2 Inspections

Canadian Nuclear Safety Commission Inspections

The following CNSC inspections were conducted at WL in 2025.

Table 3: Canadian Nuclear Safety Commission Inspections Conducted at Whiteshell Laboratories in 2025

Inspection No.	Area Inspected	No. of NNCs	No. of NNCs Closed [a]
CNL-WL-2025-01	General	1	1
CNL-WL-2025-02	Facility Specific – Waste Management Area	2	0

Inspection No.	Area Inspected	No. of NNCs	No. of NNCs Closed [a]
CNL-WL-2025-03	Management System	3	0
CNL-WL-2025-04	WL Security	1	0
CNL-WL-2025-05	WL-Facility Specific – Concrete Canister Storage Facility	1	0

NNC – Notice of Non-Compliance

a Closed as of 2025 December 31

International Atomic Energy Agency Inspections

The following International Atomic Energy Agency (IAEA) inspections were conducted at WL in 2025.

Table 4: International Atomic Energy Agency Inspections Conducted at Whiteshell Laboratories in 2025

Site	Inspection						Total
	PIV	DIV	RII	IIV	UI	CA	
Whiteshell Laboratories	1	1	0	0	0	0	**2**

PIV Physical Inventory Verification
DIV Design Information Verification
RII Random Interim Inspection
IIV Interim Inventory Verification
UI Unannounced Inspection
CA Complimentary Access

The results of the physical inventory verification and design information verification were acceptable.

Inspections by Other Regulatory Bodies

A Transport Canada Transportation of Dangerous Good (TDG) audit was conducted at WL in 2025 October. At the time of the inspection two non-conformances were identified; refer to Section 14.1 for further details.

1.2.3 Self-Assessments

In 2025, there were 26 self-assessments conducted at WL covering various aspects of the management system, including both SCAs and various facilities.

Canadian Nuclear Laboratories completed functional requirements assessments of the SCAs applicable to multiple sites, refer to Section 1.2.3 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* [5].

REDACTED

Table 5: List of Self-Assessments Conducted at Whiteshell Laboratories in 2025

Title	SCA	Facility (if applicable)
Storage of Radioactive Material	Radiation Protection	Nuclear Facilities
Registration and Records of Radiation Sources	Radiation Protection	N/A
RP Program Self-Assessment	Radiation Protection	N/A
Compliance to Section 8.4 of N288.5-11 Sampling of Airbourne Effluents	Environmental Protection	Nuclear Facilities
Compliance to Section 6.4 of N288.7-15 Development of specific ground water protection goals	Environmental Protection	N/A
Compliance to ISO/IEC 17025:2017 Externally provided products and services	Management System	N/A
Compliance to ISO/IEC 17025:2017 Selection, verification and validation of methods	Management System	N/A
Compliance to ISO/IEC 17025:2017 Sampling	Management System	N/A
Compliance to ISO/IEC 17025:2017 Handling of test and calibration items	Management System	N/A
Preventative Maintenance Mandatory (PMM)/Preventative Maintenance Regulatory (PMR) Self-Assessment	Fitness for Service	Nuclear Facilities
Observation and Coaching Completion	Human Performance Management	N/A
Corrective Action Program – Smarter Actions Evaluations	Management System	N/A
Compliance to Section 7.7 of ISO 17025 Ensuring Validity of Results[a]	Management System	N/A
Compliance to Section 7.6 of ISO 17025 Evaluation of Measurement Uncertainty	Management System	N/A
Compliance to Section 7.5 of ISO 17025 Technical Records[a]	Management System	N/A
Compliance to Radioisotope Laboratory Protocol (RLP) – Radionuclide Safe Handling Procedures	Environmental Protection	Radioisotope Laboratories
Compliance to Section 7.5 of N288.4-10 Media to be Measured or Sampled	Environmental Protection	N/A
Manager Dose Control Points and RP Training Designation Review	Radiation Protection	N/A
Perform Work Safely Within Controls	Operating Performance	N/A
Assess the floor care status of the WL Site	Environmental Protection	N/A
NCS Assessment – 2024 – CSD-24	Safety Analysis	Shielded Facilities

REDACTED

Title	SCA	Facility (if applicable)
NCS Assessment – 2024 – CSD-64	Safety Analysis	Shielded Facilities
NCS Assessment – 2024-2025 – Non-NCCA – B300 IFTF (Rm 1-173) and WHF (Rm 1-181)	Safety Analysis	Shielded Facilities
NCQ4[b] WL Fire Protection Oversight Plan Self-Assessment	Emergency Management and Fire Protection	N/A
Q1[b] WL Fire Protection Oversight Plan Self-Assessment	Emergency Management and Fire Protection	N/A
Q2[b] Whiteshell Fire Protection Oversight Plan Assessment[c]	Emergency Management and Fire Protection	N/A

a Work conducted in 2025 but final approvals not complete until 2026 January.
b Q4 of FY 2024-2025 (2025 January – March), Q1 of FY 2025-2026 (2025 April – June), Q2 of FY 2025-2026 (2025 July – September).
c For Q3 of FY 2025-2026 (2025 October – December) work is ongoing into 2026 to finalize the self-assessment.

1.3 Problem Identification and Resolution

1.3.1 Trending of Events Related to Operational Activities

As events at WL occur, they are recorded in the Improvement Action (ImpAct[1]) system. This information is regularly reviewed to identify any trends.

Formal event-based trend reports continue to be prepared on a monthly basis to predict any adverse trends and identify improvements. Table 6 contains a list of the identified trend ImpAct records along with the title and number of actions raised to address identified casual factors.

Table 6: Trend ImpActs Raised at Whiteshell Laboratories in 2025

ImpAct #	Title	No. of Actions Raised
ERM-25-4410	WL - Adverse Trend of Recovery Issues Related to Power Outages	1

The use of the problem identification and resolution process at WL continues to foster the internal reporting of lower significance level events (level 4 and some level 3), thus affording the opportunity to implement continuous improvement initiatives through a robust problem identification and resolution process.

REDACTED

1 ImpAct – Abbreviation for Improvement and Action: It is an internal process used to identify events, problems, non-conformities, opportunities for improvements, and personnel injuries. The process also identifies and tracks actions to correct or remediate problems.

The following table summarizes ImpActs raised over the past 5 years by Significance Level[2]. Based on the average of the previous 4 years, the total number of ImpActs in 2025 increased by 17%.

Table 7: Number of ImpActs Raised at Whiteshell Laboratories in 2025

Year	Level 0[a]	Level 1	Level 2	Level 3	Level 4	Total
2021	5	0	2	81	336	424
2022	2	1	4	61	306	374
2023	8	1	6[b]	90	312	417
2024	3	0	6[b]	36	313	358
2025	13	0	5	74	371	463

a Level 0 will be assigned if the ImpAct is deemed to be a "non- problem" and a recommendation to close the ImpAct will be given.

b The increase in the number of SL2 ImpActs in 2023 and 2024 is attributed to a change in the process for assigning significance level to inspection-related ImpActs.

1.4 Management Reviews

The WL Quality Assurance Program/Management System Reviews were completed in 2025 for Calendar Year 2024 to evaluate the effectiveness of the management system. The WL Quality Assurance Program review identified two actions, both of which are closed. The 2025 Calendar Year program/management system review has been initiated.

A CNL Management System Review was completed for period 2024 January – 2025 March to evaluate the effectiveness of the management system. The review included WL and concluded that the CNL management system is suitable to meet the necessary requirements, adequate, aligned with the strategic direction, and effective at supporting CNL to achieve corporate objectives. Four recommendations were actioned as part of the share transfer due diligence activities held in 2025 July – August for the new contractor, NLPC, assuming management of CNL.

1.5 Safety Culture

In 2025 WL was included in the company wide CNL internally led focused assessment. The assessment findings referenced the activities that the WL leadership team completed in support of promoting teamwork and innovation, securing regulator trust, meeting program compliance, and improving employee morale.

Refer to Section 1.4 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

REDACTED

[2] Significance Level: Levels assigned to an event (SL1 being most significant, SL4 being least significant) based on the actual or potential result in safety, environmental, or business consequences.

2 Human Performance Management

The Human Performance Management SCA covers activities that enable effective human performance, through the development and implementation of processes to ensure a sufficient number of qualified workers to carry on the licensed activities to safely and in accordance with the *Nuclear Safety and Control Act* [15] and the regulations made under the *Nuclear Safety and Control Act*.

2.1 Human Performance Program

Whiteshell Laboratories adheres to CNL's Performance Assurance FSA. Refer to Section 2 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* [5] for details.

The effectiveness of the Human Performance Program at WL has been enhanced through the following improvements:

- Whiteshell Laboratories continues to conduct plan of the next day and plan of the week meetings with personnel working at the site and includes engagement with subject matter experts from various disciplines such as Occupational Safety and Health (OSH), Radiation Protection (RP), Industrial Hygiene, Operations, Licensing, and Project Leaders.
- Sharing of Operating Experience (OPEX) lessons learned bulletins with field workers, FSAs, and line management highlighted through email distribution and department meetings, to ensure understanding of the situations and providing a pause to confirm sufficient safety protocols are implemented for upcoming planned work.
- Inclement weather warnings including extreme hot or cold working conditions, which may develop and could adversely impact work activities at the WL site, are distributed to the various groups, leaders, managers, or all staff.
- Enhanced engagement with safety pauses to allow space and time to reflect, review work packages for the planned work of the day, acknowledge distractions, refocus on in-depth pre-job briefs prior to field work commencing, and empowering workers to say something when things do not seem right.
- Celebrating significant work completed at the WL site, which focuses on high safety standards, collaboration, and technical excellence that defines work. Acknowledgements highlight the high level of commitment to safety by embracing the Stop/Pause principles, which ensures every activity is calculated, reviewed, and executed with care.
- Reinforcement of communication, collaboration, and safety through sharing project accomplishments during the weekly WL site all staff meetings.

There are no WL-specific licensing basis documents under the Human Performance Program.

REDACTED

2.2 Hours of Work Exceedances

As per REGDOC-2.2.4, *Fitness for Duty: Managing Worker Fatigue* [16] sections 4.2 and 4.3, CNL has recorded all exceedances of hours of work for Security's safety-sensitive positions. Refer to Table 8 for a list of exceedances at WL.

Table 8: Hours of Work Exceedances for Nuclear Security Officers and Tiered Response Force at Whiteshell Laboratories

Limits	2024				2025			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
> 16 hrs in a 24hr period	7	36	8	5	10	3	8	11
> 28 hrs in a 48hr period	0	4	1	1	0	0	0	5
Over 60 hr work week/120 hr rolling 14 Day	6	5	0	4	5	0	0	2
Min recovery of 48 hrs after 2 consecutive nights	11	10	5	13	20	9	11	6
Min recovery of 72 hrs after 3 consecutive nights	0	2	0	0	3	0	2	2
> 6 consecutive shifts	0	0	0	1	0	0	0	0
Total	24	57	14	24	38	12	21	26

REDACTED

Weather related hours of work exceedances occurred in 2025; these included winter storms in March and December. These storms impacted the ability for relieving officers to reach site resulting in staff hold overs and hours of work exceedances.

During 2025 WL Security experienced additional challenges related to available resources, including delays in the hiring process, onboarding, and training of Nuclear Security Officers (NSOs). This delay contributed to lack of additional NSOs to cover sick leave and short/long term medical leave occurrences.

Whiteshell Laboratories Security identified a trend in the hours of work exceedances for shift leadership positions (Sergeant/Corporal). These positions experienced resource shortages as there are limited qualified individuals who can act in these positions.

Nuclear Security Officer/Tiered Response Force positions on short and long-term medical leave contributed to exceedances as other shifts have to adjust and backfill for these absences.

When hours of work exceedances occur, security leadership mitigates risk during holdovers by ensuring the affected officer has a reduced workload, arranges for transportation home at end of shift, and has mandatory supported leave the following day. These initiatives reduce the impact on resources and will further reduce the occurrences of work exceedances.

Whiteshell Laboratories Security has initiated the hiring process for six casual NSO positions and two fulltime backfill NSO positions to assist with reduction of exceedances in 2026.

2.3 Training Program

Whiteshell Laboratories adheres to the Corporate Training and Development FSA. Refer to Section 2 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

In 2025, the effectiveness of the Training program at WL has been enhanced through the following improvements and accomplishments:

- Engaged technical trainers from Chalk River Laboratories (CRL) to support delivery of practical training for aerial work platform, lift truck operation, indoor overhead crane operation, and vehicle spotter training. This initiative was launched in late 2025 to mitigate low in-year completion rates for practical training and to qualify site-based practical trainers to support ongoing practical training needs at WL.
- Strengthened alignment between WL RP Group 2 training and company-wide qualification requirements by addressing a site-specific misalignment in how existing, compliant training was documented and mapped within the Learning Management System (LMS). WL RP staff had completed appropriate Group 2 training; however, deviations and equivalencies within the local RP training program had not previously been fully documented or mapped to centralized qualification requirements in the LMS. Actions completed in 2025 focused on correcting this documentation and system alignment, including aligning training data sources, clarifying role assignments and mappings in the LMS, and completing change-management documentation to formally link WL-specific training to companywide requirements. Joint reviews were initiated to identify and resolve residual compliance documentation gaps. These improvements increase the accuracy and transparency of qualification records, reduce the risk of misrepresentation during audits, and ensure WL RP qualifications more clearly and accurately reflect companywide requirements without implying deficiencies in staff training.

Canadian Nuclear Laboratories acknowledges the below expectations rating received from the CNSC in 2023 and 2024 for training related issues at WL, including gaps in the maintenance of Workplace Hazardous Materials Information System (WHMIS) qualifications, incomplete application of the Systematic Approach to Training (SAT) for the Emergency Operations Centre (EOC) Commander and Firefighter roles, and training related deficiencies identified during CNL's 2023 Fire Protection self assessment. Throughout 2025, CNL advanced corrective actions to address these findings, including:

- Provided training and support to all WL managers and supervisors on using CNL's LMS reporting to improve visibility of assigned training, due dates, and qualification status.
- Granted access to managers and supervisors for the LMS Qualification Checker report to enhance oversight of employee training and ensure training requirements are monitored consistently.

REDACTED

- Revised and updated the Firefighter Job and Task Analysis to align role expectations, required knowledge and skills, and qualification pathways with SAT.
- Created a WL-specific EOC Commander Task Analysis, establishing a defined role profile and training requirements consistent with SAT application.

These completed actions represent measurable progress toward addressing the training related issues identified by CNSC staff and improving the clarity, consistency, and oversight of training programs at WL.

There are no WL-specific licensing basis documents under the Training Program.

2.3.1 Required Training

Whiteshell Laboratories maintains a sufficient number of qualified workers to carry on the licensed activities safely and in accordance with the *Nuclear Safety and Control Act* [15] and the regulations made under the *Nuclear Safety and Control Act*.

Whiteshell Laboratories applies the SAT for positions and roles identified on the *Application of the Systematic Approach to Training (SAT) at CNL* [17] controlled list. The SAT enlists the Training Analysis method – Job/Task Analysis to identify training requirements to be documented in position/role-specific Training Plans. There are 13 positions and roles at WL that are on the controlled list [17], which include:

- Group 1 Health Physicist – WL
- Radiation Protection Surveyor – WL
- Tiered Response Force – WL
- Firefighter – WL
- Nuclear Criticality Control Officer – WL
- Dangerous Goods Handler
- Dangerous Goods Shipper
- Emergency Operations Centre – Commander – WL
- Facility Supervisor – WMA – WL (Senior Operations Technician)
- WMA Operations Technician – WL
- Facility Manager – Shielded Facilities – WL
- Facility Supervisor – Shielded Facilities – WL
- Operator – Shielded Facilities – WL

In 2025, all WL SAT-listed positions were reassessed for inclusion on the controlled list [17] based on the new SAT applicability assessment tool, as reported in the 2025 CNL ACMR [5]. The reassessment determined the following positions and roles no longer required a SAT-compliant training program, however, the training program was maintained until the next revision of the controlled list [17] in early 2026:

REDACTED

- Delegated Design Authority – WL
- Certified Industrial Hygienist – WL

These changes to the controlled list [17] were documented using the applicable change control processes.

All WL personnel, both employees and contractors, are adequately trained to ensure safe operation of the site and/or facility and to conduct work under the licence [2]. Management verifies training compliance to ensure only employees who are qualified to perform a task are assigned the work. Table 9 lists the federally and provincially legislated training roles included in position-specific training plans at WL. Table 10 provides the 2025 CNL employee and manager/supervisor required training certification at WL.

Beginning in 2025, the percent completion metric reflects only those employees who were required to complete training within the calendar year (i.e., new hires and employees newly assigned training due to role assignment or operational need). This metric does not represent the total number of employees at WL who are qualified in each role or certification.

This change represents a deliberate shift from past reporting practice, in which completion percentages were calculated using the total number of employees assigned the training, regardless of whether they were due for completion in that year. The revised metric is based on industry benchmarking and was agreed upon with CNSC staff for use in 2025 to provide a more accurate reflection of the annual training demand.

REDACTED

Table 9: Status of Federally/Provincially Legislated Training at Whiteshell Laboratories in 2025

Role	% Complete
OSH – Aerial Platform Operator – Articulating Boom 60 ft or less (Consolidated List)	100%
OSH – Aerial Platform Operator – Articulating Boom 85 ft Consolidated List)	100%
OSH – Aerial Platform Operator – Rough Terrain Scissor Lift (Consolidated List)	95%
OSH – Aerial Platform Operator – Scissor Lift (Consolidated List)	95%
OSH – Asbestos – Advanced Asbestos Awareness (Consolidated List)	100%
OSH – Confined Space Entry (Consolidated List)	89%
OSH – Crane – Indoor Overhead Crane Operator – Bridge Crane (Consolidated List)	10% *(2 of 20)
OSH – Crane – Indoor Overhead Crane Operator – Gantry Crane (Consolidated List)	6% *(1 of 18)
OSH – Crane – Indoor Overhead Crane Operator – Hoist Only (Consolidated List)	0% *(0 of 2)
OSH – Crane – Indoor Overhead Crane Operator – Jib Crane (Consolidated List)	5% *(1 of 20)

Role	% Complete
OSH – Excavation Worker (Consolidated List)	0% *(0 of 2)
OSH – First Aid Attendant (Consolidated List)	67% *(4 of 6)
OSH – Hazardous Energy Control – Authorized Individuals (Consolidated List)	98%
OSH – Lift Truck Operator – Counter Balance (Consolidated List)	24%
OSH – Lift Truck Operator – Electric Pallet Jack (Consolidated List)	25% *(3 of 8)
OSH – Lift Truck Operator – Non-Electric Pallet Jack (Consolidated List)	25% *(3 of 8)
OSH – Silica Worker and Supervisor (Consolidated List)	100%
OSH – Worker Operating/Using Ladders (Consolidated List)	100%

*Note: For certifications with a small number of assigned trainees, the completion rates may be skewed by small sample sizes. Accordingly, the number of completions versus assigned trainees is presented below the percentage (e.g., 1 of 8).

Table 10: Status of CNL Employee and Manager/Supervisor Required Training at Whiteshell Laboratories in 2025

Certification Title	% Complete
	2025
Employee Required Training	
CNL General Safety Orientation	96%
Cyber Security (9 courses)	100%
Fire Prevention Training	94%
Hazard Prevention Program	100%
Human Performance Awareness – Fundamentals and Nuclear Safety Culture	92%
Indigenous Relations at CNL	100%
Information Asset Protection (IAP) Training	100%
Introducing the ImpAct Process at CNL	100%
Introduction to CNL's Management System	100%
Nuclear Criticality Safety Program Awareness	88%
Security Awareness	97%
Values and Ethics at CNL	86%
Violence and Harassment Prevention	96%

REDACTED

Certification Title	% Complete
	2025
Waste Management Awareness	100%
WHMIS – 2015	92%
Fire Extinguisher (On-site worker only)	90%
WL Site Orientation (On-site worker only)	94%
Manager Required Training	
Continuous Behavioural Observation Program (CBOP)	64%
Responsibility in Supervising Employees (RISE)	0% *(0 of 8)
Radiation Protection Required Training	
Group 4 Radiation Protection Training	93%
Group 3 Radiation Protection Training	78% *(7 of 9)
Group 2 Radiation Protection Training (Whiteshell)	82% *(27 of 33)
Group 1 Radiation Protection Personnel: Health Physicist - WL	100% *(2 of 2)
Group 1 Radiation Protection Personnel: Radiation Surveyor (Whiteshell)	86% *(18 of 21)

*Note: For roles with a small number of assigned trainees, the completion rates may be skewed by small sample sizes. Accordingly, the number of completions versus assigned trainees is presented below the percentage (e.g., 1 of 8).

REDACTED

2.4 Analysis of Trends

When interpreting the in-year completion metric for 2025, it is important to recognize that CNL continues to apply a performance expectation of 90% completion for required training. Under the revised in-year metric, this benchmark reflects the proportion of individuals who were assigned training during the calendar year and successfully completed it within that same period. Lower in-year percentages do not indicate that employees are broadly unqualified or that WL is unable to meet its licensing obligations; rather, they reflect that individuals newly assigned training or progressing through multi-step qualification pathways may not complete all requirements within the same year. For small cohorts, even one or two outstanding completions can significantly affect the percentage. During 2025, employees were assigned work appropriate to their qualifications and role expectations. For individuals newly appointed to manager or supervisor roles, required role-based training (including RISE) may be completed within the established onboarding period (up to six months after appointment). During this period, individuals perform managerial duties commensurate with their prior experience and under existing organizational controls. At no time in 2025 were employees assigned work for which they were not trained and qualified.

Federally and Provincially Legislated Training

In 2025, WL demonstrated strong performance for core safety training. Completion rates were high for Ladder Safety, Silica Worker/Supervisor training, Hazardous Energy Control, Asbestos Awareness, and Aerial Work Platform training, with results ranging from 95% to 100%. Confined Space Entry also achieved a high in year completion rate of 89%. Lower in year completion rates were concentrated in practical equipment operation roles and smaller cohorts assigned training during 2025, including Indoor Overhead Crane Operator, Lift Truck (Counter Balance and Pallet Jack), Excavation Worker, and First Aid Attendant roles.

Overall, these results indicate that routine, high demand safety and compliance training is being completed in a manner that supports daily operational needs at WL. In contrast, in year completions for practical equipment operation roles reflect factors such as the timing of training assignments, class availability relative to demand, limited resources to deliver practical training (i.e., equipment availability and number of technical trainers to complete field check outs), and the sequencing of training requirements. During 2025, measures implemented to support completions included the issuance of automated weekly LMS Learner Role Matrix reports to improve visibility of training requirements and qualification status, as well as an onsite visit by CRL Technical Trainers in December to increase access to practical equipment training. Multiple cancellations and scheduling issues during the visit reduced the number of trainees reached. While local capability to support ongoing delivery of training was improved by qualifying WL employees to perform future practical assessments, the missed training sessions highlight risks related to planning and resource allocation. To mitigate future compliance risks and improve planning effectiveness, WL is actively working to hire a dedicated technical trainer to ensure consistent delivery of compliance training.

REDACTED

CNL Employee and Manager/Supervisor Required Training

In 2025, WL demonstrated strong performance across the majority of employee required training, with high in year completion rates for key safety, security, and administrative certifications. Most certifications achieved completion levels between 90% and 100%, indicating that employee required training is being completed in a manner that supports daily operations and maintains foundational competencies for safe and compliant work at the site. Moderately lower completion rates were observed in Nuclear Criticality Safety Program Awareness (88%) and Values and Ethics (86%), which were below CNL's 90% performance benchmark. For Values and Ethics, lower completion was influenced by user errors associated with the e-learning module, which required troubleshooting with individual employees to ensure completions were accurately captured in the LMS. The lower completion rate for Nuclear Criticality Safety Program Awareness reflects that some assigned employees had not yet completed the training by year end, and the underlying factors influencing this outcome are still being reviewed. Overall, these results indicate that the below benchmark outcomes were driven by timing and administrative factors rather than a reduction in qualified capability at WL.

Manager required training showed expected variability given the smaller number of supervisors at WL. The CBOP training achieved a moderate in-year completion rate, while RISE training

remained at 0% due to eight managers/supervisors being newly assigned the requirement in 2025. These outcomes reflect the influence of assignment timing and small cohort sizes rather than a reduction in supervisory capability at the site, with managers and supervisors progressing through their required training pathways at different points in the calendar year.

Radiation Protection training results demonstrated strong completions for employees assigned RP training in 2025. Group 4 Radiation Protection training (employee required training) and Group 1 Heath Physicists training achieved high in-year completion rates exceeding the 90% benchmark. Group 2 Radiation Protection, Group 3 Radiation Protection, and the Group 1 Radiation Surveyor training reflected completion rates below the 90% benchmark but were consistent with progression through multi-step qualification pathways within a small group of assigned employees rather than gaps in qualified capability. Strong completion rates across all RP group level training are consistent with the training program improvements and alignment efforts highlighted in Section 2.3.

2.4.1 Contractor Training

Before accessing the WL site, contractors completed, at a minimum, the following training:

- Contractor Safety Orientation (site-specific, includes the CNL Contractor Code of Conduct)
- Radiation Protection Group 4

Remote contractors that do not access the WL site completed, at a minimum, the following training:

- CNL Contractor Code of Conduct

These courses are provided to contractors via computer-based training and are hosted by a third party, contracted by CNL, to manage the Contractor Management database.

Whiteshell Laboratories utilizes the contract terms and conditions, in addition to verifying and approving the contractor company's safety programs and training records, to ensure contractors are qualified to work at the site. Canadian Nuclear Laboratories contractor representatives are required to verify contractor training records prior to the commencement of work.

2.4.2 Training Evaluations Summary

In 2025, a total of 25 Trainer Observations and 21 Post Training Effectiveness Observation and Coaching evaluations were completed at WL. These evaluation completions represent increases of 92% and 31% respectively over 2024, demonstrating a significant strengthening of evaluation practices at the site. The increases directly reflect the company-wide focus on improving the consistency of evaluations across CNL, as described in the 2025 CNL ACMR [5]. Evaluation results are reviewed by Human Performance and Training specialists and discussed through Curriculum Review Committee (CRC) meetings, with resulting improvements managed through established training change processes.

REDACTED

Employees have opportunities to provide feedback on all training courses completed using manual and online course critique forms. In 2025, WL continued to primarily utilize manual feedback forms and collected employee feedback manually and on-line on 169 courses. These course critiques represent a 56% increase over 2024 in employees providing direct feedback on training. Course critique forms are reviewed periodically to identify opportunities for improvement and changes are managed through the applicable training change processes.

The CRC serves as a method of evaluating training program health and the training program's overall effectiveness. There are two CRCs at WL that met quarterly to support SAT-based positions/roles within the SF and WMA. All other WL SAT-based positions/roles are included as part of their respective CNL Corporate Program's CRC meetings (e.g., the WL Group 1 Health Physicist is included as part of the Corporate RP Program's quarterly CRC meeting).

REDACTED

3 Operating Performance

3.1 Operating Program

Whiteshell Laboratories adheres to CNL's Conduct of Operations FSA. Refer to Section 3.1 and Section 11.2 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

Operating Program licensing basis document revision in 2025 specific to WL were provided to CNSC staff in submissions identified in the table below.

Table 11: Whiteshell Laboratories Operating Performance Licensing Basis Document Submissions in 2025

Document Title and Number	Reason for Change	Correspondence #
Facility Authorization for the Operation of the Shielded Facilities at Whiteshell Laboratories, WLSF-00583-FA-001	Routine update	WLD-CNNO-25-0055-L

3.1.1 Decommissioning Operations

Operational details on facilities identified in the *Designated Representatives of the Licensee, Site Licences, Certificates & Permits* [18] for WL are given in Appendix A through Appendix F.

3.1.1.1 Conduct of Operations

Conduct of Operations documents help ensure appropriate integration and adequate reflection of safe operation practices to meet the business requirements.

3.1.1.2 Modification to Facilities and Processes

All temporary and permanent modifications to facilities at WL are made following defined *Engineering Change Control* [19] processes.

In 2025, the following were completed by the *Engineering Change Control* process:

- Three Engineering Change Control requests (1 Category III and 2 non-nuclear).
- Eleven Reduced Risk Engineering Changes.
- Three Item Equivalency Evaluation Requests.

Relevant modifications to WL facilities are given in Appendix A through Appendix G (Facility Changes subsection of appendices).

3.2 Reporting Requirements

There are no WL-specific licensing basis documents under Reporting Requirements.

REDACTED

3.2.1 Reportable Events to the Canadian Nuclear Safety Commission

In 2025, there were 12 events that occurred at WL that were deemed reportable to the CNSC. They are listed in Table 12. All reportable events are posted on the external CNL website on a quarterly basis.

Table 12: Reportable Events to the Canadian Nuclear Safety Commission at Whiteshell Laboratories in 2025

Event No.	Title	SCA	Facility (if applicable)
HSSE-25-0089	WL B300 Fire System Impairment - January 9, 2025	Emergency Management and Fire Protection	
HSSE-25-0134	WL B300 Fire System Impairment - January 15, 2025	Emergency Management and Fire Protection	
HSSE-25-1169	WL B300 Hot Cells Fire System Impairment - 2025-04-08	Emergency Management and Fire Protection	
HSSE-25-1170	WL B425 (CCSF) Fire System Impairment - 2025-04-10	Emergency Management and Fire Protection	
HSSE-25-1250	2025-04-17 WMA/CCSF Fire System Impairment	Emergency Management and Fire Protection	
HSSE-25-0666	Regulatory Non-Compliance with REGDOC 2.12.1 High-Security Sites, Volume II	Security	
ERM-25-2527	WL - Rental Rock Truck Found Smoking	Emergency Management and Fire Protection	
ERM-25-3466	WL - B100 Roof Repair Causes Smoke from Underside of Roof Ventilation Cap	Emergency Management and Fire Protection	
HSSE-25-3687	WL - Fire System Impairment B300	Emergency Management and Fire Protection	
HSSE-25-4650	WL - Security - Unintentional Discharge at Firearms Range	Security	
HSSE-25-4622	WL Fire System Impairment - FW-HYD10	Emergency Management and Fire Protection	
ERM-25-4688	WL - Security - Missed Post Incident Alcohol and Drug Testing Following an Event	Security/ Human Performance	

REDACTED

The table below summarizes the annual count of reportable events over the last five years, as part of ongoing compliance monitoring.

Table 13: Number of Reportable Events over the Last 5 Years

2021	2022	2023	2024	2025
6	3	15	12	12

3.2.2 Reportable Events to Other Regulators

Reports to other regulatory agencies consisted of:

- Three Hazardous Occurrence Investigation Reports made to Employment and Social Development Canada (Refer to Section 8 Conventional Health and Safety for further details).
- One reportable event to Environment and Climate Change Canada (Refer to Section 9 for further details).

REDACTED

4 Safety Analysis

4.1 Safety Analysis Program

Whiteshell Laboratories adheres to CNL's Safety Analysis FSA. Refer to Section 4.1 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

4.1.1 Safety Analysis Reports

Safety Analysis Reports (SARs) are produced to demonstrate that CNL's facilities are appropriately designed to meet health, safety, security, environmental and regulatory requirements, and operated safely. These SARs form part of the basis for a set of operational limits and conditions that are documented within Facility Authorizations for each nuclear facility. At WL, three facilities have SARs and Facility Authorizations: SF, WMA, and CCSF.

A regulatory commitment date for the next revision of all of WL's SARs is 2026 December. A revised Safety Analysis Report for Waste Management Area was provided to CNSC staff (Table 14). In 2025, the CCSF SAR has been revised and will be submitted to CNSC in early 2026, and the revision to the SF SAR is underway.

A licensing basis assessment for the retrieval of wastes from the standpipes and Intermediate-Level Waste (ILW) bunkers [20] was submitted to CNSC [21] and was determined to be within the licensing basis for the WL site [22]. Additional safety analyses will be developed to support waste retrieval activities and associated handling/repackaging activities at the WL site.

Safety Analysis Program licensing basis document revisions in 2025 specific to WL were provided to CNSC staff in submissions identified in the table below.

Table 14: Whiteshell Laboratories Safety Analysis Program Licensing Basis Document Submissions in 2025

Document Title and Number	Reason for Change	Correspondence #
Safety Analysis Report for the Whiteshell Laboratories Waste Management Area, WLWMA-508640-SAR-001	Routine update	WLD-CNNO-25-0043-L

4.2 Nuclear Criticality Safety Program

Whiteshell Laboratories adheres to CNL's Nuclear Criticality Safety (NCS) FSA. Refer to Section 4.2 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

The effectiveness of the NCS program at WL has been enhanced through the improvements outlined in Section 4.2 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* [5].

REDACTED

4.2.1 Nuclear Criticality Safety Documents

Nuclear Criticality Safety Program licensing basis document revisions in 2025 specific to WL were provided to CNSC staff in submissions identified in the table below.

Table 15: Whiteshell Laboratories Nuclear Criticality Safety Program Licensing Basis Document Submissions in 2025

Document Title and Number	Reason for Change	Correspondence #
CSD-11 – WL – Concrete Canister Storage Facility (CCSF), CCSF-123400-CSD-001	Improved clarity, new simulations included	WLD-CNNO-25-0018-L
Whiteshell Laboratories Waste Management Area (CSD-27), WLWMA-123400-CSD-001	Revision to allow CSD-54 to be cancelled, new simulations included	WLD-CNNO-25-0042-L

REDACTED

5 Physical Design

5.1 Design Program

Whiteshell Laboratories adheres to CNL's Design Authority and Design Engineering FSA. The Design Authority and Design Engineering FSA maintain and control the design basis for all design activities performed at WL, helping to ensure that design is planned, executed, verified, and documented according to applicable codes, standards, regulatory, and customer requirements.

Refer to Section 5.1 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

There are no WL-specific licensing basis documents under the Design Program.

5.1.1 Items Important to Safety

In 2025, the Design Authority and Design Engineering FSA ensured that items important to safety listed in the safety related system list for all nuclear facilities at WL site met and maintained their design basis, and any changes made were controlled through the *Engineering Change Control* process [19].

5.2 Pressure Boundary Program

Whiteshell Laboratories adheres to CNL's Pressure Boundary FSA. Refer to Section 5.2 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

The *WL Pressure* B*oundary Quality Assurance Plan (QAP)* [23] was revised in 2025 June to address comments from CNSC staff review of the QAP. The WL Pressure Boundary QAP defines the pressure boundary requirements applicable to design, procurement, fabrication, installation, inspection, testing, repair, modification, and maintenance of pressure retaining systems and components at WL facilities and is consistent with CNL's Pressure Boundary Program requirements.

The Certificate of Authorization from Inspection and Technical Services Manitoba lists the scope of pressure boundary activities that can be completed by WL personnel. The current Certificate of Authorization was issued in 2024 November and remains valid until 2027 November.

Pressure Boundary Program licensing basis document revisions in 2025 specific to WL were provided to CNSC staff in submissions identified in the table below.

REDACTED

Table 16: Whiteshell Laboratories Pressure Boundary Program Licensing Basis Document Submissions in 2025

Document Title and Number	Reason for Change	Correspondence #
WL Pressure Boundary Quality Assurance Plan, WL-508140-QAP-001	Revised to incorporate CNSC staff review comments	WLD-CNNO-25-0040-L

REDACTED

6 Fitness for Service

6.1 Fitness for Service Program

Whiteshell Laboratories adheres to CNL's Fitness for Service FSA through its Maintenance, Equipment Reliability, and Work Management Programs. Refer to Section 6.1 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

The WL site provides monitoring and operation of building and facility processes and support systems. Housekeeping inspections are performed monthly to provide a formal walkthrough of facilities to help ensure compliance for specific areas relating to facility performance. Further inspections are conducted of waste storage structures by qualified personnel to maintain them in a fit for service state.

In 2022, the Aging Management Program conducted an assessment which showed that WL was partially implementing REGDOC-2.6.3, *Aging Management* [24]. In 2024 a finding from a CNSC inspection indicated further action was required at WL to address aging management requirements of Section 4.16 of CSA N292.0:19, *General principles for the management of radioactive waste and irradiated fuel* [25]. A corrective action plan was developed, and actions are underway, with all actions planned to be complete in 2027 August.

Details on various inspection and maintenance activities are provided in the following subsections.

Fitness for Service licensing basis document revisions in 2025 specific to WL were provided to CNSC staff in submissions identified in the table below.

Table 17: Whiteshell Laboratories Fitness for Service Program Licensing Basis Document Submissions in 2025

Document Title and Number	Reason for Change	Correspondence #
Periodic Inspection Plan for Whiteshell Laboratories WMA Concrete Bunkers, WLWMA-106100-MP-004252	Updated text to include inspector qualifications	WLD-CNNO-25-0035-L

REDACTED

6.1.1 Planned Maintenance, Testing & Inspections

As part of Fitness for Service, WL staff ensure that critical systems, structures and components related to the safe operation and decommissioning of WL are understood and that activities are put in place to assure their safe continued operation as they age. An integrated set of programs and activities helps ensure that performance requirements for all critical systems, structures and components are met on an ongoing basis. These processes include:

- Maintenance, in-service inspection, and functional testing, done through the Computerized Maintenance Monitoring System to allow the activities to be tracked and confirmed as complete;

- A new Computer Maintenance Management System was rolled out to staff in 2025.
- Weekly tracking of WL operational regulatory tasks to confirm required compliance and facility checks are completed, including the tasks set out in the Facility Authorization documents;
- Inspections required to meet the conditions of *Storage with Surveillance Plan for Whiteshell Laboratories Building 100 – Whiteshell Reactor 1* [26]; and
- Inspections of waste storage structures for fitness for service.

6.1.2 Equipment Fitness for Service/Equipment Performance

Preventive maintenance of safety-related systems in WL's nuclear facilities is carried out by qualified maintenance staff, in accordance with the Facility Maintenance Plan for each facility, and approved maintenance procedures. Preventive maintenance per the Facility Maintenance Plan is defined as the pre-planned routine testing, calibration, inspection, service, and overhaul of safety-related systems, structures, and components. Preventive maintenance is performed to prevent failures from occurring and to assure the continuing capability of the system, structure or component to perform its design function. The maintenance tasks and frequencies specified in the Facility Maintenance Plans are based on recommendations from qualified WL engineering and maintenance personnel, plus vendor's data where available. Situations where there is evidence of deteriorating conditions or suggestion of an increased probability of upcoming failure are addressed. Maintenance scheduling is conducted with assistance of a Computer Maintenance Management System, which outputs preventive maintenance tasks for scheduling by maintenance and work planning staff. The new Computer Maintenance Management System requires facility staff to verify completed work.

Previously deferred electrical maintenance at the WMA and Building 100 was completed in 2025. Replacement of aged power pole infrastructure from the main campus to the WMA was also completed in 2025.

Some long-standing maintenance items were completed, such as SF main active exhaust fan main damper replacement and associated repairs. Weekly meetings are held to maintain the focus of planned preventive maintenance for the upcoming month. Area outages for switchgear maintenance were carried out.

A total of 3,418 mandatory and regulatory preventative maintenance activities were completed in 2025.

6.1.3 Condition of Structures

Waste storage structures include the WMA concrete storage facilities (termed "bunkers") and CCSF concrete canisters.

As a requirement of the Environmental Assessment Follow-Up Program, a Periodic Inspection Plan (PIP) for WL concrete bunkers [27] was developed in 2007 and continues to be implemented to confirm the ongoing fitness for service of the bunkers at the WMA. The PIP

REDACTED

describes methods for conducting scheduled inspection surveys of these structures. The inspection is defined as examination, measurement, and testing work done to confirm the bunker systems are functioning as designed and the bunkers remain fit for service. The inspections are documented annually, with preventive maintenance and repairs occurring as needed. As the bunkers at the WMA are removed from service as part of the overall decommissioning of the WL site, they will be removed from the inspection process. The 2025 annual inspection of WL WMA concrete bunkers was conducted in accordance with the PIP [27]. The results showed the bunkers remained fit for service with ongoing maintenance. Low-Level Waste Bunker 6 and Building 923 were previously de-inventoried and were removed from waste storage usage. They are no longer inspected as part of the PIP, as indicated in the update [27]. Both are in the process of being converted to waste processing structures.

Additionally, pits were excavated adjacent to ILW Bunkers 1, 2, and 3 in 2025, the concrete was visually examined and sounded with a hammer and found to be stable. The pits were backfilled at the conclusion of this examination. The pits were part of the examination of the stability of the bunker structures in advance of planned groundwork to facilitate waste retrieval from these structures. No issue was found that would impact that work.

Inspection of standpipe interiors was done on 22 of the standpipes with a removable plug. In general, the interior of the standpipes appeared to be stable.

The concrete canisters are inspected quarterly for concrete spalls and any changes in the hairline cracks of the concrete. In 2025, quarterly inspections of fuelled canisters have shown no significant cracking or spallation of concrete, though existing cracks and pour pockets were regularly checked for changes. The two canisters coated in 2024 were assessed in 2025, and the coating found to be stable. The coating is deemed fit for service and will be scheduled as required based on upcoming fuel retrieval. The coating protects the canister concrete from water ingress from rain and snow melt, reducing potential freeze-thaw damage.

Environmental monitoring was conducted in the ditches at the perimeters of the WMA (see Section D.2) and the CCSF (see Section A.2), and show no evidence that any radioactivity has been released from the bunkers, standpipes, or concrete canisters.

REDACTED

6.1.4 Aging Management Program

The aging management plan was issued in early 2025, and the first phase of the plan was initiated, including:

- Confirmation that all entities are in the WL site Computerized Maintenance Management System for Class I facility Systems Important to Safety.
- Facility review of the Maintenance Categorization for Class I facilities, with uncategorized entries to be updated in the Computerized Maintenance Management System.

7 Radiation Protection

7.1 Radiation Protection Program

Whiteshell Laboratories adheres to CNL's Radiation Protection FSA. Refer to Section 7 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

Whiteshell Laboratories uses the CRL licensed Dosimetry Service Provider for external and internal dosimetry. Staff and contractors who work at the WL site are assigned Thermoluminescent Dosimeters (TLDs) to monitor for external radiation exposures.

There are no WL-specific licensing basis documents under the Radiation Protection Program.

7.1.1 ALARA Initiatives and Activities

There were no specific As Low as Reasonably Achievable (ALARA) or RP Program improvement initiatives performed at WL in 2025 although, in the latter part of the year, plans were laid to increase alignment with the corporate RP program.

7.1.2 Contamination Control

Regular radiological contamination surveys of workplaces, material transfers, and personnel are undertaken to confirm the absence of unknown contaminated material and minimise the spread of contamination. Workplace air monitors are employed to confirm the adequacy of controls and to warn of abnormal or unplanned airborne contamination conditions.

There were no contamination events in 2025 that resulted in a recordable whole-body, skin, or internal dose.

There were two workplace, skin, or clothing contaminations in 2025. One contaminated boot and some legacy contamination exposed when moving materials.

There were no airborne contamination exposure events or radioactive material spills in 2025.

The following table outlines contamination events that occurred at WL in 2025.

REDACTED

Table 18: Contamination Events

	Skin and Clothing Contamination				Workplace Contamination	
	Skin[a]	Personal Clothing[a]	Radiological Work Clothing[c]	Total	Surface[c,d]	Vehicle / Materials[b,c]
2021	0	0	0	0	1	11
2022	0	0	0	0	2	2
2023	0	0	0	0	0	1
2024	0	0	0	0	0	2
2025	0	1	0	0	1	0

a Total surface contamination found is greater than 1 Bq/cm^2 beta-gamma or 0.2 Bq/cm^2 alpha over a 100 cm^2 averaging area.

b Total surface contamination found is greater than 4 Bq/cm^2 beta-gamma or 0.4 Bq/cm^2 alpha over a 100 cm^2 averaging area.

c Removable surface contamination found is greater than 0.2 Bq/cm^2 beta-gamma or 0.01 Bq/cm^2 alpha over a 300 cm^2 averaging area for Contamination Zone 1 areas.

d Removable surface contamination found is greater than the maximum allowable levels for Contamination Zone 2 and higher designated areas.

7.1.3 Dose Control

Regular radiation surveys are performed by RP staff to confirm the radiological safety zones are correctly designated, areas with local elevated radiation doses rates are posted in accordance with the *Radiation Protection Regulations* [28], and sufficient access control provisions are in place. In 2025, there were no occurrences of dose rates exceeding permissible levels for the designated radiological safety zones and there were no occurrences of workplaces with accessible dose rates exceeding 25 µSv/h not posted or with inadequate access control.

Electronic personal alarming dosimeters (PADs) are worn by workers in addition to TLDs to track and control daily and job specific doses. The PADs have dose and dose rate alarms which are established by job specific radiological work assessments. The dose alarms are a back-out condition, and the dose rate alarms are an alert condition. Table 19 summarizes maximum recorded daily doses and dose rates for PAD work in 2025 and the previous four years. In 2025, the maximum PAD recorded daily dose received by a worker was 0.12 mSv and the highest dose rate measured in the year was 1.04 mSv/h. There were no PAD dose alarm exceedances, and the PAD records demonstrate there were no unplanned whole-body radiation exposures exceeding the WL Action Level of 0.5 mSv in a day.

REDACTED

Table 19: Whiteshell Laboratories Personal Alarming Dosimeter Dose Summary

	2021	2022	2023	2024	2025
PAD[a] – Maximum Daily Dose (mSv)	0.22	0.08	0.06	0.10	0.12
PAD – Maximum Dose Rate (mSv/h)	3.10	4.80	1.51	1.36	1.04

a Personal Alarming Dosimeter

At the beginning of 2025, managers assigned and confirmed Dose Control Points (DCPs) for employees and contractors. The DCPs are used by managers and supervisors to perform individual whole-body dose management for workers for non-emergency work situations. Dose control points of either 1 mSv or 2 mSv are assigned by WL managers and represent the worker's maximum allowable dose for the calendar year. The DCPs may be adjusted as necessary during the year upon approval of a Health Physicist after confirmation that additional dose is justified. At the end of 2025, there were no individuals with an assigned DCP higher than 2 mSv, 63 workers with an assigned DCP of 2 (RP and nuclear operations staff), and the remainder of workers (496) with a DCP of 1 mSv. No worker's dose exceeded their assigned DCP in 2025.

7.1.4 Sealed Sources

Radiation sources are registered and tracked in accordance with CNL procedures.

In 2025, there were no lost or stolen radiation sources. Leak testing was completed as required, with all sources passing their leak tests.

On 2025 December 31, the total number of registered sealed sources, contained sources, and devices at WL was 57 – one device was added to the registry, and no sources were removed.

7.2 Dosimetry

7.2.1 Interpretation of Reported Dose Quantities

WL uses the CRL licensed dosimetry service provider for external and internal dosimetry for CNL staff, non-CNL employees, and visitors. External radiation whole-body and skin doses are individually monitored using TLDs for persons entering or working in either radiological Controlled or Supervised Areas at WL[3]. Extremity dosimeters are worn for a defined job by a person who is likely to receive an extremity dose exceeding 1 mSv and significantly greater than a surface dose as monitored by their TLD. Eye dosimeters are required if exposed to beta, X-ray or gamma dose rates greater than 10 mSv/h without taking shielding into account, or if the potential dose to the eye could exceed 1 mSv taking shielding from personal protective

[3] Exceptions are authorized on a case-by-case basis by the responsible RP Program Manager or RP Program Functional Support Manager. Eight exceptions were granted in 2025 for delivery and demolition haulers in supervised areas, as well as several site tours and the "take our kids to work" event. Control dosimeters were implemented for each case.

REDACTED

equipment and clothing into account. Neutron dosimeters are issued to individuals who may be exposed to neutrons resulting in dose in excess of 1 mSv in a year or where accidental neutron exposures are possible.

WL staff and contractors participate in a routine bioassay program when there is a reasonable probability of receiving a committed effective dose from occupational intakes exceeding 1 mSv per year.

7.2.2 Radiation Doses to Personnel

The dose data in all tables represent doses delivered at CNL-WL for all monitored persons, which includes employees (including those in temporary employment such as students), contractors (including sub-contractors), and visitors.

Doses are not broken down by individual facilities as monitored individuals routinely move between facilities without changing their TLDs making it impractical to accurately attribute dose to a single facility. The doses in this report reflect the person's current designation (employee, contractor, or visitor) at the time of reporting and do not represent their designation throughout the entire calendar year.

There were no operations of exposure devices in 2025 which required employees or contractors to be placed on a two-week dosimetry period, and there was no formal dose calculations required during 2025 for local area skin contamination. Additionally, no lens of the eye dosimetry was required in 2025.

Neutron dosimeters were assigned for source inspections in 2025 in addition to fuel retrieval work performed in the WMA. All neutron doses were below the detection threshold.

Doses are summarized in Table 20 through Table 23.

In 2025 April, a new dosimetry building (B543) was approved for occupancy. The WL Whole Body Counter (WBC) was re-commissioned in the new building and independent testing by Health Canada was performed. Counting of personnel has been re-instated and the WL WBC is currently being operated in a supplementary dosimetry capacity. Discussions are currently underway as to whether the WL WBC will be re-incorporated into the CNL Dosimetry licenced activities.

In 2025, 337 individuals underwent internal bioassay, which included urinalysis and supplementary (screening) whole-body counts. Nine individuals underwent confirmatory and follow-up plutonium (Pu)-in-urine bioassay monitoring[4] and there were no individuals requiring tritium-in-urine monitoring. No committed effective dose estimates were necessary as a result of any bioassay sampling in 2025.

REDACTED

[4] Results for the thermal ionization mass spectrometry (Pu-in-urine) samples for 2023 - 2025 sampling campaigns were not available at the time of report preparation due to technical issues. Any results of interest when received will be reported as required by licence reporting requirements.

The instances of Nuclear Energy Worker (NEW) visitors listed in the tables below were associated with personnel previously designated as NEWs but not associated with radiological work at WL in 2025. These included former AECL/CNL personnel, contractors, and CNSC staff visits. The instances of non-NEW employees are associated with remote workers who visit the WL site in addition to workers who wore visitor TLDs when attending their interviews (prior to NEW designation).

REDACTED

Table 20: Distribution of Effective Dose for Whiteshell Laboratories

Monitored Person Type		Dose Range (mSv)							Total # of Persons	Individual Dose (mSv)			Collective Dose (person·mSv)
		0	0.01-0.50	0.51-1.00	1.01-5.00	5.01-10.00	10.01-20.00	>20.00		Max	Avg All[a]	Ø Avg[b]	
		Number of Persons											
NEW	Employee	265	397	0	0	0	0	0	662	0.47	0.03	0.05	17.94
	Contractor	56	13	0	0	0	0	0	69	0.11	0.01	0.03	0.43
	Visitor[c]	5	0	0	0	0	0	0	5	0.00	0.00	-	0.00
Non-NEW	Employee[d]	50	4	0	0	0	0	0	54	0.05	0.00	0.03	0.11
	Contractor	179	3	0	0	0	0	0	182	0.16	0.00	0.10	0.31
	Visitor	492	0	0	0	0	0	0	492	0.00	0.00	-	0.00
Totals		1047	417	0	0	0	0	0	1464				18.79

a Average of all measured doses that include the zero dose value, rounded to two decimal places.

b Average of all measured doses that exclude the zero dose value, rounded to two decimal places.

c Visitor NEWs are persons who were historically employee and/or contractor NEWs, but have returned to the site as visitor while retaining their historical NEW status.

d Employees deemed not requiring NEW status (e.g., remote workers). Includes some instances of non-NEW workers from alternate sites visiting and being monitored at WL.

N/A = not applicable.

REDACTED

Table 21: Distribution of Equivalent Dose to the Skin for Whiteshell Laboratories

Monitored Person Type		Dose Range (mSv)							Total # of Persons	Individual Dose (mSv)			Collective Dose (person·mSv)
		0	0.01-0.50	0.51-1.00	1.01-5.00	5.01-10.00	10.01-20.00	>20.00		Max	Avg All[a]	Ø Avg[b]	
		Number of Persons											
NEW	Employee	265	391	3	3	0	0	0	662	1.84	0.04	0.06	23.95
	Contractor	56	13	0	0	0	0	0	69	0.11	0.01	0.03	0.43
	Visitor[c]	5	0	0	0	0	0	0	5	0.00	0.00	-	0.00
Non-NEW	Employee[d]	50	4	0	0	0	0	0	54	0.05	0.00	0.03	0.11
	Contractor	179	3	0	0	0	0	0	182	0.16	0.00	0.10	0.31
	Visitor	492	0	0	0	0	0	0	492	0.00	0.00	-	0.00
Totals		1047	411	3	3	0	0	0	1464				24.80

a Average of all measured doses that include the zero dose value, rounded to two decimal places.
b Average of all measured doses that exclude the zero dose value, rounded to two decimal places.
c Visitor NEWs are persons who were historically employee and/or contractor NEWs, but have returned to the site as visitor while retaining their historical NEW status.
d Employees deemed not requiring NEW status (e.g., remote workers). Includes some instances of non-NEW workers from alternate sites visiting and being monitored at WL.

N/A = not applicable.

REDACTED

Table 22: Distribution of Equivalent Dose to the Hands and Feet for Whiteshell Laboratories

Monitored Person Type		Dose Range (mSv)							Total # of Persons	Individual Dose (mSv)			Collective Dose (person·mSv)
		0	0.01-0.50	0.51-1.00	1.01-5.00	5.01-10.00	10.01-20.00	>20.00		Max	Avg All[a]	Ø Avg[b]	
		Number of Persons											
NEW	Employee	7	9	9	5	0	0	0	30	1.52	0.53	0.70	15.99
	Contractor	-	-	-	-	-	-	-	-	-	-	-	-
	Visitor	-	-	-	-	-	-	-	-	-	-	-	-
Non-NEW	Employee	-	-	-	-	-	-	-	-	-	-	-	-
	Contractor	-	-	-	-	-	-	-	-	-	-	-	-
	Visitor	-	-	-	-	-	-	-	-	-	-	-	-
Totals		7	9	9	5	0	0	0	30				15.99

a Average of all measured doses that include the zero dose value, rounded to two decimal places.
b Average of all measured doses that exclude the zero dose value, rounded to two decimal places.
N/A = not applicable.

REDACTED

Table 23: Summary of Dose Components Received as a Result of Licensed Activities for 2025[a]

Monitored Person Type		External Penetrating Dose (mSv)					External Surface Dose (mSv)					Extremity Dose (mSv)				
		Total # Persons	Max	Avg All[b]	Ø Avg[c]	Collective (p·mSv)	Total # Persons	Max	Avg All[b]	Ø Avg[c]	Collective (p·mSv)	Total # Persons	Max	Avg All[b]	Ø Avg[c]	Collective (p·mSv)
NEWs	Employee	662	0.47	0.03	0.05	17.94	662	1.84	0.04	0.06	23.95	30	1.52	0.53	0.70	15.99
	Contractor	69	0.11	0.01	0.03	0.43	69	0.11	0.01	0.03	0.43	-	-	-	-	-
	Visitor[d]	5	0.00	0.00	-	0.00	5	0.00	0.00	-	0.00	-	-	-	-	-
Non-NEWs	Employee	54	0.05	0.00	0.03	0.11	54	0.05	0.00	0.03	0.11	-	-	-	-	-
	Contractor	182	0.16	0.00	0.1	0.31	182	0.16	0.00	0.10	0.31	-	-	-	-	-
	Visitor	492	0.00	0..00	-	0.00	492	0.00	0.00	-	0.00	-	-	-	-	-
Total		1464				18.79	1464				24.8	30				15.99

Monitored Person Type		Tritium Committed Effective Dose (mSv)					Non-Tritium Committed Effective Dose (mSv)					Neutron Dose (mSv)				
		Total # Persons	Max	Avg All[b]	Ø Avg[c]	Collective (p·mSv)	Total # Persons	Max	Avg All[b]	Ø Avg[c]	Collective (p·mSv)	Total # Persons	Max	Avg All[b]	Ø Avg[c]	Collective (p·mSv)
NEWs	Employee	-	-	-	-	-	-	-	-	-	-	11	0	0	-	0
	Contractor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Visitor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Non-NEWs	Employee	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Contractor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Visitor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total		0				0	0				0	6				0

REDACTED

a All quantities are measured in mSv unless otherwise noted.
b Average of all measured doses that include the zero dose value, rounded to two decimal places.
c Average of all measured doses that exclude the zero dose value, rounded to two decimal places.
d Visitor NEWs are persons who were historically employee and/or contractor NEWs, but have returned to the site as visitor while retaining their historical NEW status.

Lens of the eye dosimetry was not required for any of the work performed at WL in 2025 as there was no work conducted that was assessed to have a potential exposure to the lens of the eye of greater than 1 mSv.

7.2.2.1 Discussion of Dose Data

The regulatory effective dose limit for a NEW in a calendar year is 50 mSv. The maximum individual effective dose to a NEW at WL in 2025 was 0.47 mSv, and the site collective dose was 18.79 p-mSv.

The regulatory effective dose limit for a NEW in a five-year period is 100 mSv. The maximum individual effective dose during the current five-year period (2021 January 01 – 2025 December 31) is 1.05 mSv, received by a Radiation Surveyor.

The regulatory skin dose limit for a NEW in a calendar year is 500 mSv. The maximum individual skin dose to a NEW at WL in 2025 was 1.84 mSv, and the site collective dose was 24.8 p-mSv.

The regulatory hands and feet dose limit for a NEW in a calendar year is 500 mSv. The maximum individual hands and feet dose to a NEW at WL in 2025 was 1.52 mSv, and the site collective dose was 15.99 p-mSv.

The regulatory effective dose limit for a pregnant NEW is 4 mSv for the remainder of their pregnancy. In 2025, the maximum individual effective dose for a pregnant NEW for the declared term was 0.11 mSv.

The regulatory effective dose limit for non-NEWs is 1 mSv in a calendar year. In 2025, the maximum individual effective dose to a non-NEW at WL was 0.16 mSv.

REDACTED

7.2.2.2 Radiation Dose Changes or Trends

Table 24 shows external whole-body dose received from 2021 to 2025, and Figure 1 shows the maximum individual effective dose and WL collective dose for the last five years.

Similar to recent years, the site collective dose in 2025 remained below 20 p-mSv. In 2025, the number of workers receiving occupational doses above 0.2 mSv in a calendar year was ten. There were no workers receiving an annual radiation dose above 1 mSv in 2025.

The main contribution to radiation dose in 2025 was from SF maintenance work and waste management operations.

Table 24: Whiteshell Laboratories External Whole-Body Dose Performance 2021 to 2025

Performance Metric	2021	2022	2023	2024	2025
Site Collective Worker Dose (p-mSv)	18.9	17.2	17.5	16.0	18.8
Max Individual Worker Dose (mSv)	0.57	0.31	0.21	0.26	0.47
Number of Workers > 0.2 mSv in a year	11	5	2	4	10
Number of Workers > 1 mSv in a year	0	0	0	0	0

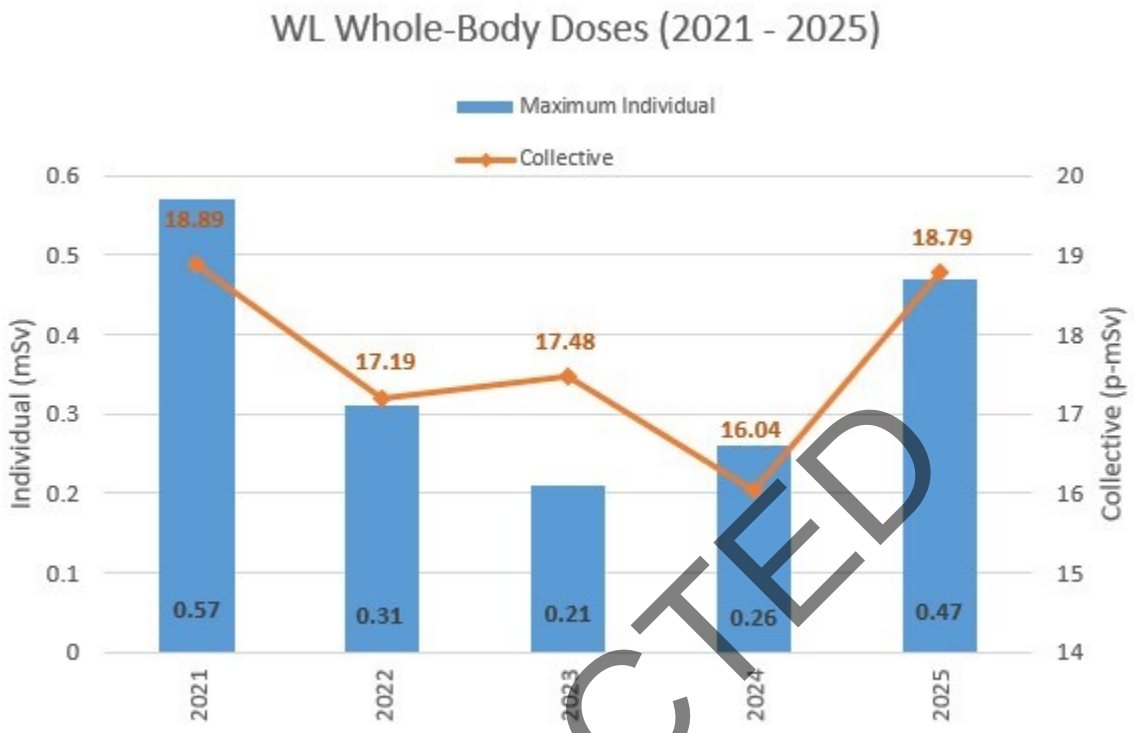


Figure 1: Maximum Individual Effective Dose and Whiteshell Laboratories Collective Dose from 2021 to 2025

7.2.3 Program Exceedances

During 2025, radiation dose to all persons working at WL were below the WL dose Action Levels [3] and the respective CNSC regulatory limits [28]. In addition, there were no individuals with doses exceeding their respective DCP as a result of activities at WL.

REDACTED

8 Conventional Health and Safety

8.1 Conventional Health and Safety Program

Whiteshell Laboratories adheres to CNL's OSH, Electrical Safety, and Health Centre FSAs. Refer to Section 8 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

The following initiatives began or were continued in 2025:

- Completed confined space assessments as required to support safe entry by workers. Working with facilities on any new space assessments as they become identified.
- Tracked employee exposure hours to asbestos and supported the Health Centre with scheduling medical baseline testing for workers who perform asbestos Type 1 and 2 abatement work. The baseline medical testing (includes chest X-rays, lung function testing) is continuing to allow scheduled abatement work to proceed.
- Contractor oversight continued by participating in activities such as site visits, pre-job briefs, pre-bid meetings, and OSH orientation for contractors.
- "Own Safety" recognition program (hazard and near miss reporting) continued with 63 submissions in 2025.
- Significant changes to the Hazardous Energy Control standard required retraining of all workers engaged in lockout activities as well as the adoption of new forms, and changes in lock colours and procedures.
- Daily site safety shares remained a priority, disseminated during daily Plan of the Next Day meetings and pre-job operational briefings, enhancing safety awareness across the site.
- "Own Safety" off-site all-staff event was held on 2025 October 30; two areas of focus were embracing change and taking personal responsibility for safety.
- Two hundred seventeen (217) observations were conducted by WL OSH staff in 2025; these observations covered a variety of topics and were entered into the DevonWay system.
- Focus on reduction of slips and falls on site including communication to all staff, provision of ice cleats for those who would like them, coordination with site services on site maintenance of parking lot, walkways, and roadways, as well as lighting improvements resulted in an approximately 50% reduction in reported slips and falls on site.

There are no WL-specific licensing basis documents under the Conventional Health and Safety Program.

8.1.1 Site Safety and Health Committee

The WL Site Safety and Health Committee is the principal forum at WL for joint employee/ management consultation and development of solutions to safety and health concerns at the

REDACTED

WL site. The WL Site Safety and Health Committee meets monthly, holding a minimum of nine meetings per year.

In 2025, the WL Site Safety and Health Committee held a total of 11 regular meetings.

The committee took 44 actions (35 of which were resolved, 9 remain open and in progress), and 74 health and safety hazards were identified – all of which were resolved.

The WL Site Safety and Health Committee is employee led and acts as an oversight body; therefore, the above actions are largely related to the WL Site Safety and Health Committee's need for more information that provides them with assurance of the effectiveness of the actions of the functional safety groups on site.

8.1.2 Inspections

There were 59 site safety and health inspections completed in 2025. ImpActs were raised to address any findings from the inspections, and remedial or corrective actions were taken as appropriate.

8.1.3 Hazardous Occurrence Investigation Reports and Lost Time Injuries

There were three hazardous occurrences at WL that were reported to Employment and Social Development Canada in 2025. CNSC staff received copies of these notifications, as per the requirements of the CNSC REGDOC-3.1.2 [4].

Table 25 presents a summary of injury rate data for the last five years.

Table 25: Summary of Whiteshell Laboratories Injury Rate Data

	2021	2022	2023	2024	2025
WL Employees					
Person Hours Worked	684,000	812,000	769,540	744,227	796,239
Lost-Time Injuries	0	0	4	4	3
Working Days Lost	0	0	25	6	7
Frequency[a]	0	0	1.04	1.07	0.75
Severity[b]	0	0	6.50	1.61	1.76
WL Contractors[c]					
Lost Time Injuries	0	0	1	0	0
Working Days Lost	0	0	4	0	0

a Frequency rate equals # of Lost-Time Injuries x 200 000 hrs of exposure divided by person hours worked (based on 100 Full Time workers).

b Severity rate equals # of Working Days Lost x 200 000 hrs of exposure divided by person hours worked (based on 100 Full Time workers).

c The Number of Person Hours worked are not divulged by contractors. As such, Frequency and Severity rates cannot be calculated.

REDACTED

There were three lost time injuries to CNL employees at WL reported to the Health Centre in 2025, and no lost time injuries to contractors who are provincially regulated. Details of the lost time injuries to CNL employees are provided in Table 26, below.

Table 26: Summary of Whiteshell Laboratories Lost Time Injuries in 2025

ImpAct ID	Date	Event Description
HSSE-25-0110	2025/01/18	Employee reported soreness in ankle after climbing stairs during radiation survey activities.
ERM-25-2120	2025/06/02	Employee reported glass in their left eye after deer struck the side of their vehicle and broke the drivers side window.
ERM-25-4581	2025/12/09	Employee received a contusion to their chest after being struck by the elbow of an industrial leaf blower.

REDACTED

9 Environmental Protection

9.1 Environmental Protection Program

Whiteshell Laboratories adheres to CNL's Environmental Protection FSA. Refer to Section 9 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

Whiteshell Laboratories has an integrated Environmental Protection Program designed to track radiological and non-radiological contaminants throughout the different compartments of the geosphere, atmosphere, and biosphere, and consists of three distinct programs: the Effluent Verification Monitoring Program, the Environmental Monitoring Program, and the Groundwater Monitoring Program. The WL Environmental Protection Program is designed to implement the requirements of the following:

- CSA N288.4-25, *Environmental Monitoring Programs at Nuclear Facilities* [29];
- CSA N288.5-22, *Effluent Monitoring Programs at Nuclear Facilities* [30];
- CSA N288.6-22, *Environmental Risk Assessments at Nuclear Facilities and Uranium Mines and Mills* [31];
- CSA N288.7-23, *Groundwater Protection and Monitoring Programs for Nuclear Facilities and Uranium Mines and Mills* [32];
- CSA N288.8-17, *Establishing and Implementing Action Levels for Releases to the Environment from Nuclear Facilities* [33]; and
- CSA/International Standards Organization (ISO)-14001 (2015), *Environmental Management Systems* [34].

The integrated Environmental Protection Program is dynamic in nature, meaning that it is continually evolving based on various sources of information received.

Program documentation is updated on an ongoing and/or required basis.

This report will focus and discuss the implementation of the *WL Effluent Verification Monitoring Plan* [35]. This plan defines the methodologies and protocols followed in performing the effluent verification monitoring required in CSA N288.5-22 [30].

The WL site has maintained its CSA/ISO-14001 (2015) [34] registration in 2025, with initial registration in 2010.

Environmental Protection licensing basis document revisions in 2025 specific to WL were provided to CNSC staff in submissions identified in the table below.

REDACTED

Table 27: Whiteshell Laboratories Environmental Protection Licensing Basis Document Submissions in 2025

Document Title and Number	Reason for Change	Correspondence #
WL Effluent Verification Monitoring Plan, WL-509200-PLA-001	Updated to include a background monitoring location for liquid effluent on the Winnipeg River at the bridge on Highway #211	WLD-CNNO-25-0023-L

9.2 Quality Assurance

In order to help ensure that the data collected through the program is valid, the laboratories performing monitoring for the program have strong Quality Assurance / Quality Control programs as required by CSA N288.5-22 [30]. General quality assurance objectives for CNL's Environmental Protection Program are set out in quality assurance plans. Radiological analysis is conducted in accordance with laboratory-specific environmental monitoring quality assurance plans. The plans include detailed working procedures for field operations, laboratory operations, laboratory administration, equipment performance, and quality verification of analytical results. The plans were written to align to CSA/ISO / International Electrotechnical Commission (IEC) 17025 [36] for analytical laboratories.

Whiteshell Laboratories' Environmental Management group conducts frequent internal checks of its technical capabilities as it performs its measurements. These are called "quality verification tests" and are grouped as follows according to purpose:

- Reproducibility tests, such as measurement of sample replicates, establish the relative precision of the method(s). To be acceptable, replicate measurements must agree within limits established by long-term method performance.
- Accuracy tests, such as blanks or samples, each spiked with known amounts of the analyte(s), establish the presence or absence of any biases due to sample matrix, sample preparation, or instrument function. To meet acceptance criteria, the spike quantity must be recovered within limits established by long-term method performance.

Environmental Management performed 6,190 quality verification tests during 2025 on WL's radiochemical counting equipment. Of these tests, 98.6% fully complied with acceptance criteria. The results of these tests are shown in Table 28.

REDACTED

Table 28: Whiteshell Laboratories' Summary of Quality Verification Tests Performed

Method	No. of Tests	No. of Failures	% Pass
Total Alpha (instrumentation)	1,436	46	96.8
Total Beta (instrumentation)	1,436	18	98.7
Gamma (instrumentation)	3,069	12	99.6
Tritium	249	11	95.6
2025 Total	**6,190**	**87**	**98.6**

In 2025, the WL Effluent Verification Program continued performing regular field quality verification testing on the Process Outflow (Outfall), the Sewage Lagoon (Lagoon), and ditch effluent sampling (Table 29). The program uses travelling blanks to determine and account for any possible introduction of contamination into the sample being analyzed by the sampling methodology being employed by the program, and the program also collects duplicate samples to demonstrate sampling reproducibility.

Table 29: Whiteshell Laboratories' Summary of Field Quality Verification Tests Performed

Method	Travelling Blanks		Duplicates	
	No. of Travelling Blanks	Average Concentration of Blanks	No. of Duplicates	% Pass
Outfall				
Non-radiological Parameters				
pH	4	5.91	4	100
Conductivity	4	<LMDL	4	100
Total Organic Carbon	4	<LMDL	4	100
Phenols	4	<LMDL	4	75
TSS	4	<LMDL	4	25
Phosphorus	4	<LMDL	4	25
Oil and Grease	4	<LMDL	4	100
Mercury	4	<LMDL	4	100
Chromium	4	0.00025 mg/L	4	100
Copper	4	<LMDL	4	100
Magnesium	4	<LMDL	4	100
Iron	4	<LMDL	4	25
Lead	4	<LMDL	4	75
Nickel	4	<LMDL	4	75

REDACTED

Method	Travelling Blanks		Duplicates	
	No. of Travelling Blanks	Average Concentration of Blanks	No. of Duplicates	% Pass
Potassium	4	<LMDL	4	100
Sodium	4	<LMDL	4	100
Strontium	4	<LMDL	4	100
Uranium	4	<LMDL	4	100
Zinc	4	<LMDL	4	100
Bromodichloromethane	4	<LMDL	4	100
Chloroform	4	<LMDL	4	75
Manganese	4	<LMDL	4	0
Radiological Parameters				
Gross Alpha	N/A	N/A	2	100
Gross Beta	N/A	N/A	2	100
Cesium-137	N/A	N/A	2	50
Americium-241	N/A	N/A	2	100
Potassium-40	N/A	N/A	2	100
Lead-214	N/A	N/A	2	100
Beryllium-7	N/A	N/A	2	100
Strontium-90	N/A	N/A	2	100
Plutonium-238	N/A	N/A	2	100
Plutonium-239/240	N/A	N/A	2	100
Sewage Lagoon				
Un-ionized Ammonia	1	<LMDL	0	N/A
Total Residual Chlorine	1	<LMDL	0	N/A
pH	1	6.15	0	N/A
Phosphorus	1	0.004 mg/L	0	N/A
TSS	1	<LMDL	0	N/A
Chromium	1	<LMDL	0	N/A
Copper	1	<LMDL	0	N/A
Iron	1	<LMDL	0	N/A
Lead	1	<LMDL	0	N/A
Nickel	1	<LMDL	0	N/A
Zinc	1	<LMDL	0	N/A

REDACTED

Method	Travelling Blanks		Duplicates	
	No. of Travelling Blanks	Average Concentration of Blanks	No. of Duplicates	% Pass
Mercury	1	<LMDL	0	N/A
Phenolics	1	<LMDL	0	N/A
Oil & Grease	1	<LMDL	0	N/A
Ditches				
Non-radiological Parameters				
pH	1	5.33	1	100
Conductivity	1	<LMDL	1	100
Phenols	1	<LMDL	1	0
TSS	1	<LMDL	1	100
Phosphorus	1	<LMDL	1	100
Oil and Grease	1	<LMDL	1	100
Mercury	1	<LMDL	1	0
Chromium	1	<LMDL	1	100
Copper	1	<LMDL	1	100
Iron	1	<LMDL	1	100
Lead	1	<LMDL	1	100
Nickel	1	<LMDL	1	100
Zinc	1	<LMDL	1	100
Radiological Parameters				
Gross Alpha	1	<LMDL	1	100
Gross Beta	1	<LMDL	1	100
Tritium	1	<LMDL	1	100
Cesium-137	1	<LMDL	1	100
Americium-241	1	<LMDL	1	100
Cobalt-60	1	<LMDL	1	100
Radium-228	1	<LMDL	1	100
Europium-154	1	<LMDL	1	100
Lead-210	1	<LMDL	1	100
Thorium-228	1	<LMDL	1	100
Thorium-230	1	<LMDL	1	100
Thorium-234	1	<LMDL	1	100

REDACTED

Method	Travelling Blanks		Duplicates	
	No. of Travelling Blanks	Average Concentration of Blanks	No. of Duplicates	% Pass
Uranium-235	1	<LMDL	1	100
Radium-226	1	<LMDL	1	100
Actinium-228	1	<LMDL	1	100
Potassium-40	1	<LMDL	1	100
Site Intake				
Non-radiological Parameters				
pH	2	5.3	2	100
Conductivity	2	<LMDL	2	100
Total Organic Carbon	2	0.31 mg/L	2	100
Phenols	2	<LMDL	2	100
TSS	2	<LMDL	2	0
Phosphorus	2	<LMDL	2	100
Oil and Grease	2	<LMDL	2	50
Mercury	2	<LMDL	2	100
Chromium	2	<LMDL	2	100
Copper	2	<LMDL	2	50
Magnesium	2	<LMDL	2	100
Iron	2	<LMDL	2	50
Lead	2	<LMDL	2	50
Nickel	2	<LMDL	2	100
Potassium	2	<LMDL	2	100
Sodium	2	<LMDL	2	100
Strontium	2	<LMDL	2	100
Uranium	2	<LMDL	2	100
Zinc	2	<LMDL	2	100
Bromodichloromethane	2	<LMDL	2	100
Chloroform	2	0.0006 mg/L	2	100
Manganese	2	<LMDL	2	100
Radiological Parameters				
Gross Alpha	N/A	N/A	2	100
Gross Beta	N/A	N/A	2	100

REDACTED

Method	Travelling Blanks		Duplicates	
	No. of Travelling Blanks	Average Concentration of Blanks	No. of Duplicates	% Pass
Cesium-137	N/A	N/A	2	100
Americium-241	N/A	N/A	2	100
Potassium-40	N/A	N/A	2	100
Lead-214	N/A	N/A	2	100
Beryllium-7	N/A	N/A	2	100
Strontium-90	N/A	N/A	2	50
Plutonium-238	N/A	N/A	N/A	N/A
Plutonium-239/240	N/A	N/A	N/A	N/A

LMDL = laboratory method detection limit; N/A = not applicable; TSS = total suspended solids.

Out of the 197 duplicate quality verification tests, 170 of these tests meet the acceptance criteria (±20% of the actual result) of the program, to yield an 86% pass rate. Regarding the duplicate quality verification tests, note all of the failures are due to analyzing environmental samples with contaminants close to the detection limits. This results in a high occurrence of two things happening: a set of samples will straddle the detection limit with one sample just able to be detected and the other being a non-detect, and results are close to the smallest reportable increment (e.g., if the results of the duplicate set were 1 mg and 1.5 mg, and the smallest reportable increment was 0.5 mg, then despite being the next physically measurable number able to be measured, this duplicate set would fail).

In 2025, the WL Environmental Management group took part in four inter-laboratory comparison studies. Two of these studies, which focused on radiological analyses, were offered through the Environmental Research Associates. The other two studies, which focused on non-radiological analyses, were offered through the Proficiency Testing Canada's program. The results of the WL Environmental Monitoring laboratory performance are shown in Table 30 and Table 31. The "Not Acceptable" result for MRAD-43 was due to an error in value input. The actual result achieved by the instruments was accurate. MRAD-43 also did not have tritium analysis performed due to all tritium analysis on site being temporarily suspended. The current instrumentation used for tritium analysis experienced failure beyond repair and was placed out of service. All tritium samples continue to be collected and sent to contract laboratories for analysis. New analysis equipment is in the process of being procured and commissioned. Analysis on-site will resume later in 2026.

For all inter-laboratory tests pertaining to the Effluent Verification Monitoring Program, there was 1 failure out of a total of 35 tests, giving CNL a 97.1% passing rate.

REDACTED

Table 30: Environmental Research Association Inter-Laboratory Comparison Program for CNL Whiteshell Laboratories – 2025

MRAD Study	Matrix	Analyte	Units	MRAD Assigned Value	WL Reported Value	Acceptance Limits	Performance Evaluation
MRAD-42	Air Filter Radionuclides	Americium-241	(pCi/Filter)	67.7	67.16	48.3 - 90.3	Acceptable
MRAD-42	Air Filter Radionuclides	Cesium-134	(pCi/Filter)	232	172.41	151 - 284	Acceptable
MRAD-42	Air Filter Radionuclides	Cesium-137	(pCi/Filter)	451	441.58	370 - 592	Acceptable
MRAD-42	Air Filter Radionuclides	Cobalt-60	(pCi/Filter)	250	248.98	212 - 318	Acceptable
MRAD-42	Air Filter Radionuclides	Zinc-65	(pCi/Filter)	632	679.17	518 - 966	Acceptable
MRAD-42	Air Filter Gross Alpha/Beta	Gross Alpha	(pCi/Filter)	39.5	50.79	20.6 - 65.1	Acceptable
MRAD-42	Air Filter Gross Alpha/Beta	Gross Beta	(pCi/Filter)	55.2	58.28	33.5 - 83.4	Acceptable
MRAD-42	Water Radionuclides	Americium-241	pCi/L	39.5	34.07	27.1 - 50.5	Acceptable
MRAD-42	Water Radionuclides	Cesium-134	pCi/L	1600	1311.25	1210 - 1760	Acceptable
MRAD-42	Water Radionuclides	Cesium-137	pCi/L	1080	1032.73	925 - 1230	Acceptable
MRAD-42	Water Radionuclides	Cobalt-60	pCi/L	255	251.8	220 - 293	Acceptable
MRAD-42	Water Radionuclides	Zinc-65	pCi/L	231	229.73	206 - 292	Acceptable
MRAD-42	Water Gross Alpha/Beta	Gross Alpha	pCi/L	77.3	71.05	28.2 - 107	Acceptable
MRAD-42	Water Gross Alpha/Beta	Gross Beta	pCi/L	99.4	96.04	49.7 - 137	Acceptable
MRAD-42	Water Tritium	Tritium	pCi/L	9420	9240.94	7100 - 11500	Acceptable
MRAD-43	Air Filter Radionuclides	Americium-241	(pCi/Filter)	39.8	38.99	28.4 - 53.1	Acceptable
MRAD-43	Air Filter Radionuclides	Cesium-134	(pCi/Filter)	341	256.13	221 - 418	Acceptable
MRAD-43	Air Filter Radionuclides	Cesium-137	(pCi/Filter)	379	358.39	311 - 497	Acceptable
MRAD-43	Air Filter Radionuclides	Cobalt-60	(pCi/Filter)	322	293.28	274 - 409	Acceptable
MRAD-43	Air Filter Radionuclides	Zinc-65	(pCi/Filter)	193	196.86	158 - 295	Acceptable

REDACTED

MRAD Study	Matrix	Analyte	Units	MRAD Assigned Value	WL Reported Value	Acceptance Limits	Performance Evaluation
MRAD-43	Air Filter Gross Alpha/Beta	Gross Alpha	(pCi/Filter)	22	23.71	11.5 - 36.2	Acceptable
MRAD-43	Air Filter Gross Alpha/Beta	Gross Beta	(pCi/Filter)	40.5	34.9	24.6 - 61.2	Acceptable
MRAD-43	Water Radionuclides	Americium-241	pCi/L	68.6	78.12	47.1 - 87.7	Acceptable
MRAD-43	Water Radionuclides	Cesium-134	pCi/L	765	6626.46	578 - 842	Not Acceptable
MRAD-43	Water Radionuclides	Cesium-137	pCi/L	1670	1593.45	1430 - 1900	Acceptable
MRAD-43	Water Radionuclides	Cobalt-60	pCi/L	2080	1942.42	1790 - 2390	Acceptable
MRAD-43	Water Radionuclides	Zinc-65	pCi/L	463	479.44	412 - 584	Acceptable
MRAD-43	Water Gross Alpha/Beta	Gross Alpha	pCi/L	136	100.38	49.6 - 188	Acceptable
MRAD-43	Water Gross Alpha/Beta	Gross Beta	pCi/L	188	142.27	94.0 - 259	Acceptable

MRAD = multi-media radiochemistry; pCi = picocurie.

REDACTED

Table 31: Proficiency Testing Canada Accreditation
Inter-laboratory Comparison Program CNL Whiteshell Laboratories – 2025

Proficiency Testing Canada	Sample Id	Analyte	Units	Proficiency Testing Canada Assigned Value	WL Reported Value	Score	Performance Evaluation
2025 March	CO1A-1	Conductivity	(µS/cm)	479	487	95	Acceptable
	CO1A-2	Conductivity	(µS/cm)	461	469		
	CO1A-3	Conductivity	(µS/cm)	663	671		
	CO1A-4	Conductivity	(µS/cm)	764	778		
2025 March	CO4A-1	TSS	(mg/L)	52.3	50	92	Acceptable
	CO4A-2	TSS	(mg/L)	132	127		
	CO4A-3	TSS	(mg/L)	11.3	9		
	CO4A-4	TSS	(mg/L)	152	140		
2025 March	C15-1	pH	(pH units)	8.66	8.61	95	Acceptable
	C15-2	pH	(pH units)	5.9	5.91		
	C15-3	pH	(pH units)	6.38	6.37		
	C15-4	pH	(pH units)	3.17	3.11		

Proficiency Testing Canada	Sample Id	Analyte	Units	Proficiency Testing Canada Assigned Value	WL Reported Value	Score	Performance Evaluation
2025 October	CO1A-1	Conductivity	(µS/cm)	1200	1250	91	Acceptable
	CO1A-2	Conductivity	(µS/cm)	446	461		
	CO1A-3	Conductivity	(µS/cm)	823	843		
	CO1A-4	Conductivity	(µS/cm)	676	694		
2025 October	CO4A-1	TSS	(mg/L)	141	137	94	Acceptable
	CO4A-2	TSS	(mg/L)	170	160		
	CO4A-3	TSS	(mg/L)	92.7	92		
	CO4A-4	TSS	(mg/L)	13.8	12.5		
2025 October	C15-1	pH	(pH units)	3.92	3.81	90	Acceptable
	C15-2	pH	(pH units)	8.42	8.31		
	C15-3	pH	(pH units)	7.72	7.71		
	C15-4	pH	(pH units)	5.3	5.25		

TSS = total suspended solids.

REDACTED

9.3 Supplementary Studies

As a part of Canada's Greenhouse Gas (GHG) Reporting Program, in 2025, the WL site continued monitoring the lagoon effluents for methane released on an annual basis by measuring Biological Oxygen Demand (BOD). Samples were collected quarterly in 2025 to account for seasonal fluctuations. The results of this monitoring are incorporated into Section 9.5.2.3.

In 2025, the WL site added a new background monitoring location for liquid effluent comparison. A monthly sample collection of Winnipeg River water, at the bridge on Highway 211 was added, assessing the non-radiological parameters. This location was chosen as it is upstream of the WL site and will provide valuable information regarding changes in the water drawn into site, prior to any influence resulting from WL infrastructure or site activities.

9.4 Effluent Monitoring - Radiological

This section addresses the licence requirement regarding radiological monitoring of airborne and liquid effluents for the WL site. It also addresses the effluent monitoring requirements listed under the Environmental Assessment Follow-Up Program [37] for WL.

Results of environmental monitoring and progress on the Environmental Assessment Follow-Up Program work packages will be provided in their respective annual reports, *Environmental Monitoring in 2025 at Whiteshell Laboratories* [38] and *2025 Progress Report on the Environmental Assessment Follow-Up Program for Whiteshell Laboratories* [37].

9.4.1 Effluent Monitoring

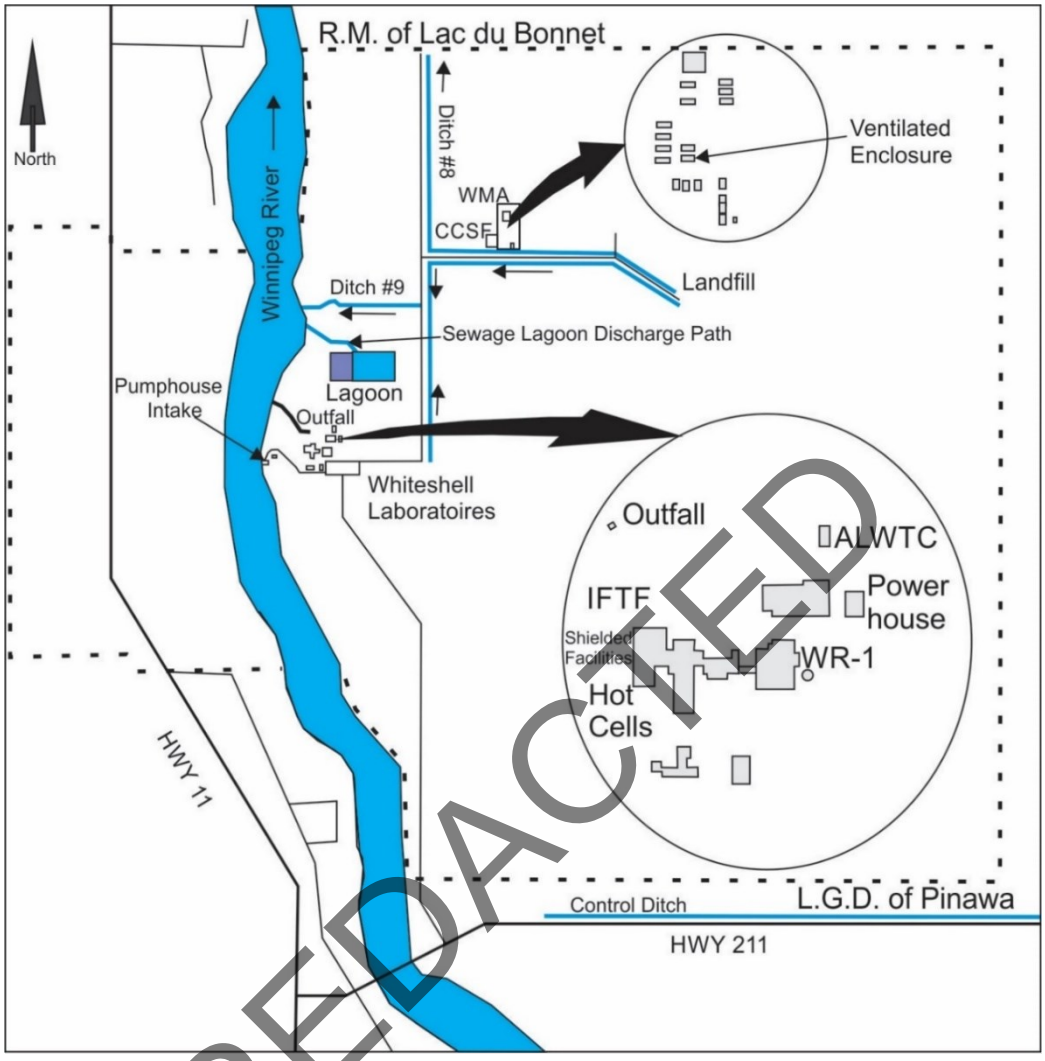
9.4.1.1 Site-Effluent Verification monitoring System and Results Evaluation

Monitoring locations for airborne and liquid effluent streams are representative of the final discharge to the off-site environment and may include the combined discharge from several facilities. Additional monitoring points are maintained at upstream locations as an aid in identifying the specific sources of emissions. Sampling system design helps ensure that samples are representative of the total content of the stream at each location.

Figure 2 includes a map of the effluent discharge paths/effluent streams at WL.

Effluent streams are monitored for all groups of radionuclides that are likely to be present and significant contributors to the total, expressed as a percentage of applicable derived release limits (DRLs) [39]. The DRLs in use at WL came into effect on 2021 January 31. All current and historical data in this report have been compared against these DRLs. Monitoring is conducted either by direct measurement on location or by sampling and laboratory analysis. In many cases, gross-measurement parameters (e.g., gross beta) are monitored and reported rather than specific radionuclides. This is done provided that either the relative composition of radionuclides indicated by the gross parameter is not likely to vary significantly, or total emissions of the gross parameter are very small relative to the DRLs. For comparison with DRLs, the gross parameters are always evaluated conservatively. They are either assumed to consist solely of the most restrictive radionuclide, based on the DRL value that is likely to be present in measurable quantities, or are assumed to be the radionuclide(s) known to be present in the effluent. To confirm proper selection of the DRL values, the effluents are periodically characterized using, for example, gamma spectrometry to identify individual gamma emitters, or chemical extraction and analysis of individual beta-emitting radionuclides, such as strontium (Sr)-90, complemented by examination of historical data.

REDACTED



REDACTED

Figure 2: Effluent Discharge Paths to the Winnipeg River

The significance of the measured radioactive materials in airborne and liquid effluents is assessed by comparison with DRLs that relate the releases to the potential radiation dose to the identified, most exposed groups (i.e., critical groups). Derived release limits are the upper limits for releases of radionuclides in airborne or liquid effluents from a facility or site. Whiteshell Laboratories' DRLs were calculated in accordance with the principles and methods in CSA N288.1-08 [40]. The DRL for a particular radionuclide is derived from the regulatory dose limit for members of the public, 1 mSv in a year, as specified in the *Radiation Protection Regulations* [28] under the *Nuclear Safety and Control Act* [15]. The intention of the DRL is to establish a release limit such that compliance with it will give reasonable assurance that the annual regulatory dose limit for members of the public is not exceeded. Weekly DRLs are calculated and applied for airborne effluents, and monthly DRLs for liquid effluents.

For multiple effluents and radionuclides at a site, verifying that the sum of all releases as a percentage of the respective DRLs is less than 100% provides a reasonable assurance[5] that the annual dose limits have not been exceeded. This is a conservative approach since the critical group may differ for different release paths and radionuclides. The actual releases are a very small fraction of the DRL as shown in Figure 3. The decrease in 2023 liquid effluents was due to a decrease in detection limit values for americium (Am)-241 and Pu-239/240. When the activities of radionuclide contaminants are not detected, it is standard practice to report detection limit values as if they were observed concentrations. For example, plutonium isotope activities and Am-241 activities were always below detection limits, so their reported values are detection limits.

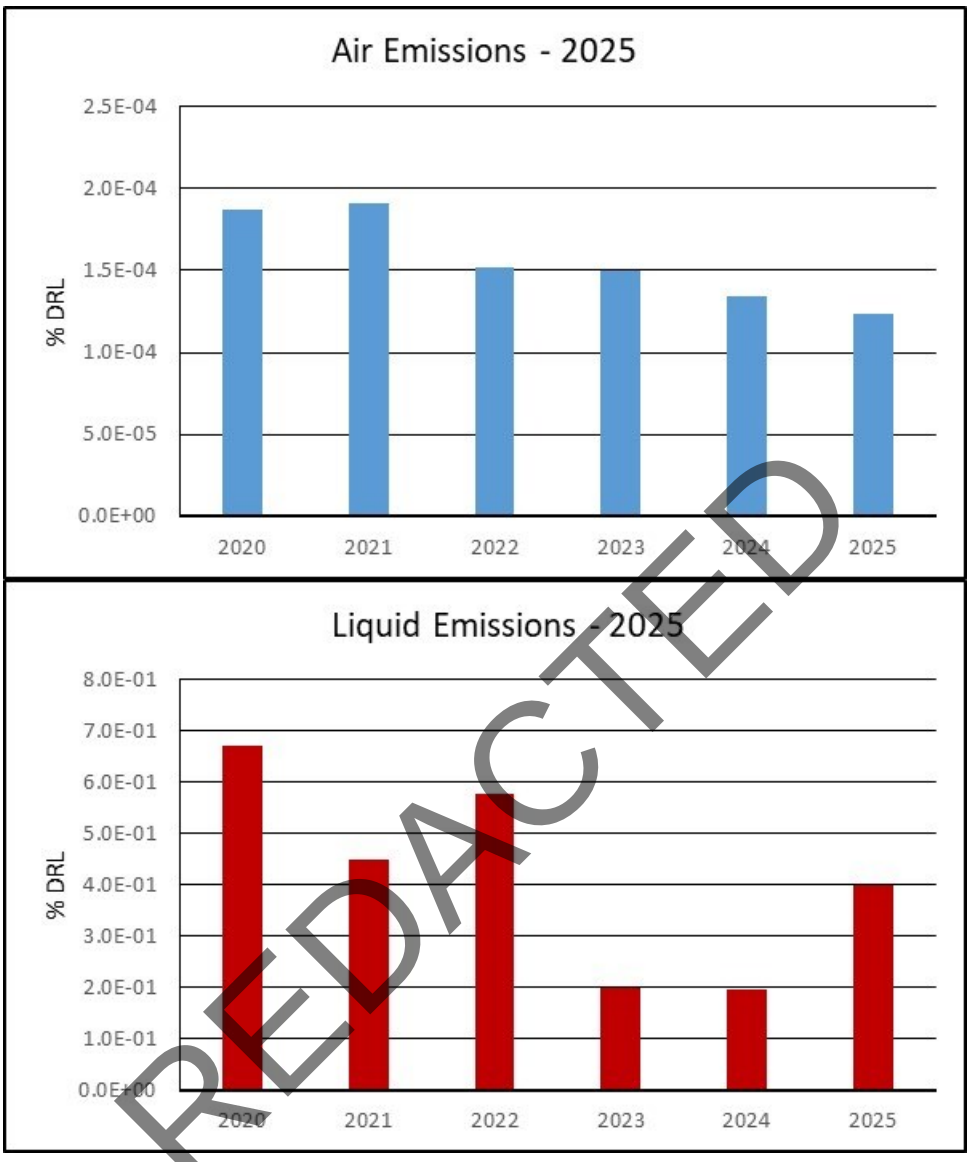
Analytical models of all significant environmental pathways to an individual in the critical group are used in the DRL calculations. Derived release limits for WL have been calculated for a large number of radionuclides, many of which are currently not detected in site effluents. Derived release limit calculations (of a wide range of radionuclides) provide a means of determining which radionuclides may be significant dose contributors. Thus, they aid in determining which nuclides warrant inclusion in the monitoring program, and in interpreting monitoring results.

Performance is also measured against the regulatory Administrative and Action Levels[6] as specified in *Standard Administrative Levels and Action Levels for WL Air and Liquid Radioactive Effluents* [41]. The Action Levels were calculated based on current CNSC guidance to meet CSA N288.8 [33] and to better reflect current effluent streams and were released for use based on an effective date of 2022 December.

REDACTED

[5] The effluent DRL model and assumptions are further verified annually through results from the WL environmental monitoring program. The program assesses radiation doses to members of the public using direct measurements of radioactivity in the environment (e.g., in air, water, and food).

[6] Action Level – In the context of CNL's Environmental Protection Program, an "Action Level" for radioactive emissions is a release rate of radioactive emissions that, if reached, may represent a loss of control of performance for a facility's environmental protection program or emission control system. Releases above Action Levels must be investigated and reported to CNSC staff. Action Levels for WL radioactive effluents are lower than the DRLs.



REDACTED

Figure 3: Trends for Airborne and Liquid Emissions from Whiteshell Laboratories for 2020 to 2025

9.4.2 Airborne Effluent Monitoring

9.4.2.1 Monitoring Points, Schedules and Parameters

The main sources of airborne radioactive effluents, as a result of decommissioning, operational, and historical activities at WL, are the following:

- HCF (Building 300)
- IFTF (Building 300)
- Reactor Building (Building 100)

Air effluents from Buildings 100 and 300 were sampled continuously throughout the year. The frequency and type of monitoring will continue to be evaluated over time and adjusted to reflect findings from the monitoring activities. The current monitoring schedule and locations are noted in Table 32. A monitoring activity will cease once it can be shown that an effect has stabilized or has been reduced to a level where it is no longer considered significant by regulatory requirements or community concerns.

Table 32: Radiological Air Effluent Monitoring Schedule – 2025

Sample Location	Sample Collection		Analytical Method and/or Parameter			
	Frequency [a]	Method	Gross Beta	Gross Alpha	Tritium	Gamma Spec
Building 100 Stack	Cont	GFA Filter	W	W	N/A	W
	Cont	Charcoal Filter (Cartridge)	N/A	N/A	N/A	W
	Cont	Bubbler	N/A	N/A	W	N/A
Building 300 HCF	Cont	GFA Filter	W	N/A	N/A	W
	Cont	Charcoal Filter (Cartridge)	N/A	N/A	N/A	W
	Cont	Millipore Filter	N/A	W	N/A	N/A
Building 300 IFTF	Cont	GFA Filter	W	N/A	N/A	W
	Cont	Charcoal Filter (Cartridge)	N/A	N/A	N/A	W
	Cont	Millipore Filter	N/A	W	N/A	N/A

a The air effluent is measured by passing a continuous (Cont) sample of the exhaust through a filter. The GFA filter is normally used for beta-gamma; the Millipore for alpha, charcoal or silver zeolite for radioiodine; and a water Bubbler for tritium.

N/A = not applicable; W = weekly.

REDACTED

The air to be monitored from the buildings and facilities is drawn past sample probes located in the exhaust vents, pumped through filters and then returned to the exhausts. The WL maintenance planning team performs the measurements for the stack flows and the RP team measures the sampler flow. The sampler flows at WL are checked during each sample collection period to help ensure that they are within the established acceptance criteria and are re-measured and verified on an annual basis. The release factors are calculated by the WL Environmental Management staff and verified independently on an annual basis. Activities measured in the laboratory are used in conjunction with sampler and exhaust stack flow rates to calculate the release in becquerels (Bq). The lower limit of detection (LLD) is the product of the release factor of the source and the laboratory minimum detectable activity. For a given radionuclide, the minimum detectable activity and LLD can vary, as they are calculated assuming a 30-minute count time and average detector efficiency, both of which can change.

Derived release limits have been calculated for 74 radionuclides for airborne effluents at WL [39]. Separate DRLs have been calculated for on-site workers and for members of the public at the site boundary. For gross alpha and gross beta activities, the DRL applied is the most

restrictive from amongst those of the radionuclides that could be present (Sr-90 for gross beta and Pu-239 and Pu-240 for gross alpha).

Sampling procedures, field operating procedures, laboratory procedures, equipment performance checks, quality verification procedures, and laboratory administrative procedures are described in detail in the governing WL Environmental Management documentation.

9.4.2.2 Monitoring Results

The airborne emission results are summarized in Table 33 and Figure 3 for the years 2020 to 2025. Average weekly emissions, in becquerels, are shown for gross alpha, and in gross beta for facilities in Buildings 100, 200, and 300. Emissions from Building 100 also include tritium. In addition, the current year releases, the average release for the previous five years, and the maximum weekly emissions as a percent of the DRL are given. Emissions from these identified release points are added for each year to provide an indicator of the performance of the site. The reader should be aware that the values for 2025 in Table 33 represent averages that include values below the detection limit.

Airborne emissions remain a small fraction of the release limit. The result for 2025 (0.00012% of the DRL) is less than 2024 and the average for the previous five years. Total site gross alpha in 2025 is less than 2024 and the previous five years average. It remains near detection limit values. The gross beta emissions are less than 2024 and the last five-year average. In 2025, the air emissions from all facilities were below Administrative Levels[7] and regulatory Action Levels. In 2021, Building 200 was demolished and no longer contributes to air emissions. The average values of the previous five years show that Building 200 had contributed 16% of the total alpha air emissions and 8% of the total beta air emissions.

Tritium emissions from the WR-1 stack were similar to 2024 and lower than the five-year average. During the Phase 1 Decommissioning of WR-1, all bulk heavy water was removed from WR-1, and an exhaustive process of eliminating heavy water and tritium from the reactor piping and tanks occurred. It was concluded that over the lifetime of WR-1, tritiated heavy water was absorbed into the pipe, tank walls, and into concrete walls and floors. Therefore, the moderator system continues to be purged with air flow to remove additional tritium from the system and the tritium removal rates have been measured. The tritium emissions from the facility fluctuate with the humidity and temperature as the tritiated water is drawn out of the system. The maximum releases were all below the Administrative Level (5.66E+09 Bq/wk) for the facility and well below the Action Level (2.83E+10 Bq/wk) and DRL (1.65E+15 Bq/wk). As many gross alpha and gross beta measurements are at or below the LLD, the yearly variations within these extremely small numbers are of very little consequence.

Localized operational workplace air monitoring is conducted as part of the RP Program, and this was performed during activities associated with Building 100, the SF and CCSF. Environmental

[7] An Administrative Level is a CNL internal reporting level for radioactive emissions by way of an individual effluent stream. The Administrative Levels are established and maintained by CNL to provide timely warning of above normal radioactive emissions, with the intent of aiding in the application of the ALARA process.

REDACTED

airborne dust monitoring is performed close to the north, east, south and west boundaries of the WL campus when buildings are demolished. In 2025 there were no building demolitions. The results of any dust monitoring would have been described in the *2025 Progress Report on the Environmental Assessment Follow-Up Program for Whiteshell Laboratories* [37].

REDACTED

Table 33: Radionuclides in Air Effluents from Whiteshell Laboratories Facilities – 2020 to 2025

Location/ Parameter	DRL [a] (Bq/wk)	Action Level (Bq/wk)	2020 (Bq/wk)	2021 (Bq/wk)	2022 (Bq/wk)	2023 (Bq/wk)	2024 (Bq/wk)	Five-Year Average		2025		2025 Maximum	
								(Bq/wk)	(%DRL)	(Bq/wk)	(%DRL)	(Bq/wk)	(%DRL)
Reactor Building (B100)													
Gross Alpha [b]	1.73E+09	3.34E+04	3.07E+02	4.16E+02	2.79E+02	2.93E+02	2.83E+02	3.16E+02	1.83E-05	2.58E+02	1.49E-05	7.72E+02	4.46E-05
Gross Beta [b]	6.79E+09	1.51E+05	1.62E+03	2.34E+03	8.27E+02	6.55E+02	8.37E+02	1.26E+03	1.85E-05	3.41E+02	5.02E-06	8.65E+02	1.27E-05
Tritium	1.65E+15	2.83E+10	2.51E+08	5.19E+08	5.36E+08	4.04E+08	2.47E+08 [c]	3.92E+08	2.37E-05	2.44E+08	1.48E-05	3.13E+07	1.89E-06
ALWTC (B200)													
Gross Alpha	1.73E+09	N/A	3.80E+02	N/A	N/A	N/A	N/A	3.80E+02	2.20E-05	N/A	N/A	N/A	N/A
Gross Beta	6.79E+09	N/A	4.59E+02	N/A	N/A	N/A	N/A	4.59E+02	6.76E-06	N/A	N/A	N/A	N/A
HCF (B300)													
Gross Alpha	1.73E+09	1.70E+04	6.00E+02	6.19E+02	6.00E+02	6.00E+02	6.00E+02	6.04E+02	3.49E-05	6.00E+02	3.47E-05	6.00E+02	3.47E-05
Gross Beta	6.79E+09	7.79E+04	8.43E+02	1.07E+03	9.07E+02	1.42E+03	8.31E+02	1.02E+03	1.50E-05	7.32E+02	1.08E-05	2.93E+03	4.32E-05
IFTF (B300)													
Gross Alpha	1.73E+09	1.61E+04	6.37E+02	5.78E+02	5.78E+02	5.78E+02	5.93E+02	5.93E+02	3.43E-05	5.78E+02	3.34E-05	5.78E+02	3.34E-05
Gross Beta	6.79E+09	2.37E+05	1.18E+03	1.08E+03	6.35E+02	6.58E+02	6.15E+02	8.33E+02	1.23E-05	6.77E+02	9.97E-06	1.62E+03	2.39E-05
Total Tritium (as %DRL)			1.52E-05	3.15E-05	3.25E-05	2.45E-05	7.93E+07	3.58E+08	2.17E-05	1.29E+07	7.75E-07	3.13E+07	1.89E-06
Total Alpha (as %DRL)			1.11E-04	9.32E-05	8.42E-05	8.51E-05	1.48E+03	1.89E+03	1.09E-04	1.44E+03	8.30E-05	1.95E+03	1.13E-04
Total Beta (as %DRL)3			6.04E-05	6.61E-05	3.49E-05	4.03E-05	3.36E-05	3.56E+03	5.25E-05	1.75E+03	2.58E-05	5.42E+03	7.98E-05
Total (%DRL)			**1.87E-04**	**1.91E-04**	**1.52E-04**	**1.50E-04**	**1.34E-04 [c]**	**1.86E-04**		**1.24E-04**		**2.28E-04**	

a The DRLs shown are for members of the public at the WL boundary as described in reference [39].

b Gross alpha releases are conservatively assumed to consist of Pu-239 and Pu-240, and Gross beta releases are assumed to be Sr-90, the radionuclides with the most restrictive DRLs and likely to be present in the effluent.

c The 2024 tritium release and total %DRL for 2024 have been modified from what was published for 2024 to fix an error.

N/A not applicable.

REDACTED

9.4.3 Liquid Effluent Monitoring

9.4.3.1 Monitoring Points, Schedules and Parameters

Figure 2 shows the locations of the sources of liquid effluents to the Winnipeg River, including the Outfall, the Lagoon and the numbered ditches.

The primary source of liquid radioactive effluents is the Outfall, which discharges continuously to the Winnipeg River. The discharge from the Outfall is composed of storm water runoff from paved roadways and around buildings through the weeping tile system, cooling water used in process and experimental facilities, and discharges from the Low-Level Liquid Waste Treatment System (LLLWTS) tanks based in Building 100 and Building 300. Holding tanks collect water containing low levels of radioactivity as a result of cleanup activities associated with operational and decommissioning work, as well as historical activities at WL. The current monitoring schedule and locations are listed in Table 34.

Table 34: Radiological Liquid Effluent Monitoring Schedule – 2025

Sample Location	Sample Collection		Analytical Methods and Parameters								
Location Name	Frequency	Method	Beta Screen	Gross Beta	Gross Alpha	Tritium	Gamma Spec (liquid)	Gamma Spec (ash)	Sr-90 (ash)	U-238 Pu-239/240 Pu-238	C-14
WL Site											
Outfall	Continuous	Auto-Sampler	Wc	Mc	Mc	Mc	Wc	Mc	Mc	Qc	Mc
Lagoon	Continuous during Discharge	Auto-Sampler	N/A	Disch	Disch	N/A	N/A	Disch	Disch	Disch	N/A
Ditch North of WMA (Ditch 8)	We	Grab	N/A	We	We	We	N/A	A/R	A/R	N/A	N/A
Ditch West of WMA (Ditch 9)	We	Grab	N/A	We	We	We	N/A	A/R	A/R	N/A	N/A
Building 100 and Building 300											
B300 LAW-TK 1/2/3/4	Discharge	Grab	N/A	Disch	Disch	N/A	Disch	N/A	Disch	N/A	N/A
B100 LAW-TK1/2	Discharge	Grab	N/A	Disch	Disch	N/A	Disch	N/A	Disch	N/A	N/A

Disch Per discharge, up to twice a year for the Lagoon.
Wc Weekly composite, composite of samples collected during the week.
Mc Monthly composite, composite of samples collected during the month.
We Weekly, when ditches have flowing water, usually after a rain or snowmelt.
Qc Quarterly composite, composite of samples collected during a three-month period.
A/R = as required; N/A = not applicable.

REDACTED

Specific activities that may have influenced the 2025 liquid releases are similar to those for the previous five years and include cleaning of footwear and respirators. The water from these cleaning activities is combined with Building 300 sump water into the Building 300 receiver tanks. Sump water from Building 100 is directed to the Building 100 receiver tanks. The liquids from these holding tanks are discharged to the Winnipeg River through the Outfall.

An automatic sampler continuously samples the outflow from the Outfall, proportional to its rate of flow. A weekly screening sample (4 L), representative of effluent released from the Outfall during the preceding week, is collected and submitted for uranium (total metals) and gross beta analysis and scanned by gamma spectrometry.

Monthly composite samples (at least 32 L) are gathered for analysis of total uranium (total metals) gross alpha, gross beta, tritium, radio strontium and other radionuclides (Am-241, cesium (Cs-137)) by gamma spectrometry. Starting in 2017, three-month composite samples were collected for Pu-239/240, and Pu-238 isotopic analyses. Monitoring for carbon (C-14) and tritium in Outfall samples was initiated in 2020 because they are known to exist in WR-1, and decommissioning activities have a potential for releasing these isotopes. The activities of tritium and C-14 at the Outfall continued to be below the lower limits of detection.

The secondary source of liquid effluent is the Sewage Lagoon (Lagoon). The Lagoon collects sanitary and wastewater from most buildings on the site, as well as from the laundry facility. The minimum residence time for the Lagoon is equal to the amount of time the secondary cell is isolated from the primary cell, to allow for biodegradation and settling. This is typically around 45 days. Prior to each planned discharge, the secondary cell is isolated and tested for a series of non-radiological parameters (discussed in detail in Section 9.5.1.4.5.1). If these are acceptable, the accumulated contents of the secondary cell only are released to the Winnipeg River via a small drainage ditch leaving the Lagoon’s north side. In 2025, the effluent from the Lagoon was discharged once in October.

Whenever there is a discharge from the Lagoon, the outflow is continuously sampled. The resulting composite sample is analyzed for gross alpha, gross beta, Pu-239/240, Pu-238 and radio strontium, and it is also scanned by gamma spectrometry.

Small quantities of radionuclides at levels seen in samples from Ditch Location 9 and Ditch Location 8 (see Figure 11 in Appendix A) are released to the Winnipeg River. Water passing through Ditch Location 9 flows westward directly into the river, while water flow past Ditch Location 8 flows northward off site and eventually into the river (Figure 2). Water from the recharge area east of the WMA is diverted around the WMA to the west, flowing past Ditch Location 9 and into the Winnipeg River. Drainage from the WMA tends to flow toward the river through the ditch on the north side of the WMA road and flow northward past Ditch Locations 7, 10, and 8 (in south to north order). This ditch drains the land north of the WMA up to the site boundary and beyond. Note that drainage from the WMA can also enter the south ditch and drain to the river past Ditch Location 9. The volume of water in the ditches and resulting flow to the river is entirely dependent on rainfall and spring runoff. Precipitation (392.6 mm) in 2025 was less than in 2024 (497 mm), and significantly less than in 2022

REDACTED

(687 mm), which was noted as a reference to the maximum precipitation in recent years. The precipitation in 2025 was low during January through May. It increased slightly during June through August and peaked during October. As a result of the low 2025 precipitation, ditches were only sampled once in April and once in October.

The ditches are sampled only when water is flowing freely within them, and at a maximum frequency of once per week. This occurs after snowmelt or significant rainfall. At the same time, samples were also collected from the northern ditch bordering Highway 211. This is far enough from WL's operation to be a reasonable background (control) sample[8]. The samples are analyzed for gross alpha, gross beta, gamma spec, metals, and tritium. If the level of the gross beta measurement exceeds 10 Bq/L, the samples are submitted for radio strontium analysis. Uranium activities are calculated from uranium concentrations obtained from total metals analysis. Surface water samples are collected in and around the WL WMA from locations upstream from Ditch Locations 8 and 9. The results of the analysis of these operational control samples are reported in Appendix D of this report.

Derived release limits for 63 radionuclides were calculated for liquid effluents at WL [39]. Gross alpha and gross beta measurements provide a quick measurement of the total alpha and beta radioactivity produced by a number of radionuclides without having to test for those radionuclides. However, as in the case of airborne effluents, the most restrictive DRLs apply to gross beta and gross alpha activity: Cs-137 for beta activity and Pu-239 and Pu-240 for alpha activity. With the introduction of total uranium (U) and isotopic plutonium analysis for the Outfall, a comparison can be made to the individual contributors to the gross alpha activity. Therefore, the comparison to the %DRL of the individual isotopes is presented and the sum of those reported. This is also the case for gross beta.

REDACTED

9.4.3.2 Monitoring Results

The liquid emission results are summarized in Table 35 and Figure 3 for the years 2020 to 2025. Average monthly emissions, in becquerels, are shown for gross alpha, gross beta, total uranium (including U-234, U-235, and U-238), Am-241, Sr-90, and Cs-137 for the releases from the Outfall and the Lagoon. The monitoring of tritium from the Outfall began in 2019. In addition, quarterly activities of Pu-239/240 and Pu-238 were reported for Outfall effluents. A plot of the monthly Cs-137 and Sr-90 releases as Bq from the Outfall in 2025 is compared with radioactivity (Bq) discharged to the Outfall from the LLLWTSs in Figure 4. Discharges to the Outfall from the low-level liquid waste (LLLW) treatment tanks occurred in all months. The total releases of Sr-90 and Cs-137 from the tanks in 2025 were 6.96E+05 Bq and 1.16E+06 Bq, respectively. These releases were slightly lower than in 2024. The discharge from the tanks represents only a fraction of the total Sr-90 (4.70E+08Bq) and Cs-137 (3.39E+06Bq) releases from the Outfall. In 2025, there was no correlation between the pattern of releases from the tanks and the pattern of releases from the Outfall. In 2025, there were a total of 29 tank discharges, compared to

[8] The control ditch sample is collected from a location not influenced by CNL's operation and therefore serves as an indicator of the natural background conditions in the area.

25 discharges in 2024, and 44 discharges in 2022. The additional Sr-90 and Cs-137 activities noted at the Outfall that were above the amounts discharged from tanks may be from pre-existing contamination in the storm drain system from historical site contamination events and historical radioactivity disposition in the storm drain line from Building 200 LLLW discharges. Some of this contamination may have been from unplanned emissions from the Hot Cells in the 1970s, although more likely from the Building 200 drain line.

All monthly releases from the Outfall were well below the Administrative Levels of 1.18E+07 Bq/mo for gross alpha, 9.39E+07 Bq/mo for gross beta, and 7.29E+09 Bq/mo for tritium. Releases of gross alpha were less than the 2024 releases and the five-year average. Gross beta releases in 2025 were greater than the 2024 releases and the five-year average. Strontium-90 releases in 2025 were greater than in 2024 and the five-year average. Cesium-137 releases were less than the 2024 releases and the five-year average. Americium-241 releases were less than 2024 releases and the five-year average. The Am-241 activities were all below the detection limit values. The total uranium releases were less than in 2024 and the five-year average. The relatively constant emissions of gross alpha, gross beta, Sr-90 and Cs-137 from the Outfall over the years suggest a constant source, more like contaminated piping than the effects of recent decommissioning activities. Plutonium-239/240 and Pu-238 releases were very low, being based on detection level concentrations (%DRL less than 0.02). In 2025, Outfall water was also analyzed for the presence of C-14, which could be introduced by the discharge tanks from Building 100. Carbon-14 was below detection levels (varying from 1.4 to 1.5 Bq/L) in Outfall samples. Given that the DRL for C-14 is 7.67E+10 Bq/mo, a detection limit of 1.21 Bq/L would correspond to a %DRL value of 0.15.

As stated in Section 9.4.3.1, the Lagoon was discharged once in 2025. In 2025, the Lagoon contributed 1% to the total liquid discharges of radioactivity from the site during October. From 2016 until 2024, the Lagoon discharge contributed 0% to 23% of the total effluent discharge.

REDACTED

Table 35: Radionuclides in Liquid Effluents from Whiteshell Laboratories – 2020 to 2025

Location/ Parameter	DRL (Bq/mo)	Action Level (Bq/mo)	2020 (Bq/mo)	2021 (Bq/mo)	2022 (Bq/mo)	2023 (Bq/mo)	2024 (Bq/mo)	Five-Year Average		2025		2025 Maximum	
								(Bq/mo)	(%DRL)	(Bq/mo)	(%DRL)	(Bq/mo)	(%DRL)
Outfall													
Gross Alpha [a]	1.11E+09	1.18E+08	3.99E+06	2.33E+06	1.54E+06	1.77E+06	1.62E+06	2.25E+06	-	1.44E+06	-	2.15E+06	-
Uranium-total	1.25E+10	N/A	9.65E+05	9.28E+05	1.29E+06	8.59E+05	9.93E+05	1.01E+06	8.06E-03	6.59E+05	5.27E-03	9.53E+05	7.63E-03
Plutonium-239/240	1.11E+09	N/A	2.32E+06	1.86E+06	2.00E+06	7.66E+05	1.23E+05	1.41E+06	1.27E-01	1.35E+05	1.21E-02	1.56E+05	1.40E-02
Plutonium-238	1.16E+09	N/A	1.99E+06	1.86E+06	1.95E+06	6.48E+05	1.06E+05	1.31E+06	1.13E-01	1.41E+05	1.21E-02	2.00E+05	1.72E-02
Americium-241	1.04E+09	N/A	9.76E+05	9.70E+05	5.97E+05	5.29E+05	8.40E+05	7.82E+05	7.52E-02	3.42E+05	3.29E-02	7.31E+05	5.84E-02
Gross Beta [b]	N/A	4.7E+08	1.98E+07	1.26E+07	1.48E+07	6.93E+06	1.80E+07	1.44E+07	-	4.08E+07	-	6.48E+07	-
Strontium-90	1.30E+10	N/A	2.41E+06	1.99E+06	1.87E+06	1.75E+06	6.48E+06	2.90E+06	2.23E-02	4.08E+07	3.14E-01	7.70E+07	4.88E-01
Cesium-137	1.16E+10	N/A	1.03E+06	8.63E+05	6.84E+05	4.21E+05	7.18E+05	7.43E+05	6.40E-03	3.23E+05	2.79E-03	7.95E+05	4.27E-03
Tritium	6.80E+13	3.30E+10	4.09E+08	3.48E+08	4.97E+08	4.03E+08	5.61E+08	4.51E+08	6.63E-04	3.96E+08	5.82E-04	6.67E+08	9.50E-04
Lagoon													
Gross Alpha [a]	1.11E+09	6.21E+07	1.57E+06	N/A	7.01E+05	N/A	5.26E+05	9.31E+05	--	1.72E+05	-	1.72E+05	-
Uranium-total	1.25E+10	N/A	1.19E+05	N/A	4.77E+06	N/A	1.31E+05	1.67E+06	1.34E-02	6.96E+04	5.57E-04	6.96E+04	5.57E-04
Americium-241	1.04E+09	N/A	5.22E+05	N/A	7.47E+04	N/A	3.96E+04	2.12E+05	2.04E-02	1.35E+05	1.30E-02	1.35E+05	1.30E-02
Pu-238	1.16E+09	N/A	N/A	N/A	N/A	N/A	7.76E+04	7.76E+04	6.69E-03-	1.33E+04	1.14E-03	1.33E+04	1.14E-03
Pu-239/240	1.11E+09	N/A	9.67E+05	N/A	1.01E+06	N/A	1.04E+05	6.93E+05	6.25E-02	1.65E+04	1.49E-03	1.65E+04	1.49E-03
Gross Beta	N/A	1.94E+08	1.04E+07	N/A	4.10E+06	N/A	4.84E+06	6.46E+06	-	2.19E+06	-	2.19E+06	-
Strontium-90	1.30E+10	N/A	2.35E+06	N/A	6.68E+05	N/A	1.03E+06	1.35E+06	1.04E-02	6.38E+05	4.91E-03	6.38E+05	4.91E-03
Cesium-137	1.16E+10	N/A	5.22E+05	N/A	1.24E+04	N/A	1.79E+04	1.84E+05	1.59E-03	3.65E+04	3.14E-04	3.65E+04	3.14E-04
Tritium	6.80E+13									7.94E+07	1.17E-04	7.94E+07	1.17E-04
TOTAL as %DRL	**N/A**	**N/A**	**6.71E-01**	**4.52E-01**	**5.78E-01**	**2.00E-01**	**1.95E-01**	**N/A**	**4.17-01**		**4.01E-01**	**N/A**	**7.31E-01**

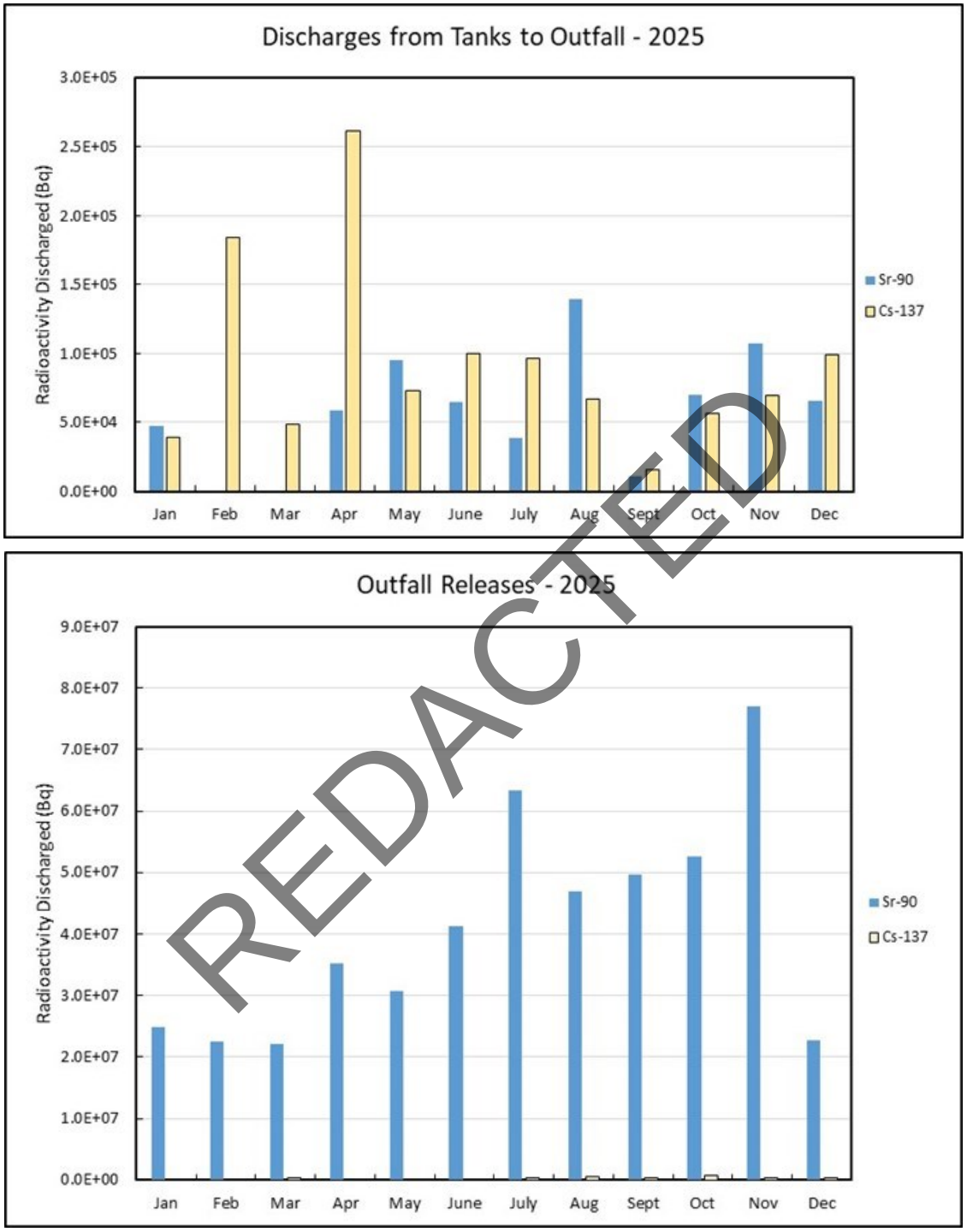
a In 2018 monitoring for Outfall began for U-total, Pu-239/240 and Pu-238. In the Lagoon Pu-239/238 was calculated from gross alpha mass balance. The %DRL is reported for these isotopes instead of gross alpha. Note that Pu isotope activities are detection level values and Am-241 and Cs-137 activities are very close to detection levels.

b Gross beta releases are not included in the %DRL totals as the regulated components of the gross beta (Cs-137 and Sr-90) are already accounted.

c The Lagoon was not discharged in 2021 and 2023 because these were dry years, and the Lagoon was not full enough to require discharging. Therefore there was no data.

N/A not applicable.

REDACTED



REDACTED

Figure 4: Radioactivity on Outfall Releases and Discharge from Active Liquid Waste Treatment Tanks for 2025

The averaged results for the two drainage ditches and control sample are shown in Table 36. The reported errors are the standard deviations of parameter values indicating their variability between different sampling events.

Table 36: Annual Mean Radioactivity Surface Water Drainage Ditches Near WL Waste Management Area – 2020 to 2025

Activity (Bq/L)									
Location	**Drinking Water Screening Level**	**LLD**	**2020**	**2021**	**2022**	**2023**	**2024**	**Five-Year Average**	**2025 [a]**
Ditch 8 – Ditch from WMA – North to WL Boundary									
Gross Beta	1	0.05	0.12	0.13	0.32	0.40	0.36	0.26	0.50 ± 0.22
Gross Alpha	0.50	0.07	0.10	0.05	0.23	0.32	0.28	0.20	0.31 ± 0.13
Tritium	7,000	3.0	4.3	4.6	4.9	3.6	14.3	6.3	14.7 ± 14.2
Ditch 9 – Ditch from WMA – West to Winnipeg River									
Gross Beta	1	0.05	0.11	0.24	0.35	0.45	0.34	0.30	1.01 ± 0.21
Gross Alpha	0.50	0.07	0.06	0.07	0.25	0.3	0.24	0.18	0.36 ± 0.02
Tritium	7,000	3.0	6.5	4.7	6.2	3.9	5.4	5	65 ± 69
Control Ditch – Off Highway 211									
Gross Beta	1	0.05	0.11	0.17	0.33	0.34	0.44	0.28	0.36 ± 0.09
Gross Alpha	0.50	0.07	0.07	0.05	0.27	0.3	0.30	0.20	0.31 ± 0.09
Tritium	7,000	4.0	4.7	4.4	4.1	3.0	3.0	3.8	3.9 ± 1.2

a Uncertainties are expressed as the standard deviation of the average activity of the processed samples.

REDACTED

During 2025, the gross beta activities in Ditch Locations 8 and 9 were higher than in 2024. The 2025 gross alpha activities were higher at Ditch Locations 8 and 9 compared to 2024. The average gross beta values were higher than the control sample collected from Highway 211. The gross alpha values were similar to the control ditch. The control sample is unaffected by WL's operations. Compliance with the *Guidelines for Canadian Drinking Water Quality* [42] may be inferred for gross beta activity since the measurements are all less than 1.0 Bq/L. The gross alpha activity was below the drinking water screening level of 0.5 Bq/L for all samples. The local well waters within the Canadian Shield contain naturally occurring uranium [43] at levels ranging from 0.04 Bq/L to in excess of 2.5 Bq/L. Vertical flow occurs in the surficial clay unit and in the intermediate clay till unit. The head gradient is upward, leading the water in these layers to discharge to the surface. Naturally occurring uranium and its progeny are contributors to the total alpha activity and could account for levels seen in some of the ditch water samples. In addition, naturally occurring alpha emitters may be present in suspended sediment in some of the samples.

As discussed in Appendix D of this report, the WMA contains a number of trenches with varying amounts of low-level radioactive and conventional waste. Tritium was identified as potentially capable of migrating to the ditches surrounding the WMA. In 2025 the amounts measured at Location 8 (14.7 ± 14.2 Bq/L) and Location 9 (65 ± 69 Bq/L) were higher than that noted at the control location (3.9 ± 1.2 Bq/L). A number of ditches close to WMA are known to contain tritium. In 2025, the concentrations of tritium reaching Ditch Locations 8 and 9 were elevated. The tritium increase is likely due to the WMA characterization efforts, well drilling and soil sampling at depth that generated water requiring to be relocated. Water relocations had totes of water containing tritium. Water with elevated tritium (but at environmentally safe levels), was discharged to the ditches. This water was responsible for the increase of detectable tritium. The tritium activities measured at all three ditch locations were much lower than the Guidelines for Canadian Drinking Water Maximum Acceptable Concentration for tritium (7,000 Bq/L) [42].

Table 35 summarizes the data for releases of liquid effluents[9] for the years 2020 to 2025. The average monthly releases, expressed as a percentage of the DRLs, are added for the various sources on site to provide a quantitative indicator of the performance of the site. The average total release for 2025 was 0.40% of the DRL, which is higher than 2024 and similar to the five-year average (0.42%). A number of factors influence the release of radioactivity from the Outfall, including the total volume of water discharged, the annual precipitation, the contributions from the active liquid waste treatment tanks, and the detection limits of americium and plutonium isotopes. Looking at the annual discharge data from 2020 to 2025, it is apparent that the release of radioactivity (as quantified by the %DRL) increases with the volume of Outfall discharge and the annual precipitation. The latter increases runoff and the flushing of the site storm drain system and releasing historical contamination. Finally, when laboratories report higher detection limits for americium and plutonium isotopes, the %DRL will increase because detection limit values are reported when these radioelements are not detected. The lower %DRL for 2025, compared to the five-year average, can be attributed to reduced release of radioactivity from active liquid waste tanks, a below-normal level of precipitation, and a decrease in the total volume of discharged effluent.

REDACTED

9.4.4 Unavailability of Effluent Verification Monitoring

The unavailability of effluent verification monitoring is determined for all online Environmental Protection Program monitors as follows:

- Absence of monitoring or monitoring results due to equipment failure, maintenance/ calibration outages, or operator action requires “unavailability” to be assigned.

[9] The radioactivity from Ditches 8 and 9 was found to be below the Canadian Drinking Water Screening Level [42] for both gross beta and gross alpha activity, within the uncertainty of the analysis. Tritium levels were well below the Canadian Drinking Water Maximum Acceptable Level. The contributions were considered insignificant due to the small volume of release, and are not included in the liquid release table.

- Routine sample media changes on the monitoring equipment are not considered to be part of unavailability of the equipment.
- Unavailability criteria (see Table 37) for monitoring equipment on effluent streams with effluent rates that are normally at least 0.5% of weekly DRLs are set to be more stringent (for unplanned unavailability) than for those streams with normal effluent rates less than 0.5% of weekly DRLs. Unavailability is expressed in hours of unmonitored effluent releases per year and applies separately to each monitored parameter on each effluent stream.

Table 37: Effluents Monitoring Equipment Unavailability – 2025

	Unavailability Criteria		Number of Exceedances
Air effluent streams with normal emission rate ≥0.5% of weekly DRL.	Planned	168 hours/year/stream	0
	Unplanned	84 hours/year/stream	0
Air effluent streams with normal emission rate <0.5% of weekly DRL.	Planned	168 hours/year/stream	0
	Unplanned	288 hours/year/stream	0
Continuously monitored liquid effluent streams.	Planned	168 hours/year/stream	0
	Unplanned	288 hours/year/stream	0

REDACTED

Unavailability criteria (Table 37) are set separately for planned and unplanned events.

Examples of planned unavailability include routine maintenance or inspections, and calibration activities, while unplanned unavailability includes events such as detection and repair of unexpected monitor or monitoring equipment failures.

In 2025, there were no instances in which the unavailability criteria (Table 37) outlined above were exceeded. There were 71 hours of unplanned unavailability of monitoring for liquid effluents from the Outfall, resulting from a power interruption. Since the monitoring loss was greater than 5 percent of the October monitoring period (actual was 9.5 percent), a lost monitoring calculation was performed. In November another power interruption led to 23 hours of unplanned unavailability for the Outfall. This was less than 5 percent of the monitoring interval and did not require a correction to the monitoring result.

For non-radiological monitoring becoming unavailable, refer to Section 9.5.1.3.

9.4.5 Overall Performance

Figure 3 summarizes the data presented in Table 33 and Table 35 on site-wide airborne and liquid emissions, expressed as totals of percentages of DRLs (the lower rows of the tables) for the years 2020 to 2025. The average emissions for the past six years continue to be very small. Liquid emissions of radioactive material from WL in 2025 were below WL's Administrative and Action Levels, and continue to be very small compared with the applicable DRLs [39]. All air emissions were below WL's Administrative and Action Levels.

Total radioactive airborne emissions from the WL site during 2025 continue to be very low, averaging 0.00010% of the DRL, which is less than 2024 and lower than the five-year average.

Radioactivity in the WL liquid releases for 2025 was 0.40% of the DRL, which is greater than in 2024 (0.20%). The increase in %DRL for 2025 over 2024 can be attributed to an increase in the release of Sr-90. The source of the Sr-90 was likely contaminated piping because there was no increase in the amount of Sr-90 discharged from active liquid waste tanks. Am-241, at detection limit values, was the primary contributor to the Outfall, averaging 0.07% of the DRL. The level of tritium activity noted in the two ditches carrying drainage from the WMA remains well below the Maximum Acceptable Concentration for Drinking Water.

The 2025 release results, as well as the previous years' trends, indicate that WL has taken reasonable precautions to control the release of radioactive nuclear substances within the site, and into the environment, as a result of the licensed activity. All airborne and liquid release results are consistent with the cleanup and operational activities associated with decommissioning of the site.

The results of the monitoring program demonstrate that controls for the release of potentially hazardous substances currently in place at WL continue to provide substantial protection of the environment.

REDACTED

9.5 Effluent Monitoring – Non-Radiological

This section addresses the licence requirement on hazardous substances monitoring of liquid and airborne effluents for the WL site for 2025. It also fulfills similar effluent monitoring requirements listed under Work Package 1 of the *Environmental Assessment Follow-Up Program* [37].

9.5.1 Liquid Effluent Monitoring

9.5.1.1 Monitoring Points, Schedules, and Parameters

Whiteshell Laboratories staff members collect samples for non-radiological parameters from nine different monitoring points. The first four are the Lagoon at point of discharge to the Lagoon drainage ditch, the Outfall, the north drainage ditch (referred to as Ditch 8), and the west drainage ditch (referred to as Ditch 9). These effluents flow directly to the Winnipeg River. Two monitoring locations measure internal process wastes leaving the LLLWTS from Building 300 and Building 100. The remaining three monitoring locations are used as background monitoring locations, and are the raw Winnipeg River water at provincial Highway 211 near the bridge, the Intake water taken from the Winnipeg River at the Pump House (Building 902), and a control ditch on provincial Highway 211. More details for each monitoring area are provided in the sections that follow.

Figure 2 (Section 9.4) shows the approximate release locations of the effluent streams to the Winnipeg River. Ditch 8 meets the river some distance downstream (north) of the site boundary.

Table 38 lists the non-radiological parameters monitored at the inlet and effluent streams sampled, and the sampling schedule that is followed. The WL monitoring program follows the protocols from the Ontario Ministry of Environment [44] in its Municipal/Industrial Strategy for Abatement program. Under that system, parameters that are normally measured by the same analytical technique are grouped into numbered Analytical Test Groups (ATGs). These are listed in Table 39, which includes information about the regulatory method detection limit (RMDL), laboratory method detection limit (LMDL) and the smallest reporting increment. The LMDL and smallest reporting increment were determined following protocol. The WL monitoring program also meets the requirements set out in the Federal Wastewater Systems Effluent Regulations [45] and the standards from CSA N288.5-22, *Effluent and Emissions Monitoring Programs at Nuclear Facilities* [30].

Table 38: Schedule for Non-radiological Monitoring at Whiteshell Laboratories

ATG	Parameter	Intake & Winnipeg River [a]	Lagoon	Outfall	Ditches 8, 9 & Control	LLLWTS Tanks	
						Building 300 LLLWTS	Building 100 LLLWTS
N/A	CBOD	N/A	Pre-discharge	N/A	N/A	N/A	N/A
N/A	Un-ionized Ammonia	N/A	Discharge	N/A	N/A	N/A	N/A
N/A	Total Residual Chlorine	N/A	Discharge	N/A	N/A	N/A	N/A
N/A	Acute Lethality Test	N/A	Pre-discharge	Quarterly	N/A	N/A	N/A
N/A	Fecal Coliforms	N/A	Pre-discharge	N/A	N/A	N/A	N/A
N/A	Total Coliforms	N/A	Pre-discharge	N/A	N/A	N/A	N/A
3	pH	Monthly	Discharge	Discharge	Discharge	Discharge	Discharge
5b	Total Organic Carbon	Monthly	N/A	Discharge	N/A	N/A	N/A
6	Phosphorus (Total)	Monthly	Discharge	Discharge	Discharge	Discharge	Discharge
7	Conductivity	Monthly	Discharge	Discharge	Discharge	Discharge	Discharge
8	TSS	Monthly	Discharge	Discharge	Discharge	Discharge	Discharge
9	Chromium	Monthly	Discharge	Discharge	Discharge	Discharge	Discharge
9	Copper	Monthly	Discharge	Discharge	Discharge	Discharge	Discharge
9a	Iron	Monthly	Discharge	Discharge	Discharge	Discharge	Discharge
9	Lead	Monthly	Discharge	Discharge	Discharge	Discharge	Discharge
9a	Magnesium	Monthly	N/A	Discharge	N/A	N/A	N/A
9	Manganese	Monthly	N/A	Discharge	N/A	N/A	N/A
9	Nickel	Monthly	Discharge	Discharge	Discharge	Discharge	Discharge
-	Potassium	Monthly	N/A	Discharge	N/A	N/A	N/A
9	Strontium	Monthly	N/A	Discharge	N/A	N/A	N/A

REDACTED

ATG	Parameter	Intake & Winnipeg River [a]	Lagoon	Outfall	Ditches 8, 9 & Control	LLLWTS Tanks	
						Building 300 LLLWTS	Building 100 LLLWTS
9a	Uranium	Monthly	N/A	Discharge	N/A	N/A	N/A
9	Zinc	Monthly	Discharge	Discharge	Discharge	Discharge	Discharge
12	Mercury	Monthly	Discharge	Discharge	Discharge	Discharge	Discharge
14	Phenolics	Monthly	Discharge	Discharge	Discharge	Discharge	Discharge
16	Bromodichloromethane	Monthly	N/A	Discharge	N/A	N/A	N/A
16	Chloroform	Monthly	N/A	Discharge	N/A	N/A	N/A
25	Oil & Grease	Monthly	Discharge	Discharge	Discharge	Discharge	Discharge

a Monthly refers to grab-sample taken once within each month.

CBOD = carbonaceous biochemical oxygen demand; TSS = total suspended solids; N/A = not applicable.

Intake water was sampled each month as grab-samples are drawn from the wet well of the Pump House (Building 902). Winnipeg River at Highway 211 water was sampled each month as grab-samples drawn from the shoreline near the bridge.

In 2025, there was one discharge of the Lagoon in October.

At the Outfall, daily monitoring and weekly samples were collected for non-radiological parameters.

The ditches were sampled only when water was flowing freely within them, and at a maximum frequency of once per week. This occurs after snowmelt or significant rainfall, of which there were two sampling events in 2025.

Whenever a tank was discharged at either of the LLLWTSs, the effluent was sampled. Tank discharges are discussed in Sections E.4 and F.4.

REDACTED

9.5.1.2 Analytical Protocol and Results Evaluation

With minor modification, the protocols for sample collection, and result reporting used here, were adopted from the Ontario Ministry of Environment publication *Protocol for the Sampling and Analysis of Industrial/Municipal Wastewate*r [44]. The protocols are used under Ontario's industry-specific effluent monitoring and limits regulations. The system supplies a justifiable set of methods to help ensure that the final reported result is representative of the effluent sampled. Guidance is given on sampling of wastewater streams, sample handling including pre-treatment, and acceptable analytical techniques. Some of these are common to more than one parameter, so they are grouped into ATGs, listed in Table 39. The Ontario Ministry of Environment protocols were used again for 2025, as they have been historically. It should be noted that the Manitoba government has no such comprehensive protocols for sample collection, preservation, analyses, and result reporting.

Table 39: Listing of Analytical Test Groups

ATG	Parameter Name	Method [a]	Unit [b]	RMDL	CNL LMDL [c]	CNL SRI	Contracted Lab's LMDL
N/A	CBOD	Dissolved Oxygen Electrode	mg/L	N/A	N/A	N/A	2.0
N/A	Un-ionized Ammonia	Colorimetry	mg/L	N/A	N/A	N/A	0.0005
N/A	Total Residual Chlorine	Colorimetry	mg/L	N/A	N/A	N/A	0.020
N/A	Total Coliforms	Most Probable Number	MPNU/100 mL	N/A	N/A	N/A	3
N/A	Fecal Coliforms	Most Probable Number	MPNU/100 mL	N/A	N/A	N/A	3
3	pH	Glass Electrode	pH	N/A	N/A	0.02	N/A
5b	Total Organic Carbon	High Temperature Combustion	mg/L	N/A	N/A	N/A	0.5
6	Phosphorus	Colorimetry	mg/L	0.10	N/A	N/A	0.003
7	Conductivity	Cond. Meter	µS/cm	5	0.8	0.2	2.0
8	TSS	Gravimetry	mg/L	5	N/A	N/A	1.0
9	Chromium	ICP	mg/L	0.02	N/A	N/A	0.001
9	Copper	ICP	mg/L	0.01	N/A	N/A	0.0005
9a	Iron	ICP	mg/L	0.02	N/A	N/A	0.010
9	Lead	ICP	mg/L	0.03	N/A	N/A	0.0002
9a	Magnesium	ICP	mg/L	N/A	N/A	N/A	0.05
9	Manganese	ICP	mg/L	N/A	N/A	N/A	0.001
9	Nickel	ICP	mg/L	0.02	N/A	N/A	0.001
N/A	Potassium	ICP	mg/L	N/A	N/A	N/A	0.05
9	Strontium	ICP	mg/L	N/A	N/A	N/A	0.001
9a	Uranium	ICP	mg/L	N/A	N/A	N/A -	0.0001
9	Zinc	ICP	mg/L	0.01	N/A	N/A	0.005
12	Mercury	Cold Vapour Atomic Absorption	µg/L	0.1	N/A	N/A	0.0019
14	Phenolics	Colorimetry	mg/L	0.002	N/A	N/A	0.0010
16	Bromodichloromethane	GC-MS	mg/L	N/A	N/A	N/A	0.0005
16	Chloroform	GC-MS	mg/L	N/A	N/A	N/A	0.0005
25	Oil & Grease	Gravimetry	mg/L	1	N/A	N/A	1.0

a The inductively coupled plasma spectrometry (ICP) method is a common method for metals analysis.

b The most probable number unit (MPNU), as reported by accredited contract laboratory, is a common estimate of bacterial counts, especially for sewage effluent.

c LMDL = laboratory method detection limit; "Method detection limit" (MDL) is also used.

REDACTED

CBOD = carbonaceous biochemical oxygen demand; GC-MS = gas chromatography–mass spectrometry; RMDL = regulation detection limit; SRI = smallest reporting increment; TSS = total suspended solids; N/A = not applicable.

9.5.1.3 Unavailability of Effluent Verification Monitoring

The unavailability of effluent verification monitoring is found for all online Environmental Protection Program monitors as follows:

- Absence of monitoring or monitoring results due to equipment failure, maintenance/ calibration outages, or operator action requires “unavailability” to be assigned.
- Routine sample media changes on the monitoring equipment are not considered to be part of unavailability of the equipment.
- Unavailability criteria (see Table 37) are set separately for planned and unplanned events.

Examples of planned unavailability include routine maintenance or inspections, and calibration activities, while unplanned unavailability includes events such as detection and repair of unexpected monitor or monitoring equipment failures.

In 2025, there were two instances of unplanned availability. In October there were 71 hours of unplanned unavailability of monitoring for liquid effluents from the Outfall, resulting from a power interruption. In November another power interruption led to 23 hours of unplanned unavailability for the Outfall.

For radiological monitoring becoming unavailable, please refer to Section 9.4.4.

9.5.1.4 Monitoring Results

In the following two sub-sections, two types of presentation formats are used in reporting the results obtained in 2025: an averages summary table; and a comparison against the CNL monthly guideline acceptance criteria for the effluent at identified monitoring locations.

9.5.1.4.1 Averages Summary Tables

The summarized results for 2025 are presented in Table 40 through Table 44. The first two columns in the tables identify the Ontario Ministry of Environment ATG and parameter names [44]. The next three give the CNL monthly guideline concentration, LMDL (Table 39), and units for each measurement. The next six columns provide comparison of the average concentrations reported for the five previous years, followed by their arithmetic mean. The next seven columns have a summary of the results for the 2025 monitoring period (explained further below).

Whiteshell Laboratories previously discontinued on-site analysis of most of the non-radiological parameters. The samples are now shipped to external ISO/IEC 17025 accredited laboratories through a sample management office. The LMDL for the laboratory analyzing the parameter is provided in Table 39.

REDACTED

Within the 2025 results section, the number of samples (“No. Spl.”) included in the average is reported. This number is not constant down the table as it depends on the sampling frequency chosen for each parameter, and sample mixing to prepare composites for analysis. The next column (labelled “NDs”) gives the number of samples in which the analyte was not detected and was therefore deemed a “zero” result.

The minimum, maximum and average values of each parameter are based on individual results and not monthly averages. These results are given in the tables found at the end of the section and include any results that were zero by virtue of being non-detectable in the laboratory. The relative standard deviation of all results is also reported, expressed as a percentage of the average. This number allows some evaluation of scatter inherent in the samples and measurement method. Usually, sample variability dominates (i.e., the effluent composition changes over time).

In Table 41 through Table 44, yearly average values for parameters marked with an asterisk show that a monthly guideline was exceeded for at least one month during the calendar year being presented.

The total annual load to the environment (Winnipeg River) represented by each of the analytes is expressed in kilograms. The calculation process is described in detail in Section 9.5.1.5 (where the results for the Lagoon and Outfall monitoring points have been collected in Table 46, and compared to the previous five years).

REDACTED

Table 40: Water Quality Averages Summary for Site Intake

					Monitoring Point: Site Intake												
					Averages from Previous Five Years [a]						Results for Year 2025						
ATG	Parameter	Monthly Guide [b]	LMDL	Unit	2020	2021	2022	2023	2024	Average	No. Spl. [c]	NDs [d]	Min.	Max.	Avg. [a]	RSTD (%)	Load (kg)
3	pH	6-9	N/A	pH	7.17	7.66	7.49	7.44	7.48	7.45	12	0	6.46	8	7.43	7.04	--
5b	Total Organic Carbon	N/A	0.5	mg/L	9.0	8.4	9.4	7.5	8.57	8.6	12	0	7.9	9.2	8.68	4.58	6105
6	Phosphorus	1.0	0.003	mg/L	0.014	0.014	0.023	0.015	0.027	0.019	12	0	0.015	0.053	0.027	47.4	18.0
7	Conductivity	N/A	2.0	µS/cm	98	101	105	103	101	102	12	0	97	110	103	5.15	--
8	TSS	25	1.0	mg/L	3.80	2.23	3.67	1.97	7.04	3.74	12	0	1	46	11.7	127	7978
9	Chromium	0.5	0.001	mg/L	0.0006	0.0005	0	0	0.0002	0.0003	12	11	0	0.0022	0.0002	346	0.116
9	Copper	0.5	0.0005	mg/L	0.007	0.007	0.005	0.044	0.024	0.017	12	0	0.0024	0.062	0.024	83.8	16.2
9a	Iron	1.0	0.01	mg/L	0.242	0.247	0.275	0.879	0.884	0.505	12	0	0.218	3.53	0.776	123	566
9	Lead	0.1	0.0002	mg/L	0.0001	0.0001	0.0001	0.0001	0.001	0.0002	12	1	0	0.071	0.009	230	5.53
9a	Magnesium	N/A	0.05	mg/L	3.62	3.70	3.78	3.90	3.85	3.77	12	0	3.3	4.55	3.95	30.3	2789
9	Manganese	N/A	0.001	mg/L	N/A	N/A	0.0153	0.064	0.050	0.043	12	8	0.016	0.107	0.0010	151	5316
9	Nickel	0.5	0.001	mg/L	0.0002	0.0025	0.0002	0.0005	0.0005	0.0008	12	8	0	0.0017	0.0005	151	0.302
9	Potassium	N/A	0.05	mg/L	0.823	0.810	0.908	0.882	0.935	0.872	12	0	0.829	1	0.892	5.39	630
9	Sodium	N/A	0.05	mg/L	2.23	2.40	2.518	2.43	2.55	2.42	12	0	2.21	3.1	2.59	10.6	1823
9	Strontium	N/A	0.001	mg/L	0.023	0.024	0.024	0.025	0.0248	0.024	12	0	0.023	0.027	0.024	5.27	17.3
9a	Uranium	N/A	0.0001	mg/L	0	0	0	0	0.00004	8.16E-06	12	9	0	0.0001	2.92E-05	182	0.0204
9	Zinc	0.5	0.005	mg/L	0.0022	0.0006	0.0004	0.0011	0.0008	0.0010	12	11	0	0.007	0.0006	346	0.352
12	Mercury	1.0	0.002	µg/L	0.0016	0	0.0011	0.0013	0.0010	0.0010	12	10	0	0.003	0.0004	234	0.00032
14	Phenolics	0.02	0.001	mg/L	0	0	0	0	0.0000	0.00002	12	11	0	0.002	0.0002	346	0.0998
16	Bromodichloromethane	N/A	0.0005	mg/L	0.0015	0.0017	0.0010	0.0003	0	0.0009	12	12	0	0	0	0	0

REDACTED

					Monitoring Point: Site Intake												
					Averages from Previous Five Years [a]						Results for Year 2025						
ATG	**Parameter**	**Monthly Guide [b]**	**LMDL**	**Unit**	**2020**	**2021**	**2022**	**2023**	**2024**	**Average**	**No. Spl. [c]**	**NDs [d]**	**Min.**	**Max.**	**Avg. [a]**	**RSTD (%)**	**Load (kg)**
16	Chloroform	N/A	0.0005	mg/L	0.068	0.053	0.058	0.016	0.004	0.040	12	0	0.0007	0.006	0.004	57.9	2.64
25	Oil & Grease	15	1.0	mg/L	0	0	0	0.08	0.675	0.151	12	7	0	1.9	0.592	128	383
N/A	Estimated Flow (total volume for year)			m^3	1.12E+06	3.14E+06	7.61E+06	7.61E+06	6.82E+05	4.03E+06	7.03E+05						

a Averages were calculated by setting to zero results reported as "< DL".

b Monthly guide is from WL's non-radioactive effluent limits standard [46]. For mercury, the daily guideline is given instead, as there is no monthly guideline specified.

c No. Spl. is the number of samples analyzed and reported.

d NDs is the number of samples in which analyte was not detected (i.e., Code = "< DL", result = 0).

N/A = not applicable; RSTD = relative standard deviation; TSS = total suspended solids.

REDACTED

Table 41: Effluent Averages Summary for Lagoon

					Monitoring Point: Lagoon												
					Averages from Previous Five Years						Results for Year 2025						
ATG	Parameter	Monthly Guide [a]	LMDL	Unit	2020	2021	2022	2023	2024	Average [i]	No. Spl. [b]	NDs [c]	Min.	Max.	Vol. Wt. Avg.	RSTD [d] (%)	Load (kg)
N/A	CBOD	25	2.0	mg/L	0	N/A	8.2 [h]	N/A	5.4 [h]	4.5	5	0	4.8	8.3	5.9 [h]	20.1	78.0
N/A	Un-ionized Ammonia	1.25	0.0010	mg/L	0.0010	N/A	0.0002	N/A	0.0012	0.0008	4	1	0	0.0008	0.0004	76	0.00001
N/A	Total Residual Chlorine	1.0	0.02	mg/L	0.057	N/A	0.034	N/A	0.03	0.040	4	0	0.04	0.16	0.0801	64	0.001
N/A	Total Coliform	N/A	3	MPNU [e]/100 mL	763	N/A	200 [g]	N/A	2420 [g*]	1128	3	0	2420	2420	2420 [g]	0	N/A
N/A	Fecal Coliform	200	3	MPNU [e]/100 mL	88	N/A	133 [g]	N/A	20.3 [g]	80.4	3	0	23	30	25.3	16.0	N/A
3	pH	6 to 9	N/A	pH	7.00	N/A	7.76	N/A	7.81	7.52	4	0	7.67	8.21	7.88	2.59	N/A
6	Phosphorus	1.0	0.003	mg/L	0.075	N/A	0.078	N/A	0.073	0.075	4	0	0.12	0.16	0.131	11.4	1.74
7	Conductivity	N/A	2.0	µS/cm	446	N/A	394	N/A	380	407	4	0	467	508	482	3.33	N/A
8	TSS	25	1.0	mg/L	3.9	N/A	5.2	N/A	6.8	5.32	4	0	7.1	17	10.6	26.7	141
9	Chromium	0.5	0.001	mg/L	0	N/A	0	N/A	0	0	4	3	0	0.0012	0.0005	110	0.006
9	Copper	0.5	0.0005	mg/L	0	N/A	0.0017	N/A	0.0008	0.0008	4	1	0	0.0010	0.0007	54.3	0.009
9a	Iron	1.0	0.01	mg/L	0.116	N/A	0.163	N/A	0.16	0.148	4	0	0.134	0.197	0.18	15.0	2.40
9	Lead	0.1	0.0002	mg/L	0	N/A	0	N/A	0	0	4	4	0	0	0	0	0
9	Nickel	0.5	0.001	mg/L	0	N/A	0.0009	N/A	0.0004	0.0004	4	2	0	0.0013	0.0004	135	0.006
9	Zinc	0.5	0.005	mg/L	0	N/A	0.0004	N/A	0	0.0001	4	4	0	0	0	0	0
12	Mercury	1.0	0.002	µg/L	0	N/A	0	N/A	0.0001	0	4	4	0	0	0	0	0
4	Phenolics	0.02	0.001	mg/L	0	N/A	0	N/A	0	0	4	4	0	0	0	0	0
25	Oil & Grease	15	1.0	mg/L	0	N/A	0.275	N/A	0	0.092	4	4	0	0	0	0	0
N/A	Estimated Flow (total volume for year) [f]			m^3	3.08E+04	N/A	4.15E+04	N/A	2.02E+04	3.08E+04	1.33E+04						

REDACTED

					Monitoring Point: Lagoon												
					Averages from Previous Five Years						Results for Year 2025						
ATG	**Parameter**	**Monthly Guide [a]**	**LMDL**	**Unit**	**2020**	**2021**	**2022**	**2023**	**2024**	**Average [i]**	**No. Spl. [b]**	**NDs [c]**	**Min.**	**Max.**	**Vol. Wt. Avg.**	**RSTD [d] (%)**	**Load (kg)**
N/A	Number of Batches Discharged			N/A	1	N/A	1	N/A	1	1	1						

Notes: Any averages with an asterisk (*) show that a monthly guideline was exceeded in one or more months for the given parameter in the year.
Acute lethality test results are discussed in Section 9.5.1.4.5.2.

a Monthly guide is from WL's non-radioactive effluent limits procedure. For mercury, the daily guideline is given instead, as there is no monthly guideline specified.
b No. Spl. is the number of samples analyzed and reported.
c NDs is the number of samples in which analyte was not detected (i.e., Code = "< DL", result = 0).
d Relative standard deviation (RSTD) was calculated using Vol Wt Average.
e Most probable number units (MPNU), as given by the most probable number bacterial estimation technique.
f The Lagoon discharges are considered to occur in one "month": fall. Note there were no discharges of the Lagoon in 2021 and 2023, and no spring releases in the years listed.
g Geometric mean was used instead of Vol Wt average for this parameter, due to exponential growth of microbes.
h Simple average, as this parameter is measured prior to the Lagoon being permitted to discharge.
i Averages are based only on years with discharges.

CBOD = carbonaceous biochemical oxygen demand; N/A = not applicable; TSS = total suspended solids.

REDACTED

Table 42: Effluent Averages Summary for Outfall

					Monitoring Point: Process Outfall [a]												
					Averages from Previous Five Years [b]						Results for Year 2025						
ATG	Parameter	Monthly Guide [b]	LMDL	Unit	2020	2021	2022	2023	2024	Average	No. Spl. [c]	NDs [d]	Min.	Max.	Avg.	RSTD (%)	Load (kg)
3	pH	6 to 9	N/A	pH	7.50	7.66	7.62	7.57	7.24	7.52	52	0	6.03	8.26	7.43	8.32	N/A
5b	Total Organic Carbon	N/A	0.5	mg/L	13.4	10.2	17.9	9.01	12.5	12.6	52	0	7.2	12	8.8	11.3	9336
6	Phosphorus	1.0	0.003	mg/L	0.021	0.022	0.041	0.022	0.026	0.026	52	0	0.01	0.07	0.02	50.6	20.7
7	Conductivity	N/A	2.0	µS/cm	134	149	142	131	141	139.35	52	0	100	230	136	16.7	N/A
8	TSS	25	1.0	mg/L	5.4	5.3	14.3*	1.34	1.59	5.59	52	25	0	13	1.6	149	1804
9	Chromium	0.5	0.001	mg/L	0.0005	0.0003	0.0006	0.0001	0	0.0003	52	51	0	0.0015	0.00003	721	0.0029
9	Copper	0.5	0.0005	mg/L	0.010	0.007	0.005	0.005	0.003	0.006	52	0	0.001	0.009	0.004	58.2	3.93
9a	Iron	1.0	0.01	mg/L	0.302	0.271	0.773*	0.168	0.225	0.348	52	0	0.064	0.402	0.139	52.8	150
9	Lead	0.1	0.0002	mg/L	0.0004	0.0003	0.0005	0.0005	0.0001	0.0004	52	45	0	0.0004	0.00004	267	0.045
9a	Magnesium	N/A	0.05	mg/L	5.46	5.18	5.96	5.37	5.71	5.54	52	0	3.62	6.54	5.09	12.6	5412
9	Manganese	N/A	0.001	mg/L	N/A	N/A	0.188	0.013	0.013	0.071	52	0	0.003	0.0222	0.008	55	68
9	Nickel	0.5	0.001	mg/L	0.0007	0.0017	0.0013	0.0002	0.0004	0.0009	52	48	0	0.0011	0.0001	350	0.086
N/A	Potassium	N/A	0.05	mg/L	1.111	1.10	1.276	1.044	1.13	1.131	52	0	0.883	2.06	1.12	24.3	1187
9	Sodium	N/A	0.05	mg/L	4.40	4.34	5.15	4.05	5.83	4.75	52	0	2.41	21.4	5.05	73	5334
9	Strontium	N/A	0.001	mg/L	0.033	0.034	0.034	0.033	0.034	0.034	52	0	0.025	0.040	0.031	9.9	33.1
9a	Uranium	N/A	0.0001	mg/L	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	52	0	0.0001	0.0006	0.0003	35.7	0.318
9	Zinc	0.5	0.005	mg/L	0.006	0.006	0.001	0.002	0.0009	0.003	52	51	0	0.0053	0.0001	721	0.11
12	Mercury	1.0	0.002	µg/L	0.0002	0.0003	0.0039	0.0004	0.0009	0.0011	52	51	0	0.0025	0.00005	721	0.0001
14	Phenolics	0.02	0.001	mg/L	0.0000	0	0.0001	0.0001	0.0001	0.00006	52	48	0	0.0029	0.0001	374	0.143

REDACTED

					Monitoring Point: Process Outfall [a]												
					Averages from Previous Five Years [b]						Results for Year 2025						
ATG	**Parameter**	**Monthly Guide [b]**	**LMDL**	**Unit**	**2020**	**2021**	**2022**	**2023**	**2024**	**Average**	**No. Spl. [c]**	**NDs [d]**	**Min.**	**Max.**	**Avg.**	**RSTD (%)**	**Load (kg)**
16	Bromodichloromethane	N/A	0.0005	mg/L	0.0005	0	0.00025	0.0001	0	0.0002	52	52	52	0	0	0	0
16	Chloroform	N/A	0.0005	mg/L	0.0259	0.0072	0.01655	0.0073	0.0036	0.0121	52	52	0	0.0015	0.0047	0.0025	24.8
25	Oil & Grease	15	1.0	mg/L	0	0.15	0.092	1.13	0.42	0.358	52	52	46	0	1.7	0.15	285
N/A	Estimated Flow (total volume for year)			m^3	1.21E+06	1.23E+06	1.45E+06	1.10E+06	1.16E+06	1.23E+06	1.06E+06						

Notes: Any averages with an asterisk (*) show that a monthly guideline was exceeded in one or more months for the given parameter in the year.

Acute lethality test results are discussed in Section 9.5.1.4.5.2.

a All results below the LMDL, originally flagged as "< DL" when reported, are only estimates.

b Monthly guide is from WL's non-radioactive effluent limits procedure. For mercury, the daily guideline is given instead, as there is no monthly guideline specified.

c No. Spl. is the number of samples analyzed and reported.

d NDs is the number of samples in which analyte was not detected (i.e., Code = "< DL," result = 0).

N/A = not applicable; RSTD = relative standard deviation; TSS = total suspended solids.

REDACTED

Table 43: Effluent Averages Summary for Ditches 8, 9 and Control

					Monitoring Point: Ditch 8 (Northbound) [a]											
					Averages from Previous Years [b]						Results for Year 2025					
ATG	Parameter	Monthly Guide [c]	LMDL	Unit	2020	2021	2022	2023	2024	Average	No. Spl. [d]	NDs [e]	Min.	Max.	Avg. [b]	RSTD (%)
3	pH	6-9	N/A	pH	7.64	7.81	7.59	7.62	7.79	7.69	2	0	7.41	8.19	7.80	7.07
6	Phosphorus	1.0	0.003	mg/L	0.135	0.041	0.078	0.140	0.034	0.086	2	0	0.035	0.140	0.088	84.9
7	Conductivity	N/A	2.0	µS/cm	451	454	427	340	535	441	2	0	230	1000	615	88.5
8	TSS	25	1.0	mg/L	3.4	1.26	2.87	1.68	1.09	2.06	2	0	2.30	2.80	2.55	13.9
9	Chromium	0.5	0.003	mg/L	0.0002	0	0	0	0	0.00004	2	2	0	0	0	0
9	Copper	0.5	0.0003	mg/L	0.0010	0.0014	0.0014	0.0017	0.0014	0.0014	2	0	0.0016	0.0018	0.0017	7.18
9a	Iron	1.0	0.033	mg/L	0.205	0.141	0.27	0.12	0.173	0.182	2	0	0.095	0.130	0.112	22.2
9	Lead	0.1	0.0005	mg/L	0	0	0	0	0	0	2	2	0	0	0	0
9	Nickel	0.5	0.0006	mg/L	0.003	0.003	0.004	0.002	0.003	0.003	2	0	0.002	0.004	0.003	42.8
9	Zinc	0.5	0.0033	mg/L	0.001	0.004	0.003	0.002	0.001	0.002	2	2	0	0	0	0
12	Mercury	1.0	0.0019	µg/L	0.0014	0.0037	0.0521	0.0052	0.003	0.013	2	0	0.0026	0.0049	0.0038	43.4
14	Phenolics	0.02	0.001	mg/L	0.0008	0.0002	0.0008	0.0006	0	0.0005	2	1	0	0.0019	0.001	141
25	Oil & Grease	15	1.0	mg/L	0.08	0	0.29	1.68	0.564	0.523	2	2	0	0	0	0

REDACTED

Continued from previous page

					Monitoring Point: Ditch 9 (Westbound) [a]											
					Averages from Previous Years [b]						Results for Year 2025					
ATG	Parameter	Monthly Guide [c]	LMDL	Unit	2020	2021	2022	2023	2024	Average	No. Spl. [d]	NDs [e]	Min.	Max.	Avg. [b]	RSTD (%)
3	pH	6-9	N/A	pH	7.32	7.57	7.22	7.50	7.48	7.42	2	0	7.51	8.06	7.79	4.88
6	Phosphorus	1.0	0.003	mg/L	0.039	0.097	0.0563	0.064	0.036	0.058	2	0	0.0091	0.068	0.039	108
7	Conductivity	N/A	2.0	µS/cm	224	300	200	404	300	286	2	0	410	1200	805	69.4
8	TSS	25	1.0	mg/L	3.3	2.3	4.6	2.58	0.782	2.71	2	0	2.8	3.00	2.90	5
9	Chromium	0.5	0.003	mg/L	0.0004	0	0	0	0	0.0001	2	2	0	0	0	0
9	Copper	0.5	0.0003	mg/L	0.0018	0.0019	0.0014	0.0022	0.0019	0.0018	2	0	0.0019	0.0021	0.0020	9.29
9a	Iron	1.0	0.033	mg/L	0.558	0.382	1.69	0.320	0.612	0.712	2	0	0.083	0.418	0.250	94.8
9	Lead	0.1	0.0005	mg/L	0	0	0.0001	0	0	0.00002	2	2	0	0	0	0
9	Nickel	0.5	0.0006	mg/L	0.004	0.003	0.003	0.002	0.003	0.0031	2	0	0.002	0.003	0.002	13.2
9	Zinc	0.5	0.0033	mg/L	0.006	0.015	0.007	0.004	0.007	0.0078	2	2	0	0	0	0
12	Mercury	1.0	0.0019	µg/L	0.005	0.0109	0.0544	0.006	0.005	0.016	2	0	0.0026	0.005	0.004	42.0
14	Phenolics	0.02	0.001	mg/L	0.0002	0.0002	0.0007	0.0004	0.0002	0.0003	2	1	0	0.0017	0.0009	141
25	Oil & Grease	15	1.0	mg/L	0.1	0.2	2.40	0.96	0.727	0.87	2	2	0	0	0	0

REDACTED

Continued from previous page

					Monitoring Point: Control Ditch (north side of Highway 211) [a]											
					Averages from Previous Years [b]						Results for Year 2025					
ATG	**Parameter**	**Monthly Guide [c]**	**LMDL**	**Unit**	**2020**	**2021**	**2022**	**2023**	**2024**	**Average**	**No. Spl. [d]**	**NDs [e]**	**Min.**	**Max.**	**Avg. [b]**	**RSTD (%)**
3	pH	6-9	N/A	pH	7.54	7.76	7.44	7.34	7.60	7.54	2	0	7.14	7.92	7.53	7.32
6	Phosphorus	1.0	0.003	mg/L	0.071	0.06	0.04	0.14	0.053	0.073	2	0	0.03	0.11	0.070	80.8
7	Conductivity	N/A	2.0	µS/cm	385	415	372	432	475	416	2	0	340	1500	920	89.2
8	TSS	25	1.0	mg/L	3.1	5.63	5.66	6.76	2.94	4.82	2	0	3.6	21	12.30	100
9	Chromium	0.5	0.003	mg/L	0.0001	0	0.0004	0	0	0.0001	2	2	0	0	0	0
9	Copper	0.5	0.0003	mg/L	0.0009	0.0013	0.0017	0.0019	0.0013	0.0014	2	0	0.0013	0.0021	0.0017	34.2
9a	Iron	1.0	0.033	mg/L	0.464	0.509	1.69	1.14	0.519	0.864	2	0	0.888	1.74	1.314	34.2
9	Lead	0.1	0.0005	mg/L	0.0000	0	0.0003	0	0	0.00006	2	1	0	0.0007	0.0003	141
9	Nickel	0.5	0.0006	mg/L	0.002	0.002	0.0034	0.0024	0.0025	0.0025	2	0	0.0032	0.0039	0.0035	13.0
9	Zinc	0.5	0.0033	mg/L	0.001	0.004	0.0056	0.0058	0.0012	0.0035	2	1	0	0.0057	0.0029	141
12	Mercury	1.0	0.0019	µg/L	0.0008	0.0031	0.0500	0.0060	0.0045	0.013	2	1	0	0.0041	0.0021	141
14	Phenolics	0.02	0.001	mg/L	0.0006	0.0004	0.0001	0.0102	0.0003	0.0023	2	1	0	0.002	0.0010	141
25	Oil & Grease	15	1.0	mg/L	0.01	0	0.34	0.36	0.509	0.244	2	0	0	0	0	0

a All results below the LMDL, originally flagged as "< DL" when reported, are only estimates.

b Averages were calculated by setting to zero results reported as "< W."

c Monthly guide is from CNL's limits for non-radiological parameters in liquid effluents procedure. For mercury, the daily guideline is given instead, as there is no monthly guideline specified.

d No. Spl. is the number of samples analyzed and reported.

e NDs is the number of samples in which analyte was not detected (i.e., Code = "< W," result = 0).

N/A = not applicable; RSTD = relative standard deviation; TSS = total suspended solids.

REDACTED

Table 44: Effluent Averages Summary for the Low-Level Liquid Waste Treatment Systems

					Monitoring Point: Building 100 & 300 LLLWTS [a]												
					Averages from Previous Five Years [b]						Results for Year 2025						
ATG	**Parameter**	**Monthly Guide [c]**	**LMDL**	**Unit**	**2020**	**2021**	**2022**	**2023**	**2024**	**Average**	**No. Spl. [d]**	**NDs [e]**	**Min.**	**Max.**	**Avg. [b]**	**RSTD (%)**	**Load (kg)**
3	pH	6-9	N/A	pH	7.69	7.55	7.97	7.89	7.9	7.80	29	0	6.63	8.04	7.51	5.53	N/A
6	Phosphorus	1.0	0.003	mg/L	0.503	0.810*	0.440*	0.762*	1.344*	0.772	29	0	0.0094	11	1.45*	144	0.108
7	Conductivity	N/A	2.0	µS/cm	473	527	552	665	605	564	29	0	160	1400	521	53.7	N/A
8	TSS	25	1.0	mg/L	15.0*	10.2	5.37*	9.64*	5.27	9.10	29	1	0	51	10.7*	221	0.810
9	Chromium	0.5	0.001	mg/L	0.0011	0.0021	0.0006	0.0006	0.0007	0.001	29	16	0	0.0135	0.0014	211	0.0001
9	Copper	0.5	0.0005	mg/L	0.423*	0.333*	0.163*	0.122	0.164	0.241	29	0	0.010	0.459	0.178	59.5	0.014
9a	Iron	1.0	0.01	mg/L	1.77*	1.57*	0.64*	0.551*	0.911*	1.09	29	0	0.167	19.5	2.32*	186	0.173
9	Lead	0.1	0.0002	mg/L	0.0047	0.0143	0.0086	0.0047	0.0049	0.0074	29	0	0.0014	0.0119	0.0043	65.5	0.0003
9	Nickel	0.5	0.001	mg/L	0.0040	0.0117	0.00036	0.0051	0.0074	0.0057	29	0	0.0013	0.0616	0.0087	135	0.0007
9	Zinc	0.5	0.005	mg/L	0.124	0.175*	0.102*	0.262*	0.124	0.157	29	0	0.007	0.496	0.123	83.9	0.009
12	Mercury	1.0	0.002	µg/L	0.010	0.023	0.0366	0.0258	0.0147	0.0220	29	1	0	0.232	0.031	176	2.36E-06
14	Phenolics	0.02	0.001	mg/L	0.005	0.004	0.003*	0.005	0.005	0.004	29	6	0	0.017	0.005	98.8	0.0004
25	Oil & Grease	15	1.0	mg/L	0.70	0.18	0.26	1.23	1.68	0.81	29	8	0	5.7	1.66	86.3	0.126
--	Estimated Flow (total volume for year)			m^3	1.07E+02	8.82E+01	1.20E+02	5.64E+01	6.89E+01	8.81E+01	7.70E+01						
--	Number of batches discharged			--	40	33	44	21	26	32.8	29						

Notes: Any averages with an asterisk (*) show that a monthly guideline was exceeded in one or more months for the given parameter in the year.
Discharges of effluent coming from the new LLLWTSs are being combined, as it allows for comparisons to the data collected over the previous five years.

a All results below the LMDL, originally flagged as "< DL" when reported, are only estimates.

b Averages were calculated by setting to zero results reported as "< DL."

c Monthly guide is from CNL's limits for non-radiological parameters in liquid effluents procedure. For mercury, the daily guideline is given instead, as there is no monthly guideline specified.

d No. Spl. is the number of samples analyzed and reported.

e NDs is the number of samples in which analyte was not detected (i.e., Code = "< DL," result = 0).

N/A = not applicable; RSTD = relative standard deviation; TSS = total suspended solids.

REDACTED

9.5.1.4.2 Monthly Guideline Acceptance

Canadian Nuclear Laboratories guidelines were used as the basis against which emissions from WL were evaluated. These guidelines are not regulatory requirements but instead have been adopted by CNL to routinely evaluate the environmental significance of both process-type and non-process-type discharges from WL. Table 45 provides a summary of each of the liquid effluent parameters that exceeded its CNL monthly guideline in 2025 or at any time during the previous five years.

As with the average summary tables provided for each monitoring point (Table 40 to Table 44), the first two columns in the table (after a column with the two effluent streams: LLLWTS and Outfall) identify the Ontario Ministry of Environment ATG and parameter names. The next three columns give the CNL monthly guideline concentration, LMDL, and the units of measurement. The next six columns present the monthly guideline acceptance for each of the five previous years, and the average of those five years expressed as a percentage. The last three columns show the number of months during which discharges occurred, the number of times the monthly guideline was exceeded for each parameter and the subsequent percent of times the parameter levels met the acceptance criteria.

To assess any significant level of change and evaluate program performance, this table will be referred to in each section discussing monitoring point results.

REDACTED

Table 45: Parameters that Failed to Conform to CNL Monthly Guidelines

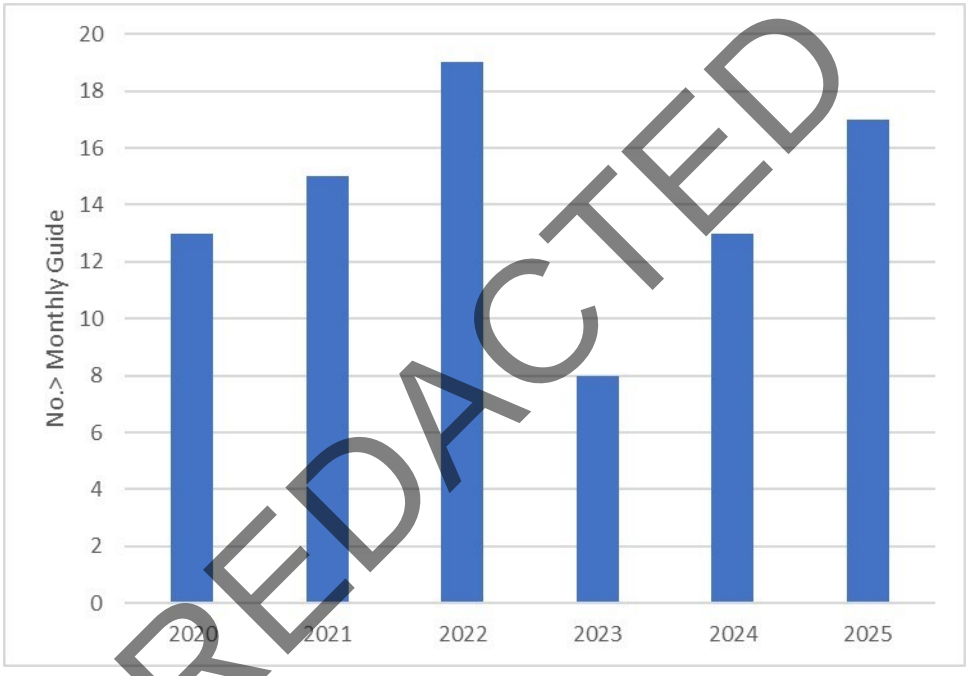
						Monthly Guideline Acceptance (%) for Previous Five Years						Results for Year 2025		
Effluent Stream	**ATG**	**Parameter**	**Monthly Guide**	**LMDL**	**Unit**	**2020**	**2021**	**2022**	**2023**	**2024**	**Average**	**No. Mth.**	**> Monthly Guide**	**Accept (%)**
LLLWTS	6	Phosphorus	1.0	0.003	mg/L	100	67	67	67	33	67	12	8	33
	8	TSS	25	1.0	mg/L	92	100	92	92	100	95	12	1	92
	9	Copper	0.5	0.0005	mg/L	58	83	92	100	100	87	12	0	100
	9a	Iron	1.0	0.010	mg/L	42	33	75	83	58	58	12	8	33
	9	Zinc	0.5	0.005	mg/L	100	92	100	92	100	97	12	0	100
	14	Phenolics	0.02	0.0010	mg/L	100	100	83	100	100	97	12	0	100
Outfall	8	TSS	25	1.0	mg/L	100	100	67	100	100	93	12	0	100
	9a	Iron	1.0	0.010	mg/L	100	100	67	100	100	93	12	0	100

Notes: Effluent stream parameters which have not exceeded a monthly guideline in the current year or in the previous five years have not been included to this table.
TSS = total suspended solids.

REDACTED

9.5.1.4.3 Monthly Guideline Plots

For parameters that have a value higher than a CNL monthly guideline, the monthly plot of values is shown for that parameter at the monitoring point. In 2025, there were eleven months when one or more of the parameters (total suspended solids, total iron, and total phosphorous) from the LLLWTS had monthly values higher than CNL monthly guidelines. Figure 5 shows the number of times the monthly guidelines have been exceeded at any monitoring point over the last six years. Plots are displayed in Figure 6 and Figure 7 for each parameter, and the explanations for the observed high values can be found in Sections 9.5.1.4.5.2 and 9.5.1.4.6. The monthly or daily guideline limit for the parameter in question is shown by a broken red line in the corresponding figures.



REDACTED

Figure 5: Non-radiological Monitored Effluent Parameters above CNL Monthly Guidelines

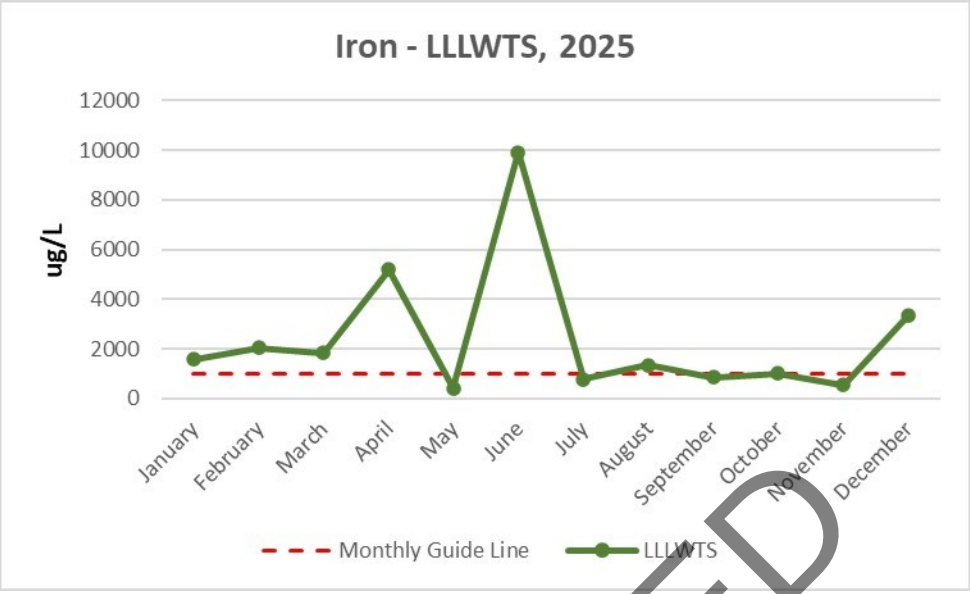


Figure 6: Monthly Average Iron Concentrations of Effluents from the Low-Level Liquid Waste Treatment Systems for 2025

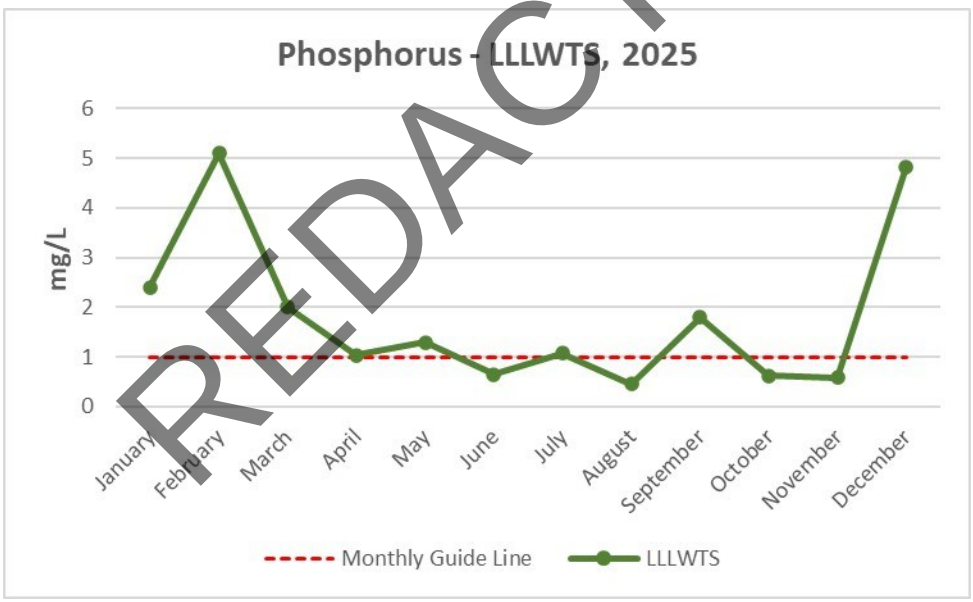


Figure 7: Monthly Average Phosphorus Concentration of Effluents from the Low-Level Liquid Waste Treatment Systems for 2025

REDACTED

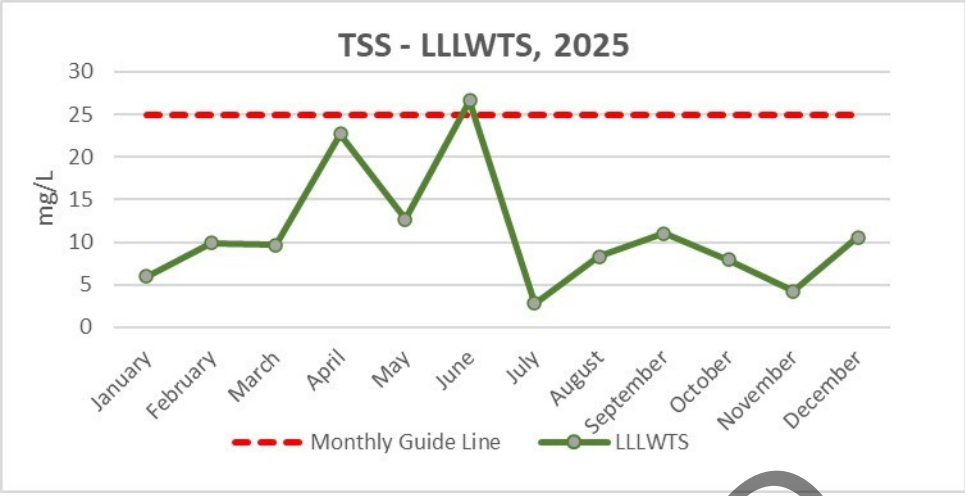


Figure 8: Monthly Average Total Suspended Solids Concentration of Effluents from the Low-Level Liquid Waste Treatment Systems for 2025

REDACTED

9.5.1.4.4 Monitoring of Intake Water from Winnipeg River

The majority of the water for the WL site is drawn from the neighbouring Winnipeg River at the Intake. The exceptions to this are the purchase of bottled drinking and distilled water. The amount of water drawn from the Winnipeg River varies from year-to-year.

Grab-samples are collected each month from the Pump House (Building 902) wet well to assess the levels of certain parameters that may be entering the site directly from the Winnipeg River. The measurements are summarized in Table 40, where they are compared to available data for the previous five years. Figure 9 shows the estimated amount of water used monthly for 2025.

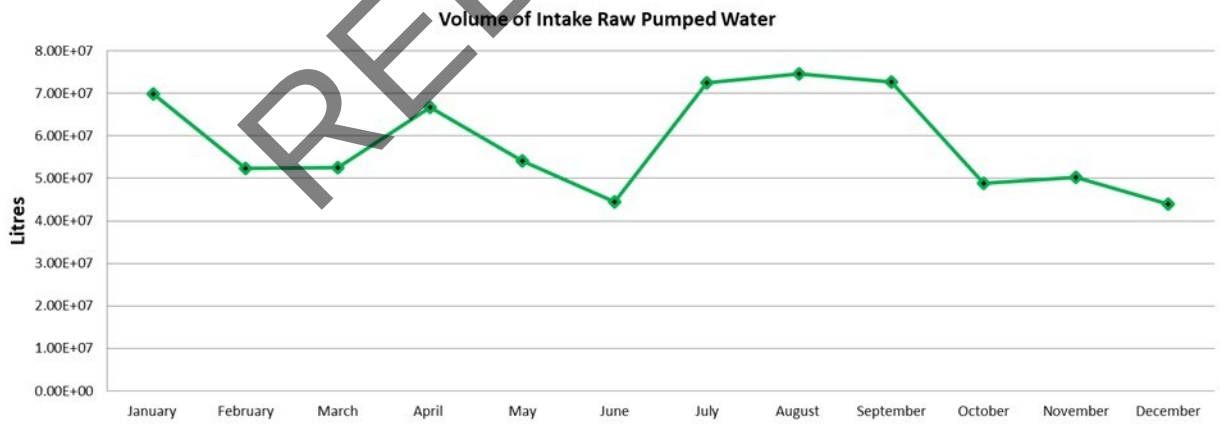


Figure 9: Estimated Monthly 2025 Intake Raw Pumped Water for Whiteshell Laboratories Usage

The following are notable points for the 2025 Intake water from the Winnipeg River:

- Compared to the five-year average, increased concentrations (more than 10%) were seen for phosphorus, TSS, copper, iron, lead, uranium, phenolics, and oil and grease.

- Parameters that had their concentrations decrease (more than 10%) in 2025 compared to the average seen for the previous five years are chromium, manganese, nickel, zinc, mercury, bromodichloromethane, and chloroform.

The composition of the Intake water can have a significant impact on the environmental performance of the WL site, and it will continue to be monitored closely. The Intake is considered a background location for baseline data. If there are notable changes in the composition of the water, it would be expected to affect the composition of WL's liquid effluents. The addition of sampling the Winnipeg River at Highway 211, see Section 9.3, is a result of changes noted in effluent and determining their origin.

9.5.1.4.5 Monitoring of Liquid Effluents to the Winnipeg River

Two effluent streams, the Lagoon and Outfall, discharge significant volumes of water to the Winnipeg River. Normal surface land runoff also reaches the river through Ditches 8 and 9. The results from monitoring each of these sources are discussed below.

REDACTED

9.5.1.4.5.1 Lagoon

The WL Lagoon secondary cell was discharged in 2025 October. The volume of effluent discharged from the Lagoon was 1.33E+04 m^3.

Prior to discharge, the Lagoon was tested for CBOD, fecal and total coliform bacteria, and acute lethality (a biological assessment on the survivability of trout in the proposed effluent). These samples are collected by the Lagoon operators at defined areas in the secondary cell after isolation of the secondary cell occurs and will determine whether discharging the Lagoon is permissible. During the actual Lagoon discharge, grab-samples are collected close to the pipe emptying into the receiving ditch that leads to the Winnipeg River. Individual samples for most parameters are collected weekly during the discharge.

The vertical scale from which surface height is found was carefully adjusted to read absolute depth from the original floor of the Lagoon. This was done because the equation for calculating the contained volume in the secondary cell for any depth is derived from the calculation for the volume of a rectangular trapezoidal trough:

$$\begin{aligned}\text{Volume (in L)} = \text{Height} \times [&\text{Width_Bottom} \times \text{Length_Bottom} \\ &+ 0.5(\text{Width}-\text{Width_Bottom})\,\text{Length_Bottom} \\ &+ 0.5(\text{Length}-\text{Length_Bottom})\,\text{Width_Bottom} \\ &+ (1/3)\,(\text{Width}-\text{Width_Bottom})\,(\text{Length}-\text{Length_Bottom})]\end{aligned}$$

Knowing the dimensions and geometry, the contained volume in the secondary cell can be calculated accurately for any depth using the following equation:

$$\text{Volume (in L)} = 636{,}655 \times d + 206.886 \times d^2 + 0.02133 \times d^3 \text{ for depth "d" (in cm)}$$

The position of the Lagoon's water surface is recorded once or twice daily while emptying. The daily flow is then calculated from changes in the contained volume. This permits the calculation

of volume-weighted concentrations and overall loads (see Section 9.5.1.5). Volume-weighted averages for a given period (month or year) are given by summing the product of the concentration for each day multiplied by the volume released that day, then dividing that sum by the total volume discharged during the period. Unlike other monitoring points (which are continuous or batch releases of fixed volume), the Lagoon discharge flow rate can vary widely. The variation makes weighting corrections highly significant in deciding meaningful average concentrations.

Discharging of the secondary cell is only allowed to proceed after initial testing. Once discharging begins, the pH is checked daily throughout the discharge period.

Table 41 summarizes the results of the fall discharge. Some notable points are:

- The Lagoon was discharged once during 2025 October.
- Compared to the five-year average, there was an increase in concentrations (> 10%) for CBOD, total residual chlorine, phosphorus, conductivity, TSS, chromium, and iron.
- Compared to the five-year averages, un-ionized ammonia, fecal coliform, and copper were all substantially lower (> 10% decrease).
- No detectable levels of chromium, lead, zinc, phenolics, or oil and grease in the discharged effluent.

The WL Lagoon discharge was compared against the limits set by the federal government in the Wastewater Systems Effluent Regulations in The Canadian Gazette [45]. The limits in force were met in all cases.

The results of the federally regulated parameters are indicated below:

- CBOD – annual volume weighted average was 5.9 mg/L, which is less than the 25 mg/L limit.
- TSS – annual volume weighted average was 10.6 mg/L which is less than the 25 mg/L limit.
- Un-ionized Ammonia – the volume weighted average concentration was 0.0004 mg/L which is less than the 1.25 mg/L limit.
- No trout mortality was observed in the fall lagoon effluent sample that underwent acute lethality testing.

9.5.1.4.5.2 Process Outfall

The Outfall monitoring station functioned as expected during 2025. The total discharge volume was 1.06 GL. This volume is lower than the previous five-year average of 1.23 GL.

The Outfall discharges continuously. Measurements were performed on the samples weekly. This provided 52 samples of each parameter for the year.

REDACTED

Table 42 summarizes the results obtained in 2025 and compares them to averages for the previous five years. Notable results for the Outfall are as follows:

- There were zero instances of CNL's monthly guidelines being exceeded at the Outfall monitoring station.
- The parameter that had a notable increase (more than 10%) compared to the five-year average was phenolics.
- Numerous parameters had a notable decrease (more than 10%) compared to the five-year average including: total organic carbon, phosphorus, TSS, chromium, copper, iron, lead, manganese, nickel, uranium, zinc, mercury, chloroform, and oil and grease. This is likely attributed to the site's resumption of street cleaning operations after the spring melt, and throughout the summer and fall months.
- There were no detectable levels of bromodichloromethane in the discharged effluent.
- Quality control test package sampling was successful for all four quarters in 2025. This test package includes a duplicate, a field blank, and acute lethality testing.
- Quarterly acute lethality testing for the Outfall effluent showed no mortality on the rainbow trout (Oncorhynchus mykiss) tested.

Overall, there were no concerns about the effluent discharged from Outfall during 2025.

9.5.1.4.5.3 Drainage Ditches

Much of the land surrounding key remote facilities at WL is drained by two structures (see Figure 11 in Section A.2). Ditch 8 drains the land north of the WMA up to the northern site boundary and beyond. Water from the (inactive) landfill and recharge area on the east is diverted instead around the WMA to the west-flowing Ditch 9, and into the Winnipeg River. These ditches are monitored for radiological and non-radiological content. The radiological monitoring is discussed in Section 9.4 of this report, and the non-radiological monitoring is discussed here.

Ditches 8 and 9 were grab-sampled each time water was flowing off site. This was after heavy rainfalls, of which there were two sampling events, April and October. At these same times, a sample was collected from the northern ditch bordering Highway 211. This is far enough from WL operations to be considered a reasonable background (control) location. It was not possible to measure the flow rates at any of the locations, or to sample representatively over entire rain events; therefore, no loads could be calculated.

Comparisons were made to CNL guidelines (although they are intended for process discharges). All values were below CNL monthly guidelines in 2025. The measurement data are summarized in Table 43. The following are notable points for the 2025 ditches results:

- There were two sampling events for the ditches.
- All concentrations remain well below the CNL's monthly guidelines.

REDACTED

- Ditch location 8 had notable increases in concentrations (more than 10%) compared to the previous five-year average for the following parameters: conductivity, TSS, copper, and phenolics.
- Ditch location 9 had notable increases in concentrations (more than 10%) compared to the previous five-year average for the following parameters: conductivity and phenolics.
- The Control ditch is considered a background reference, but there were notable increases in concentration (more than 10%) compared to the previous five-year average for conductivity, TSS, iron, lead, and nickel.
- The low number of sampling events is due to the low precipitation volume over the 2024-2025 winter and 2025 spring.

All parameters measured in Ditch 8 and Ditch 9 are comparable to those measured within the control ditch, indicating that WL had negligible effects on the environment through these two pathways.

9.5.1.4.6 Internal Liquid Discharge Monitoring

Building 300 and Building 100 both have a LLLWTS; each system represents a major area that generated low-level radioactive liquid wastes. Individual tank releases are monitored for operational control purposes.

A full tank must be emptied while a second tank is being filled. When full, tanks are sampled; if the pH and radioactivity levels meet discharge criteria, they are discharged. The LLLWTS tank pre-discharge criteria do not include all parameters listed in CNL's non-radiological guideline limit values; however, the post-discharge analysis includes all these parameters. CNL staff have determined, through historical data analysis from post-discharge samples, that if the pH in the tank is adjusted to neutral, all other parameters will normally meet the guideline limit values. All post-discharge data are reviewed to help ensure this process is working as intended and program requirements are met. All effluents pass through a 5 µm bag filter to the Process Outfall, leading via the Outfall to the Winnipeg River.

Grab-samples are taken after the filter, and at the beginning of each release from the individual tanks. Measurements are performed on the effluent of each discharge to measure pH and conductivity. For other analytes, grab-samples are collected and analyzed by a designated laboratory to complete the characterization of the effluent being discharged.

In 2025, there were 29 batched discharges from the LLLWTS totaling approximately 77.0 m^3.

The weighted averages of the joint releases from the LLLWTS are presented in Table 44 and monthly plots for the parameters that exceed the monthly guidelines as indicated in Table 45 are in Figure 6 and Figure 7.

The following are notable results for 2025:

- The total phosphorus concentration from the LLLWTS exceeded the CNL monthly guidelines eight times in 2025 (January, February, March, April, May, July, September,

REDACTED

and December). This also resulted in an Administrative Level for the facility being exceeded on two occasions (January and February) and one Action Level exceedance (December). Details on the Action Level can be found in Section 9.6.

- The TSS concentration coming from the LLLWTS exceeded the CNL monthly guideline one time (June) in 2025.
- The total iron concentration coming from the LLLWTS exceeded the CNL monthly guideline eight times in 2025 (January, February, March, April, June, August, October, and December).
- None of the monthly exceedances that occurred at the LLLWTS resulted in exceedances being observed at the Outfall monitoring location downstream in the process.
- There were increases (more than 10%) in average phosphorus, conductivity, chromium, iron, nickel, mercury, and oil and grease readings when compared to the previous five-year average.
- There were notable decreases (more than 10%) than the observed five-year average for copper, lead, and zinc.

9.5.1.5 Loading Calculations

For the Lagoon, the volume-weighted average concentration of a parameter was calculated as follows:

1. The measured concentration for each day was averaged with that of the next day.
2. The average was multiplied by the estimated volume discharged over the 24-hour period.
3. The products for all days were summed.
4. The resulting sum was divided by the total volume released during the period (spring, fall, or entire year). The load was then given as the product of the calculated volume-weighted average concentration, multiplied by the total volume for the period.

At the Outfall, the total discharge volume for each month was multiplied by the monthly average concentration of the parameter.

Table 46 shows the results from the calculations described above, grouped by parameter and by final outflow source. All mass-related parameters are shown. The table also compares them to previous years and to the five-year averages.

Note that LLLWTS discharges are not included here, as they are reflected in the Outfall loads, and ditches are also not included as lack of flow data prevents their calculation.

When examining the WL site total loads, notable results are as follows:

- Only phenolics had a load increase greater than 10% when compared to the five-year average. All of which was measured in the Outfall effluent.

REDACTED

- Most remaining loads decreased in 2025. The total volume released from WL for both Outfall and Lagoon was the lowest recorded since 2020. This resulted in decreased loads. The total annual precipitation in 2025 was less than in 2024; this combined with continued street sweeping operations results in less load originating from roadways.

Table 46: Loading for the Current Year and Previous Five Years

ATG	Parameter	Monitoring Point	Loadings from Previous Five Years (kg) [a]						Results for Year 2025		
			2020	2021	2022	2023	2024	Average	No. Spl. [b]	NDs [c]	Load (kg)
N/A	CBOD	Lagoon	0	0	340	0	110	90	5	0	78.02
		Site Total	**0**	**0**	**340**	**0**	**110**	**90**	**5**	**0**	**78.0**
N/A	Un-ionized Ammonia	Lagoon	0.043	0	0.006	0	0.0237	0.015	4	1	0.00001
		Site Total	**0.043**	**0**	**0.006**	**0**	**0.0237**	**0.015**	**4**	**1**	**0.00001**
N/A	Total Residual Chlorine	Lagoon	1.743	0	0.001	0	0.00061	0.349	4	0	0.0011
		Site Total	**1.743**	**0**	**0.001**	**0**	**0.00061**	**0.349**	**4**	**0**	**0.0011**
5b	Total Organic Carbon	Outfall	16,814	12,230	29,960	10,138	15,243	16,877	52	0	9,336
		Site Total	**16,814**	**12,230**	**29,960**	**10,138**	**15,243**	16,877	**52**	**0**	**9,336**
6	Phosphorus	Lagoon	2.3	0	0.003	0	0.001476	0.461	4	0	1.7381
		Outfall	25.2	25.9	59.2	25	29.8	33.0	52	0	20.7
		Site Total	**27.5**	**25.9**	**59.2**	**25**	**29.8**	**33.5**	**56**	**0**	**22.4**
8	TSS	Lagoon	120	0	216	0	138	94.8	4	0	141
		Outfall	6,657	6,630	21,533	1467	1977	7,653	52	25	1804
		Site Total	**6,777**	**6,630**	**21,749**	**1,467**	**2,116**	**7,748**	**56**	**25**	**1945**
9	Chromium	Lagoon	0	0	0	0	0	0	4	3	0.0063
		Outfall	0.651	0.035	0.1	0.0122	0	0.160	52	51	0.0029
		Site Total	**0.651**	**0.035**	**0.1**	**0.0122**	**0**	**0.160**	**56**	**54**	**0.0092**
9	Copper	Lagoon	0	0	0.072	0	0.0154	0.017	4	1	0.009
		Outfall	13.5	8.44	8.42	5.39	4.01	7.95	52	0	3.93
		Site Total	**13.5**	**8.44**	**8.49**	**5.39**	**4.03**	**7.97**	**56**	**1**	**3.94**
9a	Iron	Lagoon	3.57	0	6.76	0	3.32	2.73	4	0	2.40
		Outfall	381	322	1,200	187	274	473	52	0	150
		Site Total	**385**	**322**	**1,207**	**187**	**277**	**476**	**56**	**0**	**152**
9	Lead	Lagoon	0	0	0	0	0	0	4	4	0

REDACTED

ATG	Parameter	Monitoring Point	Loadings from Previous Five Years (kg) [a]						Results for Year 2025		
			2020	2021	2022	2023	2024	Average	No. Spl. [b]	NDs [c]	Load (kg)
		Outfall	0.481	0.303	0.711	0.047	0.139	0.336	52	45	0.045
		Site Total	**0.481**	**0.303**	**0.711**	**0.047**	**0.139**	**0.336**	**56**	**49**	**0.045**
9	Manganese [d]	Outfall	-	150	167[e]	121	118	139	52	0	67.7
		Site Total	**-**	**150**	**167**	**121**	**118**	**139**	52	**0**	**67.7**
9	Nickel	Lagoon	0	0	0.036	0	0.0083	0.009	4	2	0.006
		Outfall	0.972	1.49	2.17	0.22	0.554	1.08	52	48	0.086
		Site Total	**0.972**	**1.49**	**2.21**	**0.22**	**0.563**	**1.09**	**56**	**50**	**0.0920**
9	Potassium	Outfall	1,348	1,302	1,931	1183	1286	1410	52	0	1187
		Site Total	**1,348**	**1,302**	**1,931**	**1183**	**1286**	**1410**	**52**	**0**	**1187**
9	Sodium	Outfall	5,223	5,086	7,348	4643	6614	5783	52	0	5334
		Site Total	**5,223**	**5,086**	**7,348**	**4643**	**6614**	**5783**	**52**	**0**	**5334**
9	Strontium	Outfall	39.9	39.3	50.1	37.27	39.5	41.2	52	0	33.1
		Site Total	**39.9**	**39.3**	**50.1**	**37.27**	**39.5**	**41.2**	**52**	**0**	**33.1**
9a	Uranium	Outfall	0.485	0.461	0.639	0.422	0.461	0.494	52	0	0.318
		Site Total	**0.485**	**0.461**	**0.639**	**0.422**	**0.461**	**0.494**	**52**	**0**	**0.318**
9	Zinc	Lagoon	0	0	0.02	0	0	0.004	4	4	0
		Outfall	0.306	7.88	15.62	1.92	1.24	5.39	52	51	0.11
		Site Total	**0.306**	**7.88**	**15.64**	**1.92**	**1.24**	**5.40**	**56**	**55**	**0.115**
12	Mercury	Lagoon	0	0	0	0	2.35E-06	4.69E-07	4	4	0
		Outfall	0.0003	0.0003	0.0073	0.0005	0.0012	0.0019	52	51	0.0001
		Site Total	**0.0003**	**0.0003**	**0.0073**	**0.0005**	**0.0012**	**0.0019**	**56**	**55**	**0.00005**
14	Phenolics	Lagoon	0	0	0	0	0	0	4	4	0
		Outfall	0	0	0.21	0.16	0.111	0.0962	52	48	0.143
		Site Total	**0**	**0**	**0.21**	**0.16**	**0.111**	**0.0962**	**56**	**52**	**0.143**
16	Bromodichlo-romethane	Outfall	0.547	0	0	0.05	0	0.119	52	52	0
		Site Total	**0.547**	**0**	**0**	**0.05**	**0**	**0.119**	**52**	**52**	**0**
16	Chloroform	Outfall	31.4	8.82	8.82	7.65	4.26	12.2	52	0	2.63
		Site Total	**31.4**	**8.82**	**8.82**	**7.65**	**4.26**	**12.2**	**52**	**0**	**2.63**

REDACTED

ATG	Parameter	Monitoring Point	Loadings from Previous Five Years (kg) [a]						Results for Year 2025		
			2020	2021	2022	2023	2024	Average	No. Spl. [b]	NDs [c]	Load (kg)
25	Oil & Grease	Lagoon	0	0	2.99	0	0	0.598	4	4	0
		Outfall	0	188	108	1459	485	448	52	46	165
		Site Total	**0**	**188**	**111**	**1459**	**485**	**449**	**56**	**50**	**165**

a Averages were calculated by setting to zero results reported as "< DL."
b No. Spl. is the number of samples analyzed and reported.
c NDs is the number of samples in which analyte was not detected (i.e., Code = "< DL", result = 0).
d Manganese added in 2025, no loading calculations available for 2020.
e Value was corrected from 1667 kg to 167 kg in 2025 annual report.
CBOD = carbonaceous biochemical oxygen demand; N/A = not applicable.

9.5.2 Airborne Effluent Monitoring

Airborne emissions from the WL site are compiled annually for the purpose of reporting under the National Pollutant Release Inventory (NPRI) and the federal GHG report. These emissions are also recorded for trending and improvement purposes. Radiological releases are covered in Section 9.4 of this report. Non-radiological releases to the air are covered in the following sections.

9.5.2.1 Fuel Use for Building Heating

Historically, the main stationary source for non-radiological emissions to air from the WL site was the Powerhouse, which supplied district heating to various buildings on the site (see Figure 2). Table 47 presents WL heating fuel consumption from 2020 to 2025. See Figure 10 for a chart of fuel consumption.

Table 47: Fuel Use for Building Heating from Whiteshell Laboratories

Parameter	Unit	Data for Previous Five Years						Data for 2025
		2020	2021	2022	2023	2024	Average	
Fuel Burned								
Propane	L	190,372	160,159	172,865	160,159	139,544	164,620	162,077
Energy Released								
Propane [a]	TJ	5.1743	4.3531	4.6985	4.3531	3.7928	4.47436	4.4053
Heating Demand								
Heating Degree Days	HDD	5,615	5,233	6,064	5,233	5,017	5,432	5,734

a Energy released calculated from consumption at 2.718E-05 TJ/L for propane.

REDACTED

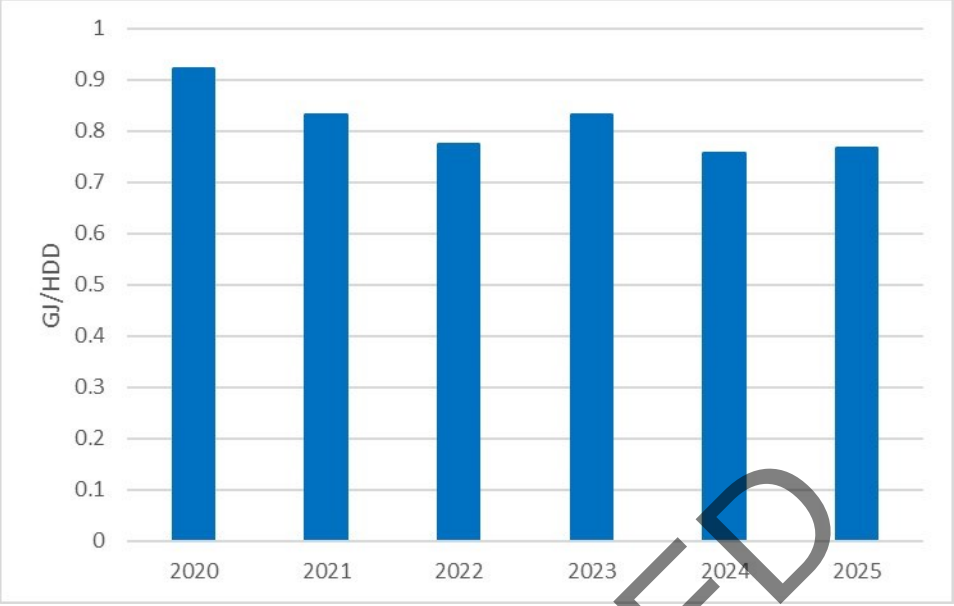


Figure 10: Annual Heating Energy Use from Fossil Fuels (per heating degree day)

9.5.2.2 Reporting Under the National Pollutant Release Inventory

Under the authority of the *Canadian Environmental Protection Act, 1999* [47], WL currently calculates releases of Part 4 substances for the NPRI program, using government reporting guidelines [48]. These releases to air include emissions caused by burning of propane for heating (as discussed above), as well as diesel fuel used from site generators, dust emissions from unpaved roads, and excavation projects.

Emission factors are applied to fuel consumption data, as well as estimated kilometres travelled on unpaved roads, to determine the amount of criteria air contaminants that are generated on site. Criteria air contaminants consist of carbon monoxide, oxides of nitrogen, sulphur dioxide, total (filterable) particulate matter (PM), PM below 10 µm (PM_{10}) and PM below 2.5 µm ($PM_{2.5}$), and volatile organic compounds. Dust generated from demolition activities in 2025 will be captured in the *2025 Progress Report on the Environmental Assessment Follow-Up Program for Whiteshell Laboratories* [37]. Table 48 outlines the annual criteria air contaminants generated from site activities, and shows emissions are all higher in 2025 compared to the five-year average for the values for total PM, PM_{10}, and $PM_{2.5}$. The WL site has reached the reporting thresholds for the generation of total PM, PM_{10} and $PM_{2.5}$. In 2025, data was included from aggregate handling for stockpiles. There was an increase in traffic, specifically the heavy weighted hauling trucks. This combined with the low precipitation contributed to the increases in TPM, PM_{10} and $PM_{2.5}$. In 2025 there was a continued increase in the amount of diesel fuel used in generators at the WL site resulting in an increase in NO_x emissions.

REDACTED

Table 48: Stationary Combustion Data and Emissions from Whiteshell Laboratories

Parameter	Unit	Data for Previous Five Years						Data for 2025	NPRI Reporting Threshold
		2020	2021	2022	2023	2024	Average		
Airborne Emissions									
NO_x (as NO_2)	Mg	0.602	0.331	0.485	0.617	0.960	0.600	2.795	20
SO_2	Mg	0.017	0.005	0.014	0.025	0.049	0.022	0.161	20
CO	Mg	0.256	0.162	0.202	0.218	0.285	0.226	0.853	20
Total PM	Mg	8.883	8.174	46.9	10.516	16.069	18.572	29.505	20
PM_{10}	Mg	2.281	2.091	11.97	2.702	4.259	4.782	8.096	0.5
$PM_{2.5}$	Mg	0.249	0.218	1.21	0.298	0.476	0.502	0.971	0.3
Volatile Organic Compounds	Mg	0.048	0.026	0.040	0.049	0.061	0.045	0.174	10

CO = carbon monoxide; NO_x = oxides of nitrogen; NO_2 = nitrogen dioxide; SO_2 = sulphur dioxide.

9.5.2.3 Greenhouse Gas Emissions

Under the authority of the *Canadian Environmental Protection Act, 1999* [47] WL must report releases under the GHGs emissions notice [49] providing the facility emits over 10,000 tonnes of carbon dioxide equivalent or more within the calendar-year.

Greenhouse gas emissions from WL include carbon dioxide, methane and nitrous oxide. Emissions are primarily from the burning of propane, the use of diesel generators, the on-site transportation fleet, and the on-site landfill. They are measured in carbon dioxide equivalent tonnes, which is a measure used to compare between gases that have different Global Warming Potential. Table 49 outlines the GHG emissions from the WL site for the last six years. These emissions from the site have increased slightly from the five-year average. This increase can be attributed to inclusion of contractor fuel use on site. Overall, greenhouse gases in 2025 are 13% higher than the average for the previous five years.

REDACTED

Table 49: Whiteshell Laboratories Site Greenhouse Gas Emissions

Parameter	Releases from Previous Five Years						2025 Releases
	2020	2021	2022	2023	2024	5 yr Avg.	
GHG CO_2e tonnes	1,692	1,177	1,215	1,203	1,215	1,409	1,596

Note: Greenhouse gas carbon dioxide equivalent (GHG CO_2e) tonnes is a unit of measure used to compare between gases that have different Global Warming Potential. For example, the Global Warming Potential for methane is 25. This means that emissions of one tonne of methane is equivalent to emissions of 25 tonnes of carbon dioxide.

9.5.2.4 Halocarbons

In the atmosphere, halocarbons contribute both to global warming and to ozone depletion, via separate mechanisms. Losses of halocarbon refrigerants and fire suppressants are reported semi-annually to Environment and Climate Change Canada, following the Federal Halocarbon Regulations [50]. All releases greater than 10 kg are considered reportable.

As seen in Table 50, there were no reportable releases of halocarbons in 2025.

Table 50: Halocarbon Losses from Whiteshell Laboratories

			Losses from Previous Five Years (kg)					Losses in 2025	
Type	**Global Warming Potential [a]**	**Ozone Depleting Potential [b]**	**2020**	**2021**	**2022**	**2023**	**2024**	**Number of Losses**	**Annual Loss (kg)**
Refrigerants									
CFC (R-11)	4,600	1	0	0	0	0	0	0	0
CFC (R-12)	10,600	1	0	0	0	0	0	0	0
CFC+HCFC (R-502) [c]	4.1	0.28	0	0	0	0	0	0	0
HCFC (R-22)	1,700	0	0	0	0	0	0	1	0.95
HFC (R-134a)	1,300	0	0	31.8	0	0	0	0	0
Fire Suppressants									
Halon (R-1301)	6,900	10	0	0	0	0	0	0	0

a Global Warming Potential per unit mass, compared to carbon dioxide (CO_2) = 1.00
b Ozone Depleting Potential per unit mass, compared to CFC R-11 = 1.00
c The data for the CFC+HCFC(R-502) are from the Federal Halocarbon Regulations, 2022 [50].
CFC = chlorofluorocarbons; HCFC = hydrochlorofluorocarbons; HFC = hydrofluorocarbons.

REDACTED

9.5.3 Overall Performance

The non-radiological effluent monitoring program set up by CNL continues to supply valuable information about the potential impacts of operations on the Winnipeg River, and thus the local environment.

There were continued notable decreases (more than 10%) in the loadings being released in the effluent to the Winnipeg River. Whiteshell Laboratories has continued to increased site maintenance of roadways which had been a contributing factor to increased loading in the past. In 2025, the annual volume of precipitation was less than in 2024, resulting in less surface runoff. The Outfall also recorded a lower-than-average total volume released from site.

There were zero CNL monthly guideline limits exceeded at the Outfall. However, there were seventeen exceedances observed upstream at the LLLWTS. Fourteen of these exceedances were within the normal operating limits of the facility. The cause for the exceedances are being attributed to the introduction of non-routine wastewater into the system.

The WL site was under most NPRI reporting thresholds in 2025, with all parameters showing an increase in 2025. WL did exceed the PM total, PM_{10} and $PM_{2.5}$ reporting thresholds. This may be attributed to the increased travel on roadways, including heavy duty equipment for aggregate stockpiling.

There was one Lagoon discharge in 2025 with no monthly guidelines being exceeded.

9.6 Regulatory Limit Exceedances and Contamination Incidents

There were no Regulatory Limit exceedances in 2025.There was one reportable event to the CNSC regarding an Action Level being exceeded at the LLLWTS in Building 100 for phosphorus (December) (note that this was discovered and reported in 2026 January). The monthly average phosphorus of the effluent in December was 11 mg/L, and the Action Level is set at 0.636 mg/L. There were no environmental impacts on the Outfall effluent, Winnipeg River, aquatic life or the public because of this Action Level exceedance. The exceedance was determined to be caused by the introduction of non-routine wastewater into the system. Non-routine water, or water not originating in the facility will be analyzed for acceptance into the LLLWTS. There was one reportable event to Environment and Climate Change Canada in 2025 January. Approximately one litre of diesel fuel was released from a firetruck within a facility, which then entered the drain system, leading to the Lagoon.

REDACTED

10 Emergency Management and Fire Protection

10.1 Emergency Preparedness Program

Whiteshell Laboratories adheres to CNL's Emergency Preparedness FSA. Refer to Section 10.1 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

Whiteshell Laboratories maintained and/or confirmed the compliance of its Emergency Preparedness FSA to applicable requirements in 2025 by:

- Conducting regulatory compliance reviews of emergency exercise requirements as listed in the Whiteshell Laboratories 5 Year Exercise and Drill Plan to ensure ongoing alignment with regulatory expectations.

Whiteshell Laboratories Emergency Management continues to adapt to the changes on site, including the demolition of buildings/assets, the construction of temporary structures, and the increasing number and varied composition of staffing levels.

There were no revisions to WL Emergency Preparedness Program licensing basis documents submitted to CNSC staff during the reporting period.

10.1.1 Drills and Exercises

Whiteshell Laboratories Emergency Management conducted all required drills and exercises per the Whiteshell Laboratories 5 Year Exercise and Drill Plan, ensuring ongoing alignment with regulatory expectations. These consisted of several types of exercises such as benchmarking flash drills, communications drills, lunch and learn sessions, and functional exercises. Of these 307 drills and exercises, 18 of the field exercises qualify as N393 compliant exercises.

10.1.2 Training

WL Emergency Management, supported by the CNL Training Department, completed the SAT requirements for the WL EOC Commander position in 2025. All four WL EOC Commanders are compliant with the training.

100% of staff who were added to the WL EOC roster in 2025 completed the WL EOC Basics course prior to being assigned.

WL Emergency Management ran ten EOC Lunch and Learn sessions in 2025. There were also two EOC functional exercises conducted in 2025.

The WL Officer-in-Charge program training continues, running typically once a month to capture new staff at the WL site. The annual refresher continues to be delivered by computer based training.

10.1.3 Status of Emergency Resources and Facilities

WL Emergency Management maintains a variety of program elements and emergency supplies and spaces. To better track these items, and to ensure their ongoing readiness, a WL

REDACTED

Emergency Management maintenance procedure was produced in 2025. This procedure is part one of a three component process to ensure ongoing emergency equipment checks are being done. The other two parts (specific checklists and a tracking tool) are expected to be rolled out in Q1 of 2026. Until then, a variety of regular checks were scheduled in 2025.

10.1.3.1 Emergency Operations Centre

There were two minor changes to the WL EOC staff list in 2025. The EOC Clerk role was formalised and added to the on-call team to ensure their availability. Secondly, an additional EOC Commander was identified for training and was added to the roster as an alternate, ready to assume the role as there is a potential for two of the current WL EOC Commanders to retire in 2026. Succession planning for two additional EOC Commanders will continue into 2026.

Whiteshell Laboratories maintains a physical EOC and conducts monthly tests of the technical equipment stored for use in that location. Repairs, improvements, and updates are requested as required and when identified. All monthly checks were completed in 2025. One formal check was cancelled to support operational requirements that needed the space, however; as a large exercise was conducted in the EOC later that same month where much of this equipment was used, it was deemed an acceptable verification for that month, even though not the same format as usual.

A cache of emergency food rations is also maintained at WL, which have a five-year shelf life. The rations were replaced in 2024. The cache is stored in a secure location, and the condition of the cases is checked annually. All cases were accounted for in 2025.

There was one Level 1 (monitoring) activation of the WL EOC in May of 2025 in response to the Lac du Bonnet Wildfire EA062.

Every month the EOC has a test of the notification system for all Core members of the EOC. Once again in all 12 tests, 100% of positions responded every time. In addition to the regularly scheduled monthly drills for the core team, WL also conducts random quarterly drills for the whole EOC team (including the subject matter expert support positions that are not paid on call). These drills are scheduled for random times and dates each quarter, involving weekends, evenings, holidays, and working hours. Staff responses to these random tests in 2025 were 86%, which given the participant demographics has been deemed acceptable.

10.1.3.2 Radiological Assessment Team/Mobile Nuclear Laboratory

The Radiological Assessment Team (RAT) at WL is made up of three teams of five RP staff. All three teams participated in a series of drills and exercises this year. These were designed to familiarise team members with the new processes and equipment that has been implemented. Members of the RAT were also able to participate in two large scale off-site exercises this year.

The Mobile Nuclear Laboratory was retired in 2025, with the new RAT Response Truck and Trailer coming online. Familiarisation activities were conducted through the drill and exercise process.

REDACTED

WL RP staff maintain the vehicle and response equipment, which is inspected regularly to maintain control of inventory and condition.

There were no emergency events requiring the activation of the RAT/Mobile Nuclear Laboratory in 2025.

10.1.4 External Collaboration

In 2025, contact was maintained with a variety of external emergency response/management organizations and interested public groups. Whiteshell Laboratories Emergency Management:

- Whiteshell Laboratories Emergency Management and WL Fire Department engaged extensively with the Manitoba Wildfire Service, the Manitoba Urban Search and Rescue team, Royal Canadian Mounted Police (RCMP), the Town/Rural Municipality (RM) of Lac du Bonnet Emergency Operations Centre, and the fire departments from Bird River, Lac du Bonnet, and the Local Government District (LGD) of Pinawa while supporting the wildfire efforts in Lac du Bonnet and Bird River this year. Engagements spanned the response, recovery and post event phases through a variety of activities.
- Supported the engagement of the Pinawa Fire & Rescue Service through an onsite orientation.
- Conducted joint training with Pinawa Fire & Rescue Service and the WL Fire Department.
- Participated in the Manitoba Provincial Flood and Forest Fire forecasting session in the spring.
- Supported the Town of Nipigon and area medical, law enforcement, and emergency professionals with a presentation on radiological safety and responses to transportation accidents. This session included a tabletop scenario with all participants.
- Engaged with the Emergency Preparedness department for the Interlake Eastern Regional Health Authority on managing industrial and radiological traumatic injuries and the opportunity for integrated response exercises in the coming years.
- Organized a formal EOC training opportunity for WL EOC staff and made some seats available to other Federal partner agencies in Winnipeg. Approaching the training this way provided WL staff with their required training but in a way that also provided a broader perspective on emergency events. This was highly effective.
- Whiteshell Laboratories Emergency Management and the WL RAT participated in Exercise Cobalt Magnet in 2025. This multinational radiological exercise was conducted across several locations in both Michigan and Ontario, involving cross-border multiagency cooperation at federal, provincial/state, and municipal levels. This exercise provided an opportunity for WL and CRL to work together along with their counterparts from Health Canada.

REDACTED

- Whiteshell Laboratories Emergency Management conducted a virtual training workshop and exercises on vehicle accidents involving Radioactive Materials with the Ministry of Transportation Ontario Northwest Region.
- Whiteshell Laboratories Emergency Management represented CNL at the Northwestern Ontario FireCon tradeshow, engaging with dozens of fire departments on Radioactive Materials shipment safety and accident response.
- Whiteshell Laboratories Emergency Management hosted visitors from Lac du Bonnet Emergency Management organisation to observe a WL EOC emergency exercise this year. This allowed for ongoing relationship building with this close neighbour of the WL site, further strengthening the site's reputation with this community.
- Two members of WL Emergency Management participated in an after-action session hosted by Manitoba Emergency Measures Organization on the 2025 wildfire season in Beausejour, MB.
- Whiteshell Laboratories Emergency Management was invited to observe and benchmark an Ontario Power Generation Darlington site's full-scale emergency exercise this year. This benchmarking opportunity has allowed WL to further strengthen their already robust exercise program.
- Whiteshell Laboratories Emergency Management and the WL RAT participated in the CNL full-scale exercise involving a radioactive material transportation accident in North Bay, ON this year. This presented an additional opportunity for WL and CRL's RAT to work together, further supporting the development of new WL RAT.
- Whiteshell Laboratories Emergency Management was invited to participate in a meeting with federal and provincial partner agencies to discuss a significant storm forecasted for Southern Manitoba in April.

REDACTED

10.1.5 Unplanned Emergency Events

The wildfire season in Eastern Manitoba was more active in 2025 than previous seasons. A combination of fire events in close proximity to the site and heavy smoke created impacts to the site for a period of two to three months. One of these off-site events triggered the activation of the WL EOC to a Level 1 (Monitoring) level. There were no unplanned events on site at WL that resulted in the activation of the WL EOC or initiation of the WL Emergency Plan.

10.2 Fire Protection Program

Whiteshell Laboratories adheres to CNL's Fire Protection FSA. Refer to Section 10.2 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

CNL self-identified deficiencies in 2023 in compliance with the Fire Protection Program. CNL is now compliant, addressing any open notices of non-compliance through corrective actions and compensatory measures, with oversight through the implementation of quarterly fire protection program assessments. In 2025, there was continued growth and defense in depth

with the WL Fire Department and Fire Protection Program. The WL Fire Department continued to improve departmental resources and capabilities. Five additional firefighter positions were created and successfully filled. In total, 2025 saw seven additional firefighters onboard and integrate into minimum complement roles.

In 2025, the Fire Protection Program onboarded a Fire Systems Specialist and Fire Standards Specialist. There is currently one open position in the WL Fire Protection Program, with recruitment ongoing to fill the vacancy.

Fire Protection Program staff provide a variety of services to the WL site, including fire safety and code reviews and evaluations, fire-related standard interpretation, fire hazard assessments, code compliance reviews, fire protection screenings, fire protection system compliance, and engineering evaluations related to fire protection and life safety.

There was a total of 13 planned and unplanned impairments of various fire protection systems at WL in 2025, with impairment plans and appropriate compensatory measures developed by the Fire Protection Program to manage and minimize risk [51]. Required inspections, testing and maintenance (ITM) of fire protection systems were completed by the Fire Protection Program, WL Operations and Maintenance, and an external contractor. The Fire Protection Program started the implementation of a new digital system for fire system ITM, with full integration complete.

All work activities and changes which could impact protection from fire continue to be assessed through the Fire Protection Screening Process. A new computer-based training module was developed to educate staff on the fire protection screening process.

Significant improvements were made to the fire response capabilities at WL in 2025:

- A third-party wildfire assessment was completed.
- Eight additional self-contained breathing apparatus assemblies with integrated thermal imaging capabilities were placed in service.
- A state-of-the-art training area was successfully procured. Class B fuel props, confined space simulator, and hazmat prop have been received. Four storey Class A burn tower and training tower are anticipated to be commissioned in Q2 2026.
- Twenty-four (24) firefighters were trained as hazardous Materials Technicians.
- Developed a procedure for fire water shuttling, ensuring a documented process for firefighting at the WMA.
- Revised the Job and Task Analysis for firefighters, which is the foundational document needed to update the SAT process for firefighters.
- Revised all fire Pre-Incident Plans for the WL site, incorporating task specific knowledge from walkdowns, verifying that all hazards are appropriately captured.
- An alternative solution was developed and approved for providing a water supply to the WMA using a water tanker and water shuttling from the main campus of WL. A

REDACTED

4,500-gallon tanker is being procured and is planned to be put into service in Q4 2026. This will replace the above ground tank that is currently in use and situated near the WMA and that is not compliant to the requirements in [52]).

- Fire Protection Oversite Plan (FPOP) was executed in 2025 with three internal assessments completed at WL. The FPOP consists of four quarterly assessments to be completed throughout the fiscal year, three of which were completed during the 2025 calendar year. The FPOP serves as a pivotal function concentrating on the holistic implementation of programmatic aspects, aligning adherence to fire safety code, standards, and procedures. The purpose of the assessments is to ensure that adequate controls are in place at each site in a well-organized, transparent, consistent, and documented manner to ensure regulatory compliance and fire safety. Corrective actions are developed to resolve any identified issues. For the three assessments completed in 2025, nine corrective actions were raised with six closed by 2025 December 31.

The WL Fire Department continues to have firefighters expand their accredited certifications. In 2025, firefighters attended 105 various courses / certifications totalling over 4200 hours of training.

An effectiveness review was carried out for the corrective actions taken from the root cause analysis carried out in 2023 for the fire program non-compliances. The effectiveness review evaluated both individual corrective actions and their collective impact on addressing root causes. There were 54 corrective actions taken - 48 actions were deemed effective, and six actions were identified as either incomplete or ineffective, with further corrective actions raised and an additional effectiveness review planned. This confirmed that CNL implemented robust controls to prevent recurrence of a similar event and also highlighted opportunities for improvement, reinforcing CNL's commitment to continuous enhancement of fire safety practices at WL.

Fire Protection Program reportable events are provided in Section 3.2.1.

Fire Protection Program licensing basis document revisions in 2025 specific to WL were provided to CNSC staff in submissions identified in the table below.

REDACTED

Table 51: Whiteshell Laboratories Fire Protection Program Licensing Basis Document Submissions in 2025

Document Title and Number	Reason for Change	Correspondence #
Canadian Nuclear Laboratories – Whiteshell Laboratories Building 401 Code Compliance Review, WL-508720-REPT-10069480	Required by CSA N393	WLD-CNNO-25-0019-L
Canadian Nuclear Laboratories – Whiteshell Laboratories Building 902 Code Compliance	Required by CSA N393	WLD-CNNO-25-0019-L

Document Title and Number	Reason for Change	Correspondence #
Review, WL-508720-REPT-10069477		
Canadian Nuclear Laboratories – Whiteshell Laboratories Building 911 Code Compliance Review, WL-508720-REPT-10069476	Required by CSA N393	WLD-CNNO-25-0019-L
Canadian Nuclear Laboratories – Whiteshell Laboratories Building 401 Fire Hazard Assessment, WL-508720-FHA-10069479	Required by CSA N393	WLD-CNNO-25-0019-L
Canadian Nuclear Laboratories – Whiteshell Laboratories Building 902 Fire Hazard Assessment, WL-508720-FHA-10069478	Required by CSA N393	WLD-CNNO-25-0019-L
Canadian Nuclear Laboratories – Whiteshell Laboratories Building 911 Fire Hazard Assessment, WL-508720-FHA-10069475	Required by CSA N393	WLD-CNNO-25-0019-L
WL-CCSF Fire Hazard Assessment, CCSF-508720-FHA-10067854	Required by CSA N393	WLD-CNNO-25-0008-L
WL - CCSF Code Compliance Review, CCSF-508720-CCR-10077495	Required by CSA N393	WLD-CNNO-25-0081-L

REDACTED

10.2.1 Fire Response Drills

The WL Fire Department ran numerous regulatory and non-regulatory fire drills, and training exercises which met the requirements of CSA N393 [52], and are included in the drills given in Section 10.1.1.

10.2.2 External Collaborations

The Fire Protection agreement with WL and the LGD of Pinawa remains current for 2025. Pinawa Fire & Rescue Service houses the extra response pumper apparatus for the WL Fire Department, using it as a first response fire apparatus to any requests for mutual aid at the WL facility.

A strong relationship is maintained between both services through regular communication and training. Pinawa Fire & Rescue Service has successfully recruited new firefighters to meet the response obligations to the community and WL with regular training occurring.

The WL Fire Department supported the Province of Manitoba and City of Thompson through a Memorandum of Understanding to provide emergency staffing to Thompson Fire & Emergency Services. WL Firefighters provided staffing to Thompson Fire & Emergency Services from 2025 February 01 – 2025 August 29 with one firefighter per shift to bolster their complement. WL firefighters directly responded to 1107 emergency calls while in Thompson.

The WL Fire Department continues to work towards full North Eastman Mutual Aid District integration. This will result in a reciprocal agreement with thirteen additional fire departments, further strengthening WL's defense in depth.

The WL Fire Department supported neighbouring fire departments and communities in 2025 May during wildfires in Lac du Bonnet and Bird River. Twenty-three firefighters provided 600 hours of support over 4 days.

Seven WL Fire Department personnel and one Fire Protection staff are currently engaged with the National Heavy Urban Search and Rescue team Canadian Task Force 4 (Can-TF4) located in Manitoba.

10.2.3 Third Party Audits & Inspections

An independent audit of the Fire Protection Program was conducted in 2024 October, which is required at least once every three years as per CSA N393 [52]. The report was finalized and provided to CNL in 2024 December. A corrective action plan was developed in to address the audit findings, and provided to CNSC staff.

10.2.4 Fire Hazard Analysis

Fire hazard analyses and code compliance reviews were completed for a number of facilities, as given in Table 51, meeting the requirements of CSA N393 [52].

REDACTED

11 Waste Management

11.1 Waste Management Program

Whiteshell Laboratories adheres to CNL's Waste Management FSA. Refer to Section 11.1 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

Initiatives undertaken at WL in 2025 focused on further developing and expanding the WL Waste Management department to ensure that staffing resources are aligned to support current and future waste-generation activities. These initiatives included the addition of a Waste Operations team to support onsite waste collections and transfers, off-site disposition activities (i.e., processing, recycling, reuse, and disposal), and to enhance the implementation of the waste hierarchy to minimize waste at WL. These initiatives also involved collaboration with the CNL Waste Management Program to facilitate benchmarking and mentorship support for WL staff. This mentorship opportunity was valuable for both WL and CRL staff, enabling knowledge sharing, strengthening professional networking opportunities, and supporting both personal and professional growth and development.

The effectiveness of the Waste Management Program at WL has been enhanced through the following key improvements:

- The capabilities of the WL staff in waste management were improved through the following:
    - Seven (7) sessions of instructor-led *Waste Planning Training* were delivered at WL, with 139 staff completing this training. This training equips staff with the necessary knowledge to effectively integrate the waste management process into their project plans and schedules. It also provided a high-level overview of the waste process.
    - Subsequently, a train-the-trainer session was conducted and resulted in three staff at WL being qualified as instructors for the *Waste Planning Training*.
    - Two waste advisors from WL visited CRL for mentorship, strengthening their capabilities to implement the waste management processes at WL.
- Regular engagements between CRL and WL teams were organized to foster knowledge sharing and to continuously improve the waste management processes and systems at both sites, leading to enhancements in waste planning documents and efficiencies in waste management execution.
- Workshops were conducted at WL to enhance WL waste management practices, including a workshop on the waste management process mapping was conducted at WL to clarify roles and responsibilities for waste management in specific areas at WL.
- Field surveillance and walk-downs were conducted at the WMA and Building 300 in WL. The surveillance and walkdowns identified actions to improve waste management practices at WL.

REDACTED

- The WL waste email inbox and protocol for triaging requests was established to streamline the waste management process at WL.
- An initiative to stand up a waste analysis facility is underway. This facility will strengthen the implementation of waste hierarchy and radiological clearance process at WL (see Section 11.1.1).
- Removal of approximately 1,800 PCB containing light ballasts.

There are no WL-specific licensing basis documents under the Waste Management Program.

11.1.1 Waste Management Operations

11.1.1.1 Radioactive Waste Management

Radioactive, clean, and hazardous wastes were generated from both ongoing operational activities and decommissioning projects. The packaged solid radioactive wastes were stored in designated storage facilities in the WL WMA depending on the hazard level and packaging, as well as dispositioned to CRL for storage. WL continues to utilize external vendors for selected waste requiring treatment.

- A total of 657.6 m³ of Low-Level Waste (LLW) was dispositioned in 2025; of this amount, 35 m³ was safely transported to CRL, with the remaining 622.6 m³ sent off-site to a third-party licensed waste processing facility.
- A total of 3.1 m³ of ILW was dispositioned in 2025. This consisted of seven shipments of ILW Bunker 8 Amine and Thorium Fuel Processing Experiment (TFRE) cemented drums that were transported to CRL for long term storage.

In 2025, the WL Standpipes Manual Retrieval Team completed visual inspections of 22 standpipes included in the Phase 1 manual retrieval scope. Of these, the team retrieved waste items from two standpipes:

- Three 45-gallon drums with 2-ethyl-1-hexanol mixture used in the TFRE; and
- One garbage can containing scrap metal, which was determined to be radiologically clean.

The repackaging and disposition of the five waste bins containing Building 200 demolition waste were completed over the course of 2025. Considering factors such as cost savings and safety, a decision was made to contract an external third-party company with the specialised expertise and capabilities to overpack the containers and provide transportation and shipment to their off-site processing facility for waste segregation and incineration. The incineration will reduce the overall waste quantity and decrease the required storage space at CRL. Low volumes of residual ash are expected to be returned to CRL over 2026 for storage. This initiative further reduces CNL's liabilities associated with radioactive waste management.

While clearable waste from controlled areas at WL continued being monitored on site, ongoing activities to stand up an area in Building 300 as a waste clearance facility progressed throughout 2025. These efforts included facility upgrades, engineering support, and the

REDACTED

establishment of a newly fenced-in compound for organizing and storage of large roll-off waste bins. This facility will enable the WL site to perform sorting and segregation of clean waste and conduct verification checks to ensure waste streams meet radiological clearance criteria.

The volumes of radioactive waste generated, stored onsite, transported to CRL and to offsite facilities in 2025 are summarized in the following tables:

- Table 52 summarizes the quantities of radioactive waste generated sent to onsite storage locations.
- Table 53 summarizes the volumes of solid LLW generated by each facility at WL.
- Table 54 summarizes the volumes of solid ILW generated by each facility at WL.
- Table 55 summarizes the radioactive wastes transported from WL to CRL and to offsite waste management facilities for disposition.

In 2025, 61.7 m³ of liquid LLW was processed in the Building 300 LLLWTS and 17.9 m³ in the Building 100 LLLWTS, for a total of 79.6 m³ of liquid LLW processed and discharged through the two systems.

REDACTED

Table 52: Radioactive Waste by Storage Location

Storage Facility	Volume (m³)	
	2024	2025
Low-Level Quonsets	25.1	30.5
Intermediate-Level Waste Bunkers	0.0	0.0
Recoverable Surface Storage and Staging Area	Not Available	154.2
Total	**25.1**	**184.7**

Table 53: Low-Level Waste Generated by Facility

Facility of Origin	2024		2025	
	Compactable Waste Volume (m³)	Non-Compactable Waste Volume (m³)	Compactable Waste Volume (m³)	Non-Compactable Waste Volume (m³)
Building 100	1.8	0.0	2.6	5.1
Building 200[a]	4.3	0.0	38.5	226.2
Building 300	0.0	0.0	4.2	3.4
Building 421	0.0	0.0	5.4	0.0
Concrete Canister Storage Facility	0.0	0.0	0.0	0.0
Shielded Facilities (HCF & IFTF)	13.4	0.0	21.4	0.0

Facility of Origin	2024		2025	
	Compactable Waste Volume (m^3)	Non-Compactable Waste Volume (m^3)	Compactable Waste Volume (m^3)	Non-Compactable Waste Volume (m^3)
Waste Handling Area	0.0	0.0	0.0	0.0
Waste Management Area	5.5	0.0	278.5	70.6
LLW Bunker 5	0.0	0.0	29.9	5.4
Affected Lands	0.0	0.0	0.0	0.0
WL site (others) [b]	N/A	N/A	153.2	0.0
Total	**25.1**[c]	**0.0**	**533.7**	**310.7**
Total after Compaction[d]	**25.1**[c]		**844.4**	

[a] Corresponds to LLW sitting on the former building footprint shipped off-site in 2025; the building was demolished in 2021.
[b] Includes volumes at WL site not listed above.
[c] Total does not sum exactly due to rounding.
[d] The volume of compactable waste was not reduced as the WL super-compactor was offline in 2024 and 2025.

REDACTED

Table 54: Intermediate-Level Waste Generated by Facility

Facility of Origin	Volume (m^3)	
	2024	2025
Affected Lands	0.0	0.0
Building 200[a]	0.0	0.0
Shielded Facilities (HCF & IFTF)	0.0	3.1
WMA Standpipes	0.8	0.0
Total	**0.8**	**3.1**

[a] The ILW sitting on the former building footprint was shipped off-site in 2025; the building was demolished in 2021.

Table 55: Radioactive Wastes Transported to Chalk River Laboratories and Off Site for Disposition

Facility of Origin	2024		2025	
	LLW Volume (m^3)	ILW Volume (m^3)	LLW Volume (m^3)	ILW Volume (m^3)
Building 200	0.0	0.0	226.2	0.0
Building 300	0.0	0.0	7.6	3.1
LLW Bunker 5	0.0	0.0	0.0	0.0
Shielded Facilities (HCF & IFTF)	0.0	0.0	7.7	0.0
Waste Management Area (legacy sources)	0.0	0.8	262.9	0.0
WL site (others)[a]	0.0	0.0	153.2	0.0
Total	**0.0**	**0.8**	**657.6**	**3.1**

[a] Includes volumes at WL site not listed above.

REDACTED

11.1.1.2 Non-Radioactive Waste Management

In 2025, the WL site continued to implement the waste hierarchy principle to minimize both radioactive and non-radioactive waste as much as practicable, consistent with *CNL's Integrated Waste Strategy* [53].

This includes sending recyclable and reusable materials to the municipal recycling facilities and material-specific facilities throughout Manitoba, as well as enhanced waste sorting and segregation and radiological clearance at the WL site. The implementation of the waste hierarchy at WL will further enhance with establishing the Waste Analysis Facility.

- A total of 1,921.5 m^3 of clean waste was dispositioned off-site in 2025. Of this amount, 533.6 m^3 was diverted through recycling and reuse. This includes 130.8 m^3 of metal that was recycled, 28.5 m^3 of concrete that was sent off-site for reuse, as well as recycling and reuse of various recyclable items (e.g., cardboard, paper, container, glass), asphalt, and ground materials.
- A total of 18.8 m^3 of hazardous waste was dispositioned off-site in 2025. This included the following:
    - Batteries and Waste Electrical and Electronic Equipment (WEEE) were sent off-site for recycling; and
    - A total of 2.2 m^3 of PCB contaminated materials were dispositioned to appropriate off-site waste receivers.

In 2025, a total of 1.7 m^3 of asbestos-containing material were safely staged and stored at the WL site, to be dispositioned to appropriate off-site waste receivers.

The amount of non-radioactive waste sent offsite for recycling, reuse, and disposal in 2025 are summarized in the following tables.

- Table 56 summarizes the amount of clean waste streams that were diverted and disposed at offsite facilities for reuse, recycling, or disposal.
- Table 57 summarizes the amount of non-radioactive hazardous waste streams that were shipped offsite for safe disposition.
- Table 58 summarizes the amount of solid and liquid non-radioactive waste streams that were shipped offsite for safe disposition.

Table 56: Clean Waste Shipped Offsite

Waste Streams	2024 Volume (m^3) (Weight (kg))		2025 Volume (m^3) (Weight (kg))	
	Diverted[a]	Disposed	Diverted[a]	Disposed
Recyclable items (e.g., cardboard, paper, container, glass)[b]	114 (5,700)	0.0 (0)	105.2 (8,783)	0.4 (77)
Shredded papers	11.8 (2,880)	0.0 (0)	24.2 (8,785)	0.0 (0)
Garbage	0.0 (0)	344.0 (93,140)	0.0 (0)	532.4 (228,039)
Metal	66.0 (28,790)	0.0 (0)	130.8 (35,269)	0.3 (37)
Asphalt	N/A	N/A	22.5 (51,090)	663.4 (1,075,913)
Concrete	182.0 (29,110)	0.0 (0)	28.5 (125,972)	0.0 (0)
Ground material	N/A	N/A	222.5 (375,620)	0.0 (0)
Polymeric	N/A	N/A	0.0 (0)	8.3 (964)
Soft strip	N/A	N/A	0.0 (0)	86.8 (146,377)
Wood	0.0 (0)	N/A	0.0 (0)	96.2 (8,576)
Sub-Total	**373.8 (66,480)**	**344.0 (93,140)**	**533.6[c] (605,519)**	**1387.8 (1,459,982)[c]**
Total	**717.8 (159,620)**		**1921.5 (2,065,501)**	

a Diverted waste includes waste that was recycled and prepared for reuse.
b This recycling waste pertains to office recycling that is generated regularly and accepted at municipal waste facilities.
c Total does not sum exactly due to rounding.

REDACTED

Table 57: Hazardous Waste Dispositioned Offsite

Waste Streams	Volume (m³) (Weight (kg))	
	2024	2025
Batteries (recycled)	N/A[a] (2,330)[a]	<0.1[b] (10)[b]
Waste Electrical and Electronic Equipment (WEEE) (recycled)	N/A[a] (492.5)[a]	<0.1[b] (1.6)[b]
Chemical (solid)	5.0 (2294.2)	1.4 (581.5)
Chemical (liquid)	1.9 (2033.9)	2.1 (2046.3)
Contaminated materials (e.g., polymeric, organics, cardboard, wood)	1.0 (1444.5)	2.5 (865.9)
Mercury containing items	<0.1 (2.0)	8.8 (629.3)
Metals (cooper, lead, others)	0.0 (0.0)	0.0 (0.0)
Organic (liquid)	0.0 (0.0)	1.7 (1775.2)
Polychlorinated biphenyl (PCB)	0.0 (0.0)	2.2 (1900.3)
Pressurized Containers	<0.1 (0.0)	0.1 (56.4)
Total	**7.9[a] (5,774.6)[a]**	**18.8 (7,866.5)[c]**

a Batteries and WEEE were considered as part of clean waste stream, not accounted as part of the total values.

b From 2025 onward, to align with waste classification, batteries and WEEE are reported under hazardous waste streams.

c Total does not sum exactly due to rounding.

REDACTED

Table 58: Non-Radioactive Hazardous Waste Shipped Offsite

Waste Type	Volume (m³) (weight (kg))	
	2024	2025
Solid hazardous waste shipped off site for disposition	6.0[b] (3740.7)[b]	14.9 (3990.8)
Liquid hazardous waste shipped offsite for disposition[a]	1.9 (20339)	3.9 (3875.7)
Total	**7.9[b] (5774.6)[b]**	**18.8 (7866.5)**

d This value also included pressurized containers containing gas.

e Values for 2024 exclude batteries and WEEE.

11.2 Decommissioning Plan

Whiteshell Laboratories adheres to CNL's Cleanup Functional Support Area. Refer to Section 11.2 of the *Annual Compliance Monitoring Report for CNL* [5] for details.

Decommissioning Plan licensing basis document revisions in 2025 specific to WL were provided to CNSC staff in submissions identified in the table below.

Table 59: Whiteshell Laboratories Decommissioning Plan Program Licensing Basis Document Submissions in 2025

Document Title and Number	Reason for Change	Correspondence #	Document Status
Storage with Surveillance Plan for Whiteshell Laboratories Building 100 – Whiteshell Reactor 1, WLD-508330-SWS-000024	Routine update	WLD-CNNO-25-0061-L	Accepted by CNSC
Detailed Decommissioning Plan, Volume 12 - Whiteshell Laboratories Licensed Site Supporting and General Infrastructure - Part 5: Affected Lands and Contaminated Structures, WLDP-35000-DDP-001	Updated to reflect changes to the scope of the plan	WLD-CNNO-25-0054-L	Submitted to CNSC for acceptance

Progress on Decommissioning and Environmental Remediation activities is summarized in the sections that follow.

11.2.1 Land Use Program

In 2025, CNL continued to engage public and Indigenous Nations on the WL Site Restoration Plan (SRP, formerly the Land Use and End State, LUES, plan). Revisions based on outcomes of engagement, and internal CNL technical reviews have been incorporated into Draft 7 of the WL SRP, which is planned to be published in early 2026. A final round of public and Indigenous feedback will continue throughout 2026 leading to the development of WL SRP revision 0, which is anticipated in late 2026.

Key outcomes of engagement in 2025 include:

- The development of the Plain Language Summary
- Incorporation of public feedback received to date
- Incorporation of Indigenous feedback received to date
- Incorporation of an internal CNL technical review

Section 15 provides additional details on public and Indigenous engagement.

11.2.2 Decommissioning and Demolition Program

11.2.2.1 Storage with Surveillance

Table 60 lists the storage with surveillance plan (SWS) submitted for CNSC acceptance in 2025.

REDACTED

Table 60: Summary of Whiteshell Laboratories Storage with Surveillance Plans in 2025

Building Number	SWS Status	Document Name and Number	Submission / Acceptance Date (if applicable)	Additional Information
100 (WR-1)	Current Published	Storage with Surveillance Plan for Whiteshell Laboratories Building 100 – Whiteshell Reactor 1, WLD-508330-SWS-000024, Rev. 2.2	2025 August 20 (CNSC acceptance) 2025 September 17 (latest submission)	Acceptance of comments disposition [54] Submission of the revised document [55]

Relevant information for storage with surveillance activities at WL in 2025 is given in Appendix F.

11.2.2.2 Decommissioning Planning

Table 61 lists the detailed decommissioning plans (DDP) and their status as of 2025.

Table 61: Summary of Whiteshell Laboratories Detailed Decommissioning Plans in 2025

Building Number/ Facility	DDP Status	Document Name and Number	Submission / Acceptance Date (if applicable)	Additional Information
Program Overview	Rev. 2 Approved by Regulator Rev. 3 Review and Update	Volume 1 – Program Overview, WLDP-02000-DDP-001	2021 December 07 (acceptance of Rev 2) 2023 October 26 (submission of Rev 3)	Revision 3 was submitted to CNSC in 2023 [56] for acceptance; CNSC accepted comments dispositions; revised DDP will be re-submitted once the cost estimate report is accepted.
Shielded Facilities	Rev. 1 Approved by Regulator Rev. 2 Review and Update	Volume 2– Shielded Facilities, WLDP-21400-DDP-001	2016 August 12 (acceptance of Rev 1) 2024 March 26 (submission of Rev 2)	Revision 2 submitted to CNSC in 2024 for acceptance [57]; CNSC staff's comments were received in 2025 (to be dispositioned).
Van de Graaff Accelerator	Closed out by End-State Report	Volume 3 – Van de Graaff Accelerator, RC-2143-3		Facility has been decommissioned. End-state report completed.
Neutron Generator	Closed out by End-State Report	Volume 4 – Neutron Generator, RC-2143-4		Facility has been decommissioned.

REDACTED

Building Number/ Facility	DDP Status	Document Name and Number	Submission / Acceptance Date (if applicable)	Additional Information
				End-state report completed.
Active Liquid Waste Treatment Centre	Current Published	Volume 5 – Active Liquid Waste Treatment Centre Building 200, WLDP-25400-DDP-001	2011 January 24	Facility has been decommissioned: demolition complete, site cleanup remains to be completed. End-state report is in development.
Whiteshell Reactor – 1 (WR-1)	Approved by Regulator	Volume 6 – Whiteshell Reactor-1: Building 100, Rev. 3 (Complete Dismantlement and Removal Approach)	2015 March 19	Facility has been shut down and is currently under monitoring and surveillance – Storage-with-surveillance plan [26].
	Submitted to CNSC	WLDP-26400-DDP-001, Rev. 6 (In-Situ Decommissioning Approach)	2025 March 26	Revision 6 incorporates changes to address CNSC staff's comments regarding Revision 5 (submitted for review of comment disposition to CNSC prior to final environmental assessment submission).
Concrete Canister Storage Facility	Submitted to CNSC	Volume 7 – Concrete Canister Storage Facility, WLDP-22500-DDP-001	2017 November 23	CNSC staff's comments were received (to be dispositioned). DDP revision on hold until fuel retrieved under operations (was initially a DDP activity, subsequently changed to an operational activity).
Waste Management Area	Under development	Volume 8 – WMA Part 1: Standpipes Area, WLDP-36500-DDP-001		Facility is operational.
	Under development	Volume 8 – WMA Part 2: Intermediate-Level Waste Bunkers, Building 417 and Amine Tanks, WLDP-24900-DDP-001		Facility is operational.

REDACTED

Building Number/ Facility	DDP Status	Document Name and Number	Submission / Acceptance Date (if applicable)	Additional Information
	Approved by Regulator	Volume 8 – WMA Part 3: Low-Level Waste Liabilities, WLDP-24400-DDP-001	2021 April 09	Facility is operational and decommissioning activities ongoing.
R&D Facilities Complex	Rev. 0 Approved by Regulator Rev. 1 Review and Update	Volume 9 – Building 300, WLDP-23500-DDP-001 Volume 9 – Building 300_Addendum, WLDP-23500-DDP-001_AD	2007 March 19 (acceptance of Rev 0) 2024 March 26 (submission of Rev 1)	Revision 1 submitted to CNSC in 2024 for acceptance [57], CNSC staff's comments were received in 2025 (to be dispositioned).
Decontamination Centre	Closed out by End-State Report	Volume 10 – Decontamination Centre Building 411, WLDP-27400-DDP-001		Facility has been decommissioned. End-state report completed.
Health and Safety Facilities	Current Published	Volume 11 – Building 402 and 305, WLDP-37000-DDP-001	2020 September 08	Buildings have been decommissioned. End-state report in development.
DDP Volume 12	Current Published	Volume 12 – WL Licensed Site Supporting and General Infrastructure: North-Side, WLDP-32000-DDP-001	2009 March 30	Operational and decommissioning activities ongoing.
	Current Published	Volume 12 – WL Licensed Site Supporting and General Infrastructure –Part 1: South-Side Buildings RC-2143-12	2006 March 14	Operational and decommissioning activities ongoing.
	Current Published	Volume 12 – WL Licensed Site Supporting and General Infrastructure –Part 3: Outer Area Buildings and Facilities WLDP-33000-DDP-001	2008 August 08	Operational and decommissioning activities ongoing.

REDACTED

Building Number/ Facility	DDP Status	Document Name and Number	Submission / Acceptance Date (if applicable)	Additional Information
	Current Published	Volume 12 – WL Licensed Site Supporting and General Infrastructure –Part 4: Site Services WLDP-34000-DDP-001	2013 January 03	Operational and decommissioning activities ongoing.
	Rev. 1 Current Published Rev. 2 Review and Update	Volume 12 – WL Licensed Site Supporting and General Infrastructure –Part 5: Site Affected Lands and Contaminated Structures WLDP-35000-DDP-001	2012 May 25 (Rev 1) 2025 August 25 (submission of Rev 2)	Operational and decommissioning activities ongoing. Revision 2 submitted to CNSC in 2025.

Table 62 provides a summary of decommissioning and demolition statuses for WL in 2024.

Table 62: Summary of Whiteshell Laboratories Decommissioning and Demolition Status by Facility in 2025

Facility	Decommissioning and Demolition Status
WMA	Active Decommissioning
Site Affected Lands and Contaminated Structures	Active Decommissioning

Decommissioning progress is also discussed in the facility sections (Appendix A through Appendix G).

11.2.2.3 Detailed End State Reporting

Two Interim End-State Reports have been accepted by CNSC in 2025 (Table 63).

Table 63: Summary of Whiteshell Laboratories Decommissioning and Demolition Interim/End-State Reports in 2025

Building	Document Type	Document Status	Document Name and Number	DDP/Work Plan Closed out by End-State Report	Submission Date (if applicable)
B100	Interim End-State Report	Current published	Whiteshell Laboratories Building 100 SLOWPOKE Demonstration Reactor Interim End-State Report, WLDP-26413-IES-002971		2024 April 17

REDACTED

Building	Document Type	Document Status	Document Name and Number	DDP/Work Plan Closed out by End-State Report	Submission Date (if applicable)
B300	Interim End-State Report	Current published	Whiteshell Laboratories Building 300 Stage 6 Interim End-State Report, WLDP-23519-IES-004625		2024 May 16

REDACTED

12 Security

12.1 Security Program

Whiteshell Laboratories adheres to CNL's Security FSA. Refer to Section 12 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

The WL Site Security Report [58] outlines the security arrangements that are in place at the WL site. The Security FSA consists of processes, procedures, and staff to manage the continuous operation and response to security incidents. The Security FSA and procedures are reviewed and updated as required to address operational requirements.

Nuclear Security Officers assigned regular duties continue to meet the physical and psychological fitness requirements for Security Officers stated in REGDOC-2.2.4, *Fitness for Duty, Volume III Nuclear Security Officer Medical, Physical and Psychological Fitness* [16].

Tiered Response Force officers continue to meet maintenance training requirements stated in REGDOC 2.12.1, *High Security Sites – Nuclear Response Force* [59].

A CNSC Security inspection was conducted in 2025 August. This inspection resulted in 1 non-compliance and 3 recommendations. A CNSC force on force exercise was conducted in 2025 November (final exercise report has not yet been released).

An internal focused self-assessment was carried out, as listed in Section 1.2.3 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* [5], to determine WL Security regulatory compliance with requirements listed under the Security SCA of the site licence. Whiteshell Laboratories site was found to meet all minimum regulatory compliance mandates as specified under the *Nuclear Safety and Control Act*, subsequent Nuclear Security Regulations, and associated regulatory documents. Opportunities for improvement were identified and associated actions have been captured in the final report.

Security Program licensing basis document revisions in 2025 specific to WL were provided to CNSC staff in submissions identified in the table below.

REDACTED

Table 64: Whiteshell Laboratories Security Program Licensing Basis Document Submissions in 2025

Document Title and Number	Reason for Change	Correspondence #
Whiteshell Laboratories Site Security Report, EPS-14000-RPT-18	Routine update	119-CNNO-025-0008-L WL SSR

12.1.1 Security Events

In 2025, there were two security events that affected WL which were reported to CNSC staff. Refer to Section 3.2.1 for details.

12.1.2 Cyber Security

In 2025 various security system hardware upgrades, software upgrades, and physical access control changes have occurred to align with Cyber Security program requirements within the WL Security Building 401 and Protected Areas. Whiteshell Laboratories Security continues to work with corporate Cyber Security program on continuous improvement and alignment initiatives.

REDACTED

13 Safeguards and Non-Proliferation

13.1 Safeguards Program

Whiteshell Laboratories adheres to CNL's Nuclear Materials and Safeguards Management FSA. Refer to Section 13 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

There are no WL-specific licensing basis documents under the Safeguards Program.

13.1.1 International Atomic Energy Agency Activities

The IAEA conducts various types of activities as part of the safeguards approach for CNL, including, but not limited to, IAEA safeguards seals changes, human surveillance, implementation and/or maintenance of IAEA safeguards monitoring equipment, and technical visits. A list of IAEA inspections conducted at WL can be found in Section 1.2.2.

A physical inventory verification inspection was completed by the IAEA on 2025 April 30. This inspection was a sampling of accessible items containing special fissionable material.

The IAEA also completed a design information verification inspection on 2025 May 01. The activities associated with the design information verification consisted of the following:

- verification of the design information;
- verification of the site and general building design;
- verification of containment integrity; and
- verification of operational status of the facility.

REDACTED

14 Packaging and Transport

14.1 Packaging and Transport Program

Whiteshell Laboratories adheres to CNL's Transportation of Dangerous Goods FSA, which includes the requirements of the Packaging and Transport SCA. Refer to Section 14 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

Activities in 2025 included the following:

- Licences to transport were approved by the CNSC to safely begin shipping both CANDU[10] fuel and cemented high-level waste to CRL for storage.
- As part of the hazard reduction efforts at WL, legacy low-level liquid waste totes, were transferred to CRL for processing.
- A Transport Canada, TDG audit was conducted 2025 October. CNL had two non-compliance(s) under TDG Reg 3.5 (4) and TDG Reg 6.3 (3) (a) [60], which have both been addressed.

Details of waste volumes generated and shipped offsite can be found in Section 11.1.1.

There are no WL-specific licensing basis documents under the Packaging and Transport Program.

14.1.1 Shipments

Whiteshell Laboratories shipped and received various classes of dangerous goods. The majority of dangerous goods shipped were Class 7, and these Class 7 shipments were predominately low-specific activity material.

14.1.2 Annual Report of Radiation Detections in Packaging and Transport

There were no shipments at WL in 2025 that met the annual reporting criteria outlined in REGDOC-3.1.2, Section 4.4 [4]. (Paragraph 3 of the PTNSR 2015.)

REDACTED

[10] CANada Deuterium Uranium

15 Other Matters of Regulatory Interest

15.1 Public Information and Disclosure Program

WL adheres to CNL's Corporate Affairs FSA, which includes the requirements of the Public Information and Disclosure Program. Refer to Section 15 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

WL continued to enhance engagement through numerous vehicles, including increased activity engaging neighbour communities and regional leadership through site tours, meetings, and educational initiatives. Whiteshell Laboratories' proactive outreach regarding the WL Restoration Plan encouraged participation through gatherings and virtual connections, and bringing together Indigenous and non-Indigenous leaders.

Highlights from 2025 include:

- Hosted third Regional Leaders Gathering on November 05, bringing together Indigenous and non-Indigenous leaders from 39 organizations for dialogue on the present and future of the WL site.
- Facilitated Indigenous involvement in environmental monitoring at WL through year-round collaboration with Sagkeeng Anicinabe Nation's Niigan Aki Program, and inviting participation from the Manitoba Métis Federation, Black River First Nation, Brokenhead Ojibway Nation, Peguis First Nation, and Hollow Water First Nation.
- Facilitated engagement with a booth at the annual Manitoba Environmental Industries Association Cleantech Conference.
- Participated in lakeshore clean-up event in Sagkeeng First Nation.
- Presented work development updates to seven municipal councils.
- Attended the Manitoba Métis Federation's Red River Métis Business Expo.
- Hosted 15 on-site tours with Indigenous Nations, local elected officials, regional business development leaders, and the media.
- Participated in Sagkeeng Anicinabe's Treaty Days celebrations.
- Sponsored 17 community events throughout the WL region, including public ice skate, community celebrations, recreation events, job fairs, and educational grants.

REDACTED

15.1.1 Outreach and Stakeholder Engagement

Whiteshell Laboratories shares information with the public through activities including public webinars, media releases, site tours followed by roundtables, local newspaper announcements, municipal and school presentations, the corporate website, corporate social media accounts, and involvement in community events.

In 2025, CNL participated in public events inclusive of both local community engagements, as well as industry and trade specific events, and site and facility tours. A selection is shown in Table 65 below.

Table 65: Examples of Public Engagements for Whiteshell Laboratories in 2025

Date	Event
2025 March 07	World Trade Centre Winnipeg & Manitoba Environmental Industries Association Site Tour
2025 June 09	Public Liaison Committee Meeting & Site Tour
2025 July 08	Manitoba Chambers of Commerce Site Tour
2025 August 28	Manitoba Ministers Site Tour
2025 September 16	Presentation at Powering Possibility for Manitoba's Energy Future event hosted by the Manitoba Chambers of Commerce
2025 September 24	CentrePort Site Tour
2025 November 05	Regional Gathering of Leaders (hosted by CNL)
2025 November 16	Saskatchewan Contingent Site Tour
2025 December 22	Booth at the Manitoba Environmental Industries Association (MEIA) Cleantech Conference

15.1.2 Public Engagement

CNL prioritizes making information about WL accessible to all interested parties. All publications and brochures include an invitation to contact CNL. The website includes contact information in multiple places, and a toll-free phone line is maintained and monitored. Inquiries received through these avenues are recorded and assessed for any trends.

CNL actively works to engage its audiences on matters related to WL activities. In 2025, in addition to the conventional communications channels discussed throughout this report, several specific methods were deployed to gain feedback from and create discussion with interested parties including feedback forms and online surveys shared after engagements like site tours and Public Liaison Committee (PLC) meetings. That feedback helped leveraging content for the Regional Gathering of Leaders in November, to bring forward discussions relevant to attendees on current activities and the site's future.

In addition, CNL hosted four online public webinars that discussed the WR-1 Reactor Decommissioning, the Standpipes Non-Automated Waste Retrieval Project, the WL SRP, and remediation options for the Low-Level Waste Trenches.

A notable engagement activity was the third WL Restoration Project (WLRP) Regional Gathering of Leaders on November 05. This event had 149 participants, including youth and Indigenous Elders, from eight Indigenous Nations, eight municipalities, two school divisions, two post secondary institutions, and four Chambers of Commerce come together for a full day of activities included panels, workshops, table discussions, and a new youth activity engaging high school students.

15.1.3 Traditional and Online Communications

The following describes several methods of outreach WL used to enable CNL's Public Information Program for the WL site.

REDACTED

Online

Refer to Section 15 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2025* for details [5].

Corporate Website

CNL uses www.cnl.ca/WL, a subpage of CNL's corporate website (cnl.ca), to share information and facilitate feedback on the WLRP. This page includes information about the WLRP and includes the Environmental Monitoring Brochure, as well as a feedback form for visitors. In 2025, cnl.ca pages related to WL had 6,795 views.

Social Media

CNL shared activities and updates about the operations at the WL site via CNL corporate social media channels Facebook, LinkedIn, and YouTube. In 2025, CNL made 32 social media posts related to the WL site.

Newsletters

In 2025, CNL distributed three issues of Kids CONTACT and one issue of WLRP CONTACT to ~7,500 households around WL.

Public Disclosures

In 2025, CNL disclosed one event relevant to WL, which was posted online and sent by email to local elected officials. See Table 66 below for details. Public disclosures are also shared directly with Indigenous Nations, Governments, communities and organizations and other select audiences based on their interests, relevancy, and feedback.

Table 66: Community Information Bulletins

Date	Bulletin
2025 September 23	Response to Smoke from Roof Work at CNL's Whiteshell Site

In addition, CNL continued to provide the public, through the external website, with a consolidated quarterly list of the reportable events at all CNL locations.

15.1.3.1 Media Releases

Canadian Nuclear Laboratories proactively earned media visibility regarding WL's ongoing operations. See Table 67 for details.

REDACTED

Table 67: Examples of Whiteshell Laboratories-Related Earned Media in 2025

Date	Article
2025 March 20	The Clipper: CNL Firefighters answer the bell
2025 December 12	Winnipeg Free Press: Big plans for small modular reactors
2025 December 12	Winnipeg Free Press: Fire safety no longer an issue at former nuclear site in Pinawa, decommissioning firm says
2025 December 12	Winnipeg Free Press: In pictures Inside Whiteshell Laboratories

Public Liaison Committee

Established in 2003, the PLC meets twice annually. The objective of the PLC is to build working relationships and create opportunities for open dialogue between various stakeholders, local communities, and CNL. Members include local elected officials and staff from related provincial government departments.

During regularly scheduled meetings, PLC members are presented with information about the WLRP, updates on the WR-1 Project, and environmental practices. Members are given the opportunity to ask questions, seek clarification, raise concerns, and discuss the information presented. PLC members are also asked to take meeting information back to their respective constituents. Meeting notes are taken to record all questions and actions raised during each meeting. Guided tours of the WL site, including areas of interest such as the Hot Cells and the WMA, are provided following many of the meetings.

In 2025, the WL PLC held a meeting at the WL site followed by a tour. The WL PLC membership was also invited to participate in the November Regional Gathering of Leaders, which was preceded by virtual meetings with each PLC member to discuss relevant topics of interest, supporting the creation of relevant discussion and information sharing at the Regional Gathering.

Municipal Engagement

Canadian Nuclear Laboratories regularly engages with the rural municipalities, including the Town and the RM of Lac du Bonnet and the LGD of Pinawa, the Town of Powerview – Pine Falls, and the RM of Alexander. Many elected officials from the nearest communities are also members on the PLC.

Canadian Nuclear Laboratories attended several council meetings throughout 2025 to share updates and invite feedback related to CNL's activities at the WL site. Municipal representatives were also invited, and attended, the November Regional Gathering of Leaders.

A list of municipal engagements is provided below in Table 68.

REDACTED

Table 68: Examples of Municipal Engagement

Date	Activity
2025 February 24	Presentation in the Town of Lac du Bonnet
2025 April 18	Presentation in the Town of Lac du Bonnet
20205 June 9	Presentation in Town of Beausejour
2025 August 18	Presentation in LGD Pinawa
2025 October 20	Presentation in LGD Pinawa
2025 December 15	Presentation in the Town of Lac du Bonnet
2025 February 24	Presentation in the Town of Lac du Bonnet
2025 April 18	Presentation in the Town of Lac du Bonnet
20205 June 9	Presentation in Town of Beausejour
2025 August 18	Presentation in LGD Pinawa
2025 October 20	Presentation in LGD Pinawa
2025 December 15	Presentation in the Town of Lac du Bonnet

15.1.4 Education

Canadian Nuclear Laboratories' WL team connected with four school activities in 2025, through a combination of webinars, in-class sessions, and tours. The WL site also hosted a Take Our Kids to Work Day on site and coordinated youth-specific activities to facilitate feedback at the Regional Gathering of Leaders in Beausejour.

A list of on-site school tours and in-class presentations is provided in Table 69.

Table 69: Examples of On-Site School Tours and Presentations

Date	School
2025 January	CNL attended the Sagkeeng Anicinabe High School for a presentation on the Niigan Aki program, and CNL's on-site environmental monitoring program
2025 February	Sagkeeng Anicinabe First Nation High School Site Tour
2025 November	University of Manitoba Canadian Society of Bioengineers (CSBE)
2025 November	Take Our Kids to Work Day
2025 November	Regional Gathering of Leaders

15.1.5 Ongoing Projects

CNL has been engaging the public and Indigenous Nations, communities, and organizations on the WR-1 Project since it was launched in 2016.

CNL's Indigenous relations and public engagement on the WR-1 Project was ongoing throughout 2025, with a focus on how the project fits into the WL SRP, as well as the most

REDACTED

recent revision of the Environmental Impact Statement, which was submitted to the CNSC in 2025 January. Key engagement activities for the reporting year included a public webinar in 2025 April as well as several tours with the public and Indigenous Nations, featuring a tour of the reactor.

Details on engagement with Indigenous Nations for the WR-1 Project can be found in the *Whiteshell Laboratories WR-1 Reactor Decommissioning Indigenous Engagement Report* [61].

Details on engagement with the public for the WR-1 Project can be found in the *Environmental Assessment Stakeholder Engagement Report - WR-1 In Situ Decommissioning* [62].

15.2 Indigenous Engagement

Canadian Nuclear Laboratories recognizes the importance of meaningful engagement to build strong relationships with Indigenous Nations. Canadian Nuclear Laboratories is seeking to understand and incorporate the perspectives and traditional knowledge of Indigenous Peoples in project planning, documentation, and reports. Canadian Nuclear Laboratories' engagement efforts follow the guidance in CNSC REGDOC-3.2.2, *Indigenous Engagement* [63].

Canadian Nuclear Laboratories seeks to provide Indigenous Nations, communities, and organizations with effective access to timely information about ongoing activities at the WL site and the possible effects of these activities on community members and the environment. Canadian Nuclear Laboratories also seeks feedback from the communities regarding traditional and current uses in the vicinity of the WL site; planned and ongoing project-related activities, programs, timelines, environmental protection, and mitigation measures; long-term benefits; and economic opportunities.

Through engagement activities on the WLRP, CNL continues to build on years of engagement with Indigenous Nations, communities, and organizations, including Sagkeeng Anicinabe Nation, Black River First Nation, Hollow Water First Nation, Wabaseemoong Independent Nations, Grand Council Treaty #3, Peguis First Nation, and the Manitoba Métis Federation, the National Government of the Red River Métis (see Table 70). Major project updates are shared with Brokenhead Ojibway Nation, Iskatewizaagegan #39 Independent First Nation, Shoal Lake 40 First Nation, and Northwest Angle #33 First Nation, with opportunities for further engagement available to those communities at their discretion.

REDACTED

Identified Indigenous Communities

Canadian Nuclear Laboratories developed a list of Indigenous Nations, Governments, communities, and organizations with potential interest in CNL's operations at the WL site. The identification of the First Nations and the Red River Métis was based on consultation with the CNSC, through CNL's previous engagement with Indigenous Nations, Governments, communities, and organizations, and through the use of publicly available sources of information, including:

- First Nation and the Manitoba Métis Federation and organization websites;
- Aboriginal and Treaty Rights Information System [64]; and

- Crown-Indigenous Relations and Northern Affairs Canada First Nation community profiles.

The inclusion of specific Nations considers the nature of the established and/or claimed rights and the potential effects of the proposed project on those rights, based on a preliminary assessment of available information. As such, the working list is subject to change based on information and dialogue with the identified First Nations, the Manitoba Métis Federation, and other Indigenous Nations, communities, and organizations. Involvement in CNL engagement is at each community's discretion and subject to community preferences and availability.

The list was based on the identified potential or established Indigenous or treaty rights of the First Nations and the Red River Métis and is provided in Table 70 with a brief rationale for inclusion. CNL remains open to engagement with any interested Indigenous community and continues to prioritize building a relationship-centred approach to Indigenous Relations at the WL site.

Table 70: Identified Indigenous Communities

First Nations, the Red River Métis or Organization	Identification Rationale
Sagkeeng Anicinabe Nation (Treaty 1 and 3)	• Asserted and/or established Aboriginal and Treaty rights exist in the vicinity of the WL site. • Occupies one reserve located 52 km north of the WL site, and downstream along the Winnipeg River. • Existing relationship and interest in the WL site. • The WL site is within the boundaries of the area over which Sagkeeng First Nation claims unsurrendered Aboriginal title, a proceeding for which is ongoing in the Manitoba Court of King's Bench.
Peguis First Nation (Treaty 1)	• Asserted and/or established Aboriginal and Treaty rights exist in the vicinity of the WL site. • Occupies one reserve located 253 km northwest of the WL site. • Interest expressed on the WLRP and WR-1 Project.
Brokenhead Ojibway Nation (Treaty 1)	• Asserted and/or established Aboriginal and Treaty rights exist in the vicinity of the WL site. • Occupies three reserves: 44 km northwest, 55 km northwest, and 73 km southwest of the WL site, respectively. • Interest expressed - comments on WR-1 Project Description.
Manitoba Métis Federation	• The Manitoba Métis Federation (MMF), the National Government of the Red River Métis, also known as the Manitoba Métis. The MMF represents more than 125,000 Red River Métis Citizens within the National Homeland and many more beyond borders and internationally. Asserted and/or established Métis harvesting rights in the vicinity of the WL site.

REDACTED

First Nations, the Red River Métis or Organization	Identification Rationale
	• The WL site is located within the National Homeland of the Red River Métis. • Interest expressed - comments on WR-1 Project Description.
Black River First Nation (Treaty 5)	• Asserted and/or established Aboriginal and Treaty rights exist in the vicinity of the WL site. • Occupies one reserve 75 km north of the WL site. • Existing relationship and interest in the WL site.
Hollow Water First Nation (Treaty 5)	• Asserted and/or established Aboriginal and Treaty rights exist in the vicinity of the WL site. • Occupies one reserve, 113 km north of the WL site. • Existing relationship and interest in the WL site.
Shoal Lake 40 First Nation (Treaty 3)	• Potential asserted and/or established Aboriginal and Treaty rights exist in the vicinity of the WL site. • Treaty 3 territory includes parts of eastern Manitoba, including the WL site. • Occupies three reserves: 94 km southeast, 110 km southeast and 140 km southeast of the WL site, respectively.
Iskatewizaagegan #39 Independent First Nation (Treaty 3)	• Potential asserted and/or established Aboriginal and Treaty rights exist in the vicinity of the WL site. • Treaty 3 territory includes parts of eastern Manitoba, including the WL site. • Occupies four reserves: 93 km southeast, 102 km southeast, 110 km southeast and 140 km southeast of the WL site, respectively.
Northwest Angle #33 First Nation (Treaty 3)	• Potential asserted and/or established Aboriginal and Treaty rights exist in the vicinity of the WL site. • Treaty 3 territory includes parts of eastern Manitoba, including the WL site. • Occupies three reserves: 111 km southeast, 140 km southeast, and 176 km southeast of the WL site, respectively.
Wabaseemoong Independent Nations (Treaty 3)	• Potential asserted and/or established Aboriginal and Treaty rights exist in the vicinity of the WL site. • Treaty 3 territory includes parts of eastern Manitoba, including the WL site. • Occupies four reserves: 80 km east, 85 km east, 95 km east, and 140 km southeast of the WL site, respectively.
Grand Council Treaty #3 (specific to this Project	• Grand Council Treaty #3 is the Traditional Government of the Anishinaabe Nation in Treaty #3. Grand Council Treaty #3

REDACTED

First Nations, the Red River Métis or Organization	Identification Rationale
includes Shoal Lake No. 40 First Nation, Iskatewizaagegan No. 39 Independent First Nation, Northwest Angle No. 33, Wabaseemoong Independent Nations, and Sagkeeng Anicinabe First Nation)	represents 28 First Nations across the Territory. Grand Council's mandate is to protect the future of the Anishinaabe people by ensuring the protection, preservation, and enhancement of inherent and Treaty rights. The Territorial Planning Unit (TPU) is a department within the Grand Council that works with the Treaty #3 Leadership to protect the lands, water, and resources within the 55,000 square miles of Treaty #3 Territory. The TPU is guided by Anishinaabe Inakonigaawin - Manito Aki Inakonigaawin (Great Earth Law) and Treaty #3 Nibi (water) Declaration. • Grand Council Treaty #3 is made up of 28 First Nation communities (2 communities in Manitoba and 26 communities in Ontario) - Five-member First Nation communities with potential interest in the Project: Shoal Lake 40 First Nation, Iskatewizaagegan 39 Independent First Nation, Northwest Angle 33 First Nation, Wabaseemoong Independent Nations, and Sagkeeng Anicinabe First Nation. • Treaty 3 territory includes parts of eastern Manitoba, including the WL site.

Throughout 2025, CNL held virtual monthly meetings with the Sagkeeng Anicinabe Nation, Black River First Nation and Hollow Water First Nation, Grand Council Treaty #3 and Wabaseemoong Independent Nations, and Peguis First Nation. In 2025, CNL continued to host bi-weekly liaison meetings with Sagkeeng Anicinabe Nation, Black River First Nation and Hollow Water First Nation, as well as frequent environmental monitoring calls with the Manitoba Métis Federation. CNL also met, as required, with the Manitoba Métis Federation to discuss the development of a new MMF–CNL Relationship Agreement, and met, when there was interest, with Brokenhead Ojibway Nation.

Indigenous engagement in 2025 focused on the WL SRP, the remediation of the LLW Trenches, fuel consolidation and waste transportation, on-site environmental monitoring, and the development of a relationship-centred approach to WL's Indigenous Relations Program through benchmarking opportunities.

The 2025 CNL Whiteshell Regional Gathering of Leaders continued to be a successful opportunity, bringing together eight Indigenous Nations, including youth, leadership, and elders, as well as non-Indigenous governments and organizations, all centred around this year's theme, "Shaping Our Shared Future".

Notably, in an afternoon fireside chat at the 2025 Whiteshell Regional Gathering of Leaders, Chief E.J. Fontaine of Sagkeeng Anicinabe Nation spoke powerfully about the need for Indigenous Peoples to be genuinely included in economic development initiatives; a reminder that reconciliation and inclusion must remain central to our collective path forward.

Another highlight of 2025 was exploring ways to increase Indigenous opportunities for employment and procurement at the WL site. To that end, CNL attended the Manitoba Métis

REDACTED

Federation's "Meetings with Meaning", a follow-up procurement event to the 2024 Manitoba Métis Federation Business Expo. As well, CNL attended the Work Readiness Program held in Sagkeeng Anicinabe Nation, which provided community members with the opportunity to learn about CNL, the available careers, and the hiring process.

Table 71 shares an overview of engagement from 2025.

Table 72 lists the engagement activities from 2025 that were held on-site.

Table 71: Examples of Indigenous Engagement Activities for 2025

Community	Details
Manitoba Métis Federation	In mid-2025, through discussions on establishing a new contribution agreement, CNL and the Manitoba Métis Federation began rebuilding a productive partnership to enable the full participation of Red River Métis Citizens. Canadian Nuclear Laboratories and the Manitoba Métis Federation continued information sharing in 2025, with increased engagement later in the year, including on-site environmental monitoring and bi-weekly environmental monitoring calls. Throughout 2025, the Manitoba Métis Federation attended several Environmental Remediation Management bi-monthly webinars that discussed WL-related topics, including updates on the WL Site, the Standpipes Non-Automated Waste Retrieval Project, the WL SRP, and the remediation of the Low-Level Waste Trenches. In-person engagement held off-site included: • In 2025 February CNL attended the Manitoba Métis Federation's "Meetings with Meaning", a follow-up procurement event to the 2024 Manitoba Métis Federation Business Expo. • In 2025 April CNL attended the Manitoba Métis Federation offices to discuss environmental monitoring at WL's WMA as it relates to the remediation of the Low-Level Waste Trenches. • In 2025 October CNL held a booth the Manitoba Métis Federation Annual General Assembly. • In 2025 November CNL attended the Manitoba Métis Federation offices for an introductory meeting on the WL SRP. At the end of 2025, CNL and the Manitoba Métis Federation initiated planning for a technical review of the WL SRP, and a more detailed review of the remediation options for the Low-Level Waste Trenches.
Sagkeeng Anicinabe Nation	Monthly meetings were held with Sagkeeng Anicinabe Nation, during which areas of interest, such as the Niigan Aki program, the WL SRP, Fuel Consolidation and Waste Transportation, the remediation of the Low-Level Waste Trenches, and WR-1 were discussed. To support engagement on the WL SRP, Sagkeeng Anicinabe Nation conducted a Future Visioning Proposal, which included gathering community feedback from two in-community meetings, numerous virtual meetings, and an on-site tour of the WL site. The final Future Visioning Proposal shared with CNL highlighted the Sagkeeng Anicinabe Nation's End-State goals and high-level aspirations for the future of the

REDACTED

Community	Details
	lands within the WL site, as well as what Sagkeeng Anicinabe Nation members want secured, protected, restored, and achieved for both present and future generations. Sagkeeng Anicinabe Nation and CNL also collaborated on a technical review of the WL SRP. CNL incorporated initial feedback into the WL SRP Draft 6. Throughout 2025, CNL and Sagkeeng Anicinabe Nation discussed the remediation of the Low-Level Waste Trenches. In 2025, engagement with Sagkeeng Anicinabe Nation at the Leadership level focused on the future of the relationship, with several meetings held throughout the year. These discussions included presentations on the remediation of the Low-Level Waste Trenches, the WL SRP, and the decommissioning of the WR-1. The Niigan Aki program continued to see Guardians participating in weekly on-site monitoring throughout 2025, including pH monitoring of the Winnipeg River, RP training, WMA Well Sampling, and numerous walk-downs for traditional medicines. In 2025, Niigan Aki and CNL continued to meet bi-weekly to discuss program initiatives and in-community engagement opportunities, including Niigan Aki's participation in the December Manitoba Environmental Industry Association's Cleantech Conference. Throughout 2025, Sagkeeng Anicinabe Nation attended several Environmental Remediation Management bi-monthly webinars that discussed WL-related topics, including updates on the WL site, the Standpipes Non-Automated Waste Retrieval Project, the WL SRP, and the remediation of the Low-Level Waste Trenches. Notably, in 2025, to continue CNL's efforts to build a relationship-centred approach to Indigenous Relations at the WL site, CNL and Sagkeeng Anicinabe Nation leadership attended the 2025 March Waste Management Symposia in Phoenix, Arizona, and participated in a panel on Indigenous Perspectives on Risk Assessment. In 2025 July, CNL welcomed a delegation from Sagkeeng Anicinabe Nation to the CRL and Nuclear Power Demonstration sites for a benchmarking trip and tour to better understand CNL's full waste cycle capabilities, and to meet with the Algonquins of Pikwàkanagàn First Nation to discuss the transportation of waste from Sagkeeng Anicinabe Nation's traditional territory to the Algonquins of Pikwàkanagàn First Nation's traditional territory. In 2025 August, CNL and Sagkeeng Anicinabe Nation also participated in a panel on Indigenous participation in CNL's Environmental Monitoring Program with representatives from Black River First Nation, Hollow Water First Nation, and the Algonquins of Pikwàkanagàn First Nation at the Nuclear Waste Management Decommissioning and Environmental Restoration Conference. In-person engagement held off-site, in the community included: • In 2025 January CNL attended the Sagkeeng Anicinabe High School for a presentation on the Niigan Aki program, and CNL's on-site environmental monitoring program. • In 2025 March CNL staff and Sagkeeng Anicinabe Nation Chief presented on a panel together at the 2025 March Waste Management Symposia in Phoenix.

REDACTED

Community	Details
	• In 2025 April CNL attended the Niigan Aki Strategic Plan meeting held in Sagkeeng Anicinabe Nation. • In 2025 May CNL held a booth at the Sagkeeng Anicinabe Nation Career Fair in Winnipeg. • In July 2025 CNL held a booth at the Sagkeeng Anicinabe Nation Treaty Days in collaboration with Niigan Aki and the Future Visioning Proposal team. • In 2025 August CNL attended the Sagkeeng Anicinabe Nation's Future Visioning Proposal community engagement meeting in Sagkeeng Anicinabe Nation. • In 2025 August CNL attended the Sagkeeng Anicinabe Nation's Future Visioning Proposal community meeting in Winnipeg. • In 2025 September CNL attended the Work Readiness Program held in Sagkeeng Anicinabe Nation, which provided community members with the opportunity to learn about CNL, the available careers, and the hiring process.
Black River First Nation/Hollow Water First Nation	Monthly meetings were held with Black River First Nation and Hollow Water First Nation, during which areas of interest, such as the WL SRP, Fuel Consolidation and Waste Transportation, the remediation of the Low-Level Waste Trenches, and WR-1 were discussed. In 2025, the Black River First Nation and Hollow Water First Nation Core Engagement Team continued to support engagement on the WLRP more broadly. In 2025 April CNL welcomed the Core Engagement Team on-site for the quarterly meeting followed by a site tour. To support engagement on the WL SRP, CNL hosted the Black River First Nation and Hollow Water First Nation Core Engagement Team for a tour and meeting in October, focused on the WL SRP's decision units, as well as fuel consolidation and waste transportation. Canadian Nuclear Laboratories continued to meet bi-weekly, and in-person when required, with the Black River First Nation/Hollow Water First Nation Liaison to establish opportunities for participation in on-site environmental monitoring and training, such as the 2025 September Mushroom Collection and RP training. Throughout 2025, Black River First Nation and Hollow Water First Nation attended several of CNL's bi-monthly webinars that discussed WL-related topics, including updates on the WL site, the Standpipes Non-Automated Waste Retrieval Project, the WL SRP, and the remediation of the Low-Level Waste Trenches. Nearing the end of 2025, conversations focused on the renewal of the Black River First Nation/Hollow Water First Nation – CNL Contribution Agreement. Notably, in 2025, to continue CNL's efforts to build a relationship-centred approach to Indigenous Relations at the WL site, in 2025 November, CNL welcomed a delegation from Black River First Nation to the CRL and Nuclear Power Demonstration sites for a benchmarking trip and tour to better understand CNL's full waste cycle capabilities, and to meet with the Algonquins of Pikwàkanagàn First

REDACTED

Community	Details
	Nation to discuss the transportation of waste. In 2025 August, CNL and Black River First Nation also participated in a panel on Indigenous participation in CNL's Environmental Monitoring Program with representatives from Sagkeeng Anicinabe Nation, and the Algonquins of Pikwàkanagàn First Nation at the Nuclear Waste Management Decommissioning and Environmental Restoration Conference.
Grand Council Treaty #3 **Wabaseemoong Independent Nations**	Bi-monthly meetings were held with Grand Council Treaty #3 and Wabaseemoong Independent Nations, during which areas of interest, such as environmental monitoring, the WL Site Restoration Plan, fuel consolidation and waste transportation, the remediation of the Low-Level Waste Trenches, and WR-1 were discussed. In September 2025, representatives from Grand Council Treaty #3 attended the 2025 Mushroom collection.
Not-Actively engaged Treaty 3 First Nations **Shoal Lake 40** **Northwest Angle #33** **Iskatewizaagegan #39**	Canadian Nuclear Laboratories continued regular outreach to all Treaty 3 communities not actively engaged in the WLRP, providing major project updates on the WL SRP, the remediation of the Low-Level Waste Trenches, and WR-1. CNL continues to engage where there is interest to do so.
Brokenhead Ojibway Nation	Canadian Nuclear Laboratories continued regular outreach with Brokenhead Ojibway Nation, providing regular updates on the WLRP, including major project updates on the WL SRP, the remediation of the Low-Level Waste Trenches, and WR-1. Canadian Nuclear Laboratories and Brokenhead Ojibway Nation met periodically throughout the year to discuss the remediation of the Low-Level Waste Trenches and the WLRP. In 2025 April CNL welcomed representatives from Brokenhead Ojibway Nation Chief and Council and the Lands Department for a tour of the WL site. The tour included a presentation on the Low-Level Waste Trenches and a tour of the WL WMA to support deeper engagement on the remediation of the Low-Level Waste Trenches.
Peguis First Nation	Discussions on the establishment of a Peguis First Nation – AECL – CNL Contribution Agreement continued throughout 2025, with an in-person leadership in 2025 April. A final agreement is expected to be established in early 2026 to provide Peguis First Nation with the capacity to engage on the WLRP, the WR-1 Project, the remediation of the Low-Level Waste Trenches, and the WL SRP. While a finalized Peguis First Nation – AECL – CNL Contribution Agreement was not finalized, CNL and Peguis First Nation continued to meet monthly, during which areas of interest, such as environmental monitoring, the WL SRP, Fuel Consolidation and Waste Transportation, the remediation of the Low-Level Waste Trenches, and WR-1 were discussed. Throughout 2025, Peguis First Nation attended several of CNL's webinars that discussed WL-related topics, including updates on the WL site, the Standpipes Non-

REDACTED

Community	Details
	Automated Waste Retrieval Project, the WL SRP, and the remediation of the Low-Level Waste Trenches. Notably, Peguis First Nation completed a technical review of the WR-1 Environmental Impact Statement, which CNL is addressing in parallel with the Federal Provincial Indigenous Review Team process.

Table 72: 2025 Indigenous Engagement Activities at the Whiteshell Laboratories Site

Date	On-Site Activity	Details
Manitoba Métis Federation (the National Government of the Red River Métis)		
2025 April 02	On-Site Training	The Manitoba Métis Federation attended the WLRP for RP training.
2025 May 29	Training	The Manitoba Métis Federation participated in the WLRP's Prairie Botanicals Mushroom Workshop.
2025 July 08	On-Site Monitoring	The Manitoba Métis Federation attended the WLRP to conduct well sampling at the WL site's WMA.
2025 August 14	On-Site Monitoring	The Manitoba Métis Federation attended the WLRP to conduct the WL WR-1 Bat Exit Survey.
Sagkeeng Anicinabe Nation		
2025	Niigan Aki On-Site Monitoring	Sagkeeng Anicinabe Nation's Niigan Aki program attended the WLRP 17 times throughout 2025 to participate in on-site environmental monitoring. Examples of Niigan Aki's participation in on-site monitoring included: • pH Monitoring of the Winnipeg River • Chaga and Cedar Walkdowns • WLRP Main Campus Well Sampling • Mushroom Collection • WR-1 Bat Exit Survey • Blueberry Collection Additional information on Sagkeeng Anicinabe Nation's participation in WL's environmental monitoring is outlined in Section 15.3.
2025 January 16	On-Site Meeting	Sagkeeng Anicinabe Nation attended the WLRP to finalize the Niigan Aki Work Plan and Budget.
2025 February 19	On-Site Meeting	Sagkeeng Anicinabe Nation attended the WLRP to finalize the Niigan Aki Work Plan and Budget.
2025 February 25	Site Tour	Sagkeeng Anicinabe Nation High School attended a site tour of the WLRP.
2025 April 02	On-Site Training	Sagkeeng Anicinabe Nation attended the WLRP for RP training.
2025 April 23	On-Site Lunch and Learn	Sagkeeng Anicinabe Nation attended the WLRP for the Earth Day Lunch and Learn.

REDACTED

Date	On-Site Activity	Details
2025 August 12	Site Tour	Sagkeeng Anicinabe Nation attended the WLRP for a tour to support the Future Visioning Proposal.
2025 August 14	On-Site Monitoring	Sagkeeng Anicinabe Nation attended the WLRP to conduct the WL WR-1 Bat Exit Survey.
2025 August 28	Site Tour	Sagkeeng Anicinabe Nation attended the WLRP to participate in the Manitoba Ministers' Tour and meeting.
2025 September 25	On-Site Monitoring	Sagkeeng Anicinabe Nation attended the WLRP to participate in the Mushroom Collection event held around the WL site.
2025 October 01	CNL Event	Sagkeeng Anicinabe Nation attended the WLRP for the WL Wellness Fair.
Black River First Nation and Hollow Water First Nation		
2025 April 02	On-Site Training	Black River First Nation/Hollow Water First Nation attended the WLRP for RP training.
2025 April 03	Core Engagement Team Meeting & Site Tour	Black River First Nation/Hollow Water First Nation attended the WLRP to attend the Core Engagement Team Meeting. The meeting focused on the remediation of the Low-Level Waste Trenches. The meeting included a tour of WL's WMA.
2025 August 14	On-Site Monitoring	Black River First Nation/Hollow Water First Nation attended the WLRP to conduct the WL WR-1 Bat Exit Survey.
2025 September 25	On-Site Monitoring	Black River First Nation/Hollow Water First Nation attended the WLRP to participate in the Mushroom Collection event held in the Greater WL area.
2025 October 14	Core Engagement Team Meeting & Site Tour	Black River First Nation/Hollow Water First Nation attended the WLRP to attend the Core Engagement Team Meeting. The meeting and tour focused on the WL SRP, specifically the end-state decision units.
Grand Council Treaty #3		
2025 September 25	On-Site Monitoring	Grand Council Treaty #3 attended the WLRP to participate in the Mushroom Collection event held around the WL site.
Peguis First Nation		
2025 April 30	On-Site Meeting	Peguis First Nation attended the WLRP for a Leadership meeting.
2025 September 25	On-Site Monitoring	Peguis First Nation attended the WLRP to participate in the Mushroom Collection event held around the WL site.
Brokenhead Ojibway Nation		
2025 August 07	On-Site Meeting and Tour	Brokenhead Ojibway Nation Chief and Council, and Lands Department attended the WLRP for a meeting on the remediation of the Low-Level Waste Trenches and a tour of the WL site's WMA.

REDACTED

15.3 Environmental Monitoring Activities with Indigenous Communities

In 2025, CNL and several Indigenous partners contributed to a joint panel at the Nuclear Waste Management, Decommissioning and Environmental Remediation Conference in Blue Mountain, Ontario. Representatives from Niigan Aki, Black River First Nation, Hollow Water First Nation, and the Algonquins of Pikwàkanagàn First Nation joined CNL to present on the incorporation of Indigenous Knowledge into CNL's environmental monitoring programs. The panel provided a platform to share the significance of on-site monitoring and highlighted the distinct roles and priorities of each Nation in stewarding their traditional territories.

CNL's collaboration with Sagkeeng Anicinabe Nation remained a central focus of 2025. Sagkeeng Anicinabe Nation's community-led environmental monitoring program, Niigan Aki, meaning Land First, continued to grow and mature as a rights-based initiative that empowers Sagkeeng Anicinabe Nation to monitor and steward its unceded traditional territory. Supported by AECL and CNL since 2022, the program advanced significantly during the year. Work in 2025 focused on strengthening the Sagkeeng Anicinabe Nation-CNL partnership, expanding participation, and identifying values of importance to the Nation within the WL site. Niigan Aki contributed to both community-based initiatives, such as Treaty Days events and high-school presentations, and on-site monitoring activities.

Notable progress towards Sagkeeng Anicinabe Nation's priorities included sampling for Chaga and partnering with Manitoba Conservation to collect deceased Sturgeon from research netting along the Winnipeg River for subsequent analysis. Niigan Aki also participated in activities such as pH monitoring of the Winnipeg River, mushroom collection, and over 17 additional on-site monitoring events. The program also played a role in youth and community outreach, including environmental presentations at the Sagkeeng Anicinabe High School and Earth Week activities at the WL site.

Engagement with Black River First Nation and Hollow Water First Nation also remained a priority with members of the Black River First Nation/Hollow Water First Nation Core Engagement Team. Black River First Nation/Hollow Water First Nation visited the WL site to participate in monitoring initiatives, including the WR-1 bat exit survey and mushroom collection. Both Nations advanced their own Guardianship initiatives, including the hiring of a Land Guardian, and CNL continued to encourage their participation in all 2025 field sampling activities through an open invitation approach.

In 2025, CNL continued to rebuild a productive working relationship with the Manitoba Métis Federation to enable full participation of Red River Métis Citizens in the various WL projects, including licensing, economic development, and environmental protection opportunities. CNL and the Manitoba Métis Federation continued information sharing and engagement, with increased involvement, for on-site activities, including environmental monitoring, on-site RP training, and a tour of the CNL WL.

The WL Environmental Protection team continued to support Indigenous engagement through monthly meetings, during which environmental monitoring results and environmental protection topics were discussed in detail.

REDACTED

One of the key communication achievements of 2025 was the release of CNL's second annual plain-language environmental monitoring brochure. Developed directly in response to Indigenous feedback requesting clearer communication of technical results, the 2025 brochure incorporated more Nation-specific engagement during its development, expanded use of photos and graphics, and revised the topics highlighted to better reflect community interests. The brochure focused on areas such as the monitoring of fish, water, game meat, and garden crops, and included descriptions of Indigenous-focused initiatives on site and in the surrounding area, including chaga collection, mushroom collection, wild rice sampling, and berry collection. This brochure will continue to be published annually.

Through continuous dialogue with Indigenous Nations, CNL has expanded the WL environmental monitoring program to include community-identified Valued Components such as wild mushrooms, berries, wild rice, as well as the exploratory analysis of chaga and sturgeon. These additions help build trust and confidence that traditional foods and medicines near the WL site can be safely harvested and consumed. As Niigan Aki and other Guardian programs continue to grow, the scope of Valued Components may also expand, supported by WL and the Indigenous Relations Program.

In 2026 and beyond, CNL remains committed to its relationship-centred approach. CNL will continue to offer an open invitation for Indigenous Nations to participate in on-site environmental monitoring, provide monthly environmental updates, and seek ongoing input from Nations to strengthen the Environmental Protection Program.

REDACTED

16 Acronyms

ACMR	Annual Compliance Monitoring Report
AECL	Atomic Energy of Canada Limited
ALARA	As Low As Reasonably Achievable
ALWTC	Active Liquid Waste Treatment Centre
Am	Americium
ATG	Analytical Test Group
Ba	Barium
BOD	Biological Oxygen Demand
Bq	Becquerel
C	Carbon
CBOD	Carbonaceous Biochemical Oxygen Demand
CBOP	Continuous Behavioural Observation Program
CCSF	Concrete Canister Storage Facility
CFC	Chlorofluorocarbons
CNL	Canadian Nuclear Laboratories
CNSC	Canadian Nuclear Safety Commission
Co	Cobalt
CRC	Curriculum Review Committee
CRL	Chalk River Laboratories
Cs	Cesium
CSA	Canadian Standards Association
DCP	Dose Control Point
DDP	Detailed Decommissioning Plan
DRL	Derived Release Limit
DROL	Designated Representative of the Licensee
EOC	Emergency Operations Centre
ERM	Environmental Remediation Management
FPOP	Fire Protection Oversite Plan
FSA	Functional Support Area

REDACTED

GHG	Greenhouse Gas
HCF	Hot Cell Facility
HSSE	Health, Safety, Security, Environment
IAEA	International Atomic Energy Agency
ICP	Inductively Coupled Plasma Spectrometry
IFTF	Immobilized Fuel Test Facility
ILW	Intermediate-Level Waste
ImpAct	Improvement Action
ISO	International Standards Organization
ITM	Inspections, Testing and Maintenance
K	Potassium
LGD	Local Government District
LLD	Lower Limit of Detection
LLLW	Low-Level Liquid Waste
LLLWTS	Low-Level Liquid Waste Treatment System
LLW	Low-Level Waste
LMDL	Laboratory Method Detection Limit
LMS	Learning Management System
LUES	Land Use and End State
MDL	Method Detection Limit
MMF	Manitoba Métis Federation
MPNU	Most Probable Number Unit
MUND	Mobile Unmanned Neutron Detector
NEW	Nuclear Energy Worker
Nb	Niobium
NCS	Nuclear Criticality Safety
NLPC	Nuclear Laboratory Partners of Canada
NNC	Notice of Non-compliance
NPRI	National Pollutant Release Inventory
NSO	Nuclear Security Officer

REDACTED

OPEX	Operating Experience
OSH	Occupational Safety and Health
PAD	Personal Alarming Dosimeter
PCB	Polychlorinated Biphenyl
PIP	Periodic Inspection Plan
PLC	Public Liaison Committee
PM	Particulate Matter
PMM	Preventative Maintenance Mandatory
PMR	Preventative Maintenance Regulatory
Pu	Plutonium
QAP	Quality Assurance Plan
R&D	Research and Development
RAT	Radiological Assessment Team
REGDOC	Regulatory Document
RCMP	Royal Canadian Mounted Police
RISE	Responsibility in Supervising Employees
RLP	Radioisotope Laboratory Protocol
RM	Rural Municipality
RMDL	Regulation Method Detection Limit
RP	Radiation Protection
RSTD	Relative Standard Deviation
SAR	Safety Analysis/ Assessment Report
SAT	Systematic Approach to Training
SCA	Safety and Control Area
SF	Shielded Facilities
SMAGS	Shielded Modular Above Ground Storage
Sr	Strontium
SRP	Site Restoration Plan
Sv	Sievert
Tc	Technetium

REDACTED

TDG	Transportation of Dangerous Goods
TFRE	Thorium Fuel Processing Experiment
TLD	Thermoluminescent Dosimeters
TOE	Technical Operability Evaluations
TPU	Territorial Planning Unit
TSS	Total Suspended Solids
U	Uranium
WBC	Whole Body Counter
WEEE	Waste Electrical and Electronic Equipment
WL	Whiteshell Laboratories
WLRP	Whiteshell Laboratories Restoration Project
WMA	Waste Management Area
WR-1	Whiteshell Reactor 1
Y	Yttrium

REDACTED

17 References

[1] *Comprehensive Study Report*, Whiteshell Laboratories Decommissioning Project, WLDP-03700-041-000, Volume 1 and 2, Revision 2, 2001 March; and Volume 3, Revision 0, 2001 November.

[2] Canadian Nuclear Safety Commission, *Nuclear Research and Test Establishment Decommissioning Licence, Whiteshell Laboratories*, Licence No. NRTEDL W5-8.00/2027. Expiry Date: 2027 December 31.

[3] Canadian Nuclear Safety Commission, *Nuclear Research and Test Establishment Decommissioning Licence, Whiteshell Laboratories, Licence Conditions Handbook, NRTEDL-LCH-08.00/2027,* WLD-508760-HBK-003, Revision 0, 2025 January 01.

[4] Canadian Nuclear Safety Commission, *Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills*, REGDOC-3.1.2, Version 1.0, 2018 January.

[5] *Annual Compliance Monitoring Report for CNL*, 145-00583-ACMR-011609, Revision 0, 2026 April.

[6] Letter, S. Brewer to N. Greencorn, *Notification of Change in Designated Representative of the Licensee – Appointment of Facility Authority for Several Facilities at Whiteshell Laboratories*, 145-CNNO-25-0067-L, 2025 December 08.

[7] Honorable G. Rickford, P.C., M.P., Minister of Natural Resources Canada, Letter to M. Binder, President and Chief Executive Officer, Canadian Nuclear Safety Commission, 2015 July 31.

[8] Letter, A. Tisler to N. Greencorn, *Submission of the Information Regarding Financial Guarantees for all Atomic Energy of Canada Limited Sites Operated by Canadian Nuclear Laboratories*, 145-CNNO-25-0038-L, 2025 August 19.

[9] Letter, N. Greencorn to A. Tisler, *CNL-CRL – CNSC Staff Review of Canadian Nuclear Laboratories' Submission of the Information Regarding Financial Guarantees for all Atomic Energy of Canada Limited Sites Operated by Canadian Nuclear Laboratories*, e-Doc 7568825 (145-NOCN-25-0038-L), 2025 October 02.

[10] *WL Quality Assurance Plan*, WL-508300-QAP-001.

[11] *Management System*, 900-514100-MAN-001.

[12] Canadian Standards Association, *Management System Requirements for Nuclear Facilities*, CSA N286:12, 2017.

[13] Canadian Standards Association, *Decommissioning Quality Assurance for Nuclear Power Plants*, CSA N286.6, 1998.

[14] *Integrated Assessment Plan*, 900-514200-MCP-003171.

[15] *Nuclear Safety and Control Act*, S.C. 1997, c.9, Government of Canada. Minister of Justice, Current to February 2013.

[16] Canadian Nuclear Safety Commission, *Fitness for Duty, Managing Worker Fatigue*, REGDOC-2.2.4, Revision 0, 2017 March.

REDACTED

[17] *Application of the Systematic Approach to Training (SAT) at CNL, 900-510200-LST-001, Revision 4, 2024 June 03.*

[18] *Designated Representatives of the Licensee, Site Licences, Certificates & Permits*, 900-514300-LST-001.

[19] *Engineering Change Control*, 900-508130-MCP-001.

[20] *Standpipe and Bunker Waste Retrieval Project – Review of Licencing Basis*, WLDP-01321-REPT-002988, Revision 1.0, 2025 April.

[21] Letter, M. Hammell (CNL) to B. Nguyen (CNSC), *Assembly and Operation of the Standpipe and Bunker Waste Retrieval System at Whiteshell Laboratories Waste Management Area*, WLD-CNNO-25-0030-L, 2025 April 29.

[22] Letter, B. Nguyen (CNSC) to M. Hammell (CNL), *CNSC Staff Review of CNL's Licensing Basis Assessment for the Assembly and Operation of the Standpipe and Bunker Waste Retrieval System at Whiteshell Laboratories Waste Management Area*, WLD-NOCN-25-0032-L, 2025 July 31.

[23] *WL Pressure Boundary Quality Assurance Plan*, WL-508140-QAP-001.

[24] Canadian Nuclear Safety Commission, *Aging Management,* REGDOC-2.6.3, 2014 March.

[25] Canadian Standards Association, *General principles for the management of radioactive waste and irradiated fuel*, National Standard of Canada, CAN/CSA N292.0:19, 2019.

[26] *Storage with Surveillance Plan for Whiteshell Laboratories Building 100 – Whiteshell Reactor 1*, WLD-508330-SWS-000024, Revision 2.2, 2025 October.

[27] *Periodic Inspection Plan for Whiteshell Laboratories WMA Concrete Bunkers*, WLWMA-106100-MP-004252, Revision 0, 2025 May.

[28] *Radiation Protection Regulations,* Canada Gazette Part II, Vol. 134, No. 13, SOR/DORS/2000-203, 2010 March 09.

[29] Canadian Standards Association*, Environmental Monitoring Programs at Nuclear Facilities*, National Standard of Canada, CAN/CSA-N288.4-25, 2025.

[30] Canadian Standards Association*, Effluent and Emissions Monitoring Programs at Nuclear Facilities*, National Standard of Canada, CAN/CSA-N288.5-22, 2022.

[31] Canadian Standards Association*, Environmental Risk Assessments at Nuclear Facilities and Uranium Mines and Mills,* National Standard of Canada, CAN/CSA-N-288.6-22, 2022.

[32] Canadian Standards Association*, Groundwater Protection and Monitoring Programs for Nuclear Facilities and Uranium Mines and Mills*, National Standard of Canada, CAN/CSA-N-288.7-23, 2023.

[33] Canadian Standards Association*, Establishing and Implementing Action Levels for Releases to the Environment from Nuclear Facilities*, National Standard of Canada, CAN/CSAN288.8-17, 2017.

[34] CSA/ISO-14001 (2015), Environmental Management Systems.

[35] *WL Effluent Verification Monitoring Plan,* WL-509200-PLA-001, Revision 1, 2023 September.

REDACTED

[36] CSA/ISO/IEC 17025:2017, Laboratory Accreditation Program.

[37] *2025 Progress Report on the Environmental Assessment Follow-Up Program for Whiteshell Laboratories*, WL-509246-ACMR-011694.

[38] *Environmental Monitoring in 2025 at Whiteshell Laboratories*, WL-509243-ACMR-011691.

[39] *Derived Release Limits for CNL's Whiteshell Laboratories*, WL-509211-RRD-001, Revision 6, 2021 January 31.

[40] Canadian Standards Association*, Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities*, National Standard of Canada, CAN/CSA-N288.1-08, Second Edition, Update No. 1, 2011 May.

[41] *Standard Administrative Levels and Action Levels for WL Air and Liquid Radioactive Effluents,* 900-509200-STD-016, Revision 0, 2021 June.

[42] Health Canada, *Guidelines for Canadian Drinking Water Quality – Summary Table* 2017 February.

[43] Betcher, R.N., Gascoyne, M., and Brown, D., *Uranium in Groundwaters of Southeastern Manitoba, Canada, Canadian Journal of Earth Sciences*, Volume 25, pages 2089-2103, 1988.

[44] Ontario Ministry of the Environment, *Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater*, Queen's Printer for Ontario, 2016 January.

[45] The Canada Gazette, Part I, Volume 144, No. 12, *Federal Wastewater System Effluent Regulations*, 2012 June 29.

[46] *Administrative Levels and Action Levels for WL Non-Radiological Effluent Standard*, 900-509200-STD-017, Revision 1, 2025 August.

[47] Canadian Environmental Protection Act, 1999 (S.C. 1999, c. 33).

[48] Environment Canada, *Guide for Reporting to the National Pollutant Release Inventory* (NPRI 2016, En81-1E-PDF).

[49] Canada Gazette Part I, Volume 157, Number 49: Supplement 1, *Notice with Respect to Reporting of Greenhouse Gases for 2024 and 2025*, 2023 December 09.

[50] The Canada Gazette, Part II, Volume 137, No.18, *Canadian Environmental Protection Act, 1999* Federal Halocarbon Regulations, 2003 August 13.

[51] *Impairment, Notification and Compensatory Measures,* 900-508720-MCP-006, Revision 2, 2024.

[52] CSA N393-13 - *Fire Protection for Facilities that Process, Handle, or Store Nuclear Substance,* Canadian Standards Association, 2013.

[53] *Canadian Nuclear Laboratories Integrated Waste Strategy*, CW-508600-PLA-002.

REDACTED

[54] Letter, B. Nguyen (CNSC) to R. Swartz (CNL), *CNL-WL - CNSC Staff Review of CNL's Response Regarding the Revised Storage with Surveillance Plan for Whiteshell Laboratories Building 100 – Whiteshell Reactor 1*, WLD NOCN-25-0038-L, 2025 August 20.

[55] Letter, R. Swartz (CNL) to B. Nguyen (CNSC), *Submission of Revised Storage with Surveillance Plan for Whiteshell Laboratories Building 100 – Whiteshell Reactor 1*, WLD-CNNO-25-0061-L, 2025 September 17.

[56] Letter, R. Swartz (CNL) to K. Ross (CNSC), *Canadian Nuclear Laboratories Submission of Overview Detailed Decommissioning Plan Referenced in Whiteshell Laboratories Licence Conditions Handbook*, WLD-CNNO-23-0044-L, 2023 October 26.

[57] Letter, R. Swartz (CNL) to A. Stewart (CNSC), *Submission of Whiteshell Laboratories' Revised Shielded Facilities and Building 300 Detailed Decommissioning Plans*, WLD-CNNO-24-0017-L, 2024 March 26.

[58] *Whiteshell Laboratories Site Security Repor*t, EPS-14000-RPT-18.

[59] Canadian Nuclear Safety Commission, *REGDOC-2.12.1, High-Security Sites: Volume II: Criteria for Nuclear Security Systems and Devices,* 2018 April.

[60] Transportation of Dangerous Goods Regulations, SOR/2001-286, 2024 October 25.

[61] *Whiteshell Laboratories WR-1 Reactor Decommissioning Indigenous Engagement Report*, WLDP-26000-REPT-002, Revision 9, 2025 December 18.

[62] *Environmental Assessment Stakeholder Engagement Report – WR-1 In Situ Decommissioning*, WLDP-26000-REPT-010, Revision 6, 2024 December 18.

[63] Canadian Nuclear Safety Commission, *Indigenous Engagement*, REGDOC-3.2.2, Version 1.2, 2022 February.

[64] Government of Canada, *Aboriginal and Treaty Rights Information System*, Version 10.1, 2016.

[65] *Facility Authorization for the Operation of the Concrete Canister Storage Facility at Whiteshell Laboratories*, CCSF-00583-FA-001, Revision 2, March 3, 2023.

[66] *Facility Authorization for the Operation of the Shielded Facilities at the Whiteshell Laboratories* (formerly FA-25), WLSF-00583-FA-001, Revision 5, 2015 September.

[67] *Facility Authorization for the Operation of the Waste Management Area at the Whiteshell Laboratories*, WLWMA-00583-FA-001, Revision 3, 2015 December.

[68] Health Canada*, Guidelines for Canadian Drinking Water Quality Guideline Technical Document Radiological Parameters*, 2009*.*

[69] COG-05-3068, Chouhan, S.L., Yankovich, T.L., Davis, P.A., *Generic Environment Concentrations Below which No Effects are Expected on Non-Human Biota in Canada*, CANDU Owners Group Inc., 2006.

[70] *Chemical Analysis of the Initial Groundwater Samples from the Lac du Bonnet Batholith*, TR-21, 1979 February.

REDACTED

[71] *The WR-1 Reactor Phase I Decommissioning Interim End State Report – Facility Description*, RC-1290, Revision 1, 1996 March.

REDACTED

Appendix A Concrete Canister Storage Facility

A.1 Operations

The CCSF is operated under the WL Site Licence [2], in accordance with the requirements of the Facility Authorization [65]. Concrete storage canisters located at the CCSF have been used at WL since 1975 to store irradiated fuel; there are currently 16 canisters in use.

The CCSF was operated in compliance with practices and procedures approved for operation. All required surveys and inspections were completed in 2025, with the exception of air sampling from Canister C-8: see Section A.2 for more information.

Routine operations in the CCSF were carried out by the Facility Manager, Facility Supervisor, WMA/CCSF Operations Technologists and two WMA/CCSF-based utility workers, with support from other WL personnel as required.

In 2025, an Operations Technologist trainee completed their training and a new Operations Technologist trainee began their training program. A Facility Manager continued training.

In 2025, the CCSF continued to maintain the minimum staffing requirements outlined in the CCSF Facility Authorization [65]. Staffing was maintained at levels to provide the needed operational and safety support.

No program changes were made for the CCSF in 2025. Procedures are updated as part of the five-year review cycle for WL Nuclear Facilities operating procedures. Procedures were developed and added for fuel retrieval. A new revision of the Criticality Safety Document came into effect (see Section 4.2.1).

Building 435 was brought into service in the CCSF. It provides power for the Mobile Unmanned Neutron Detector (MUND) that supports IAEA monitoring of fuel retrieval.

Fuel consolidation activities began, with retrieval and shipment to CRL of three fuel baskets in 2025. Prior to fuel retrievals, equipment to be used was fit tested ensuring safe and compliant retrieval of three baskets.

REDACTED

A.2 Compliance Monitoring

Air Effluent Monitoring of Canister Liners

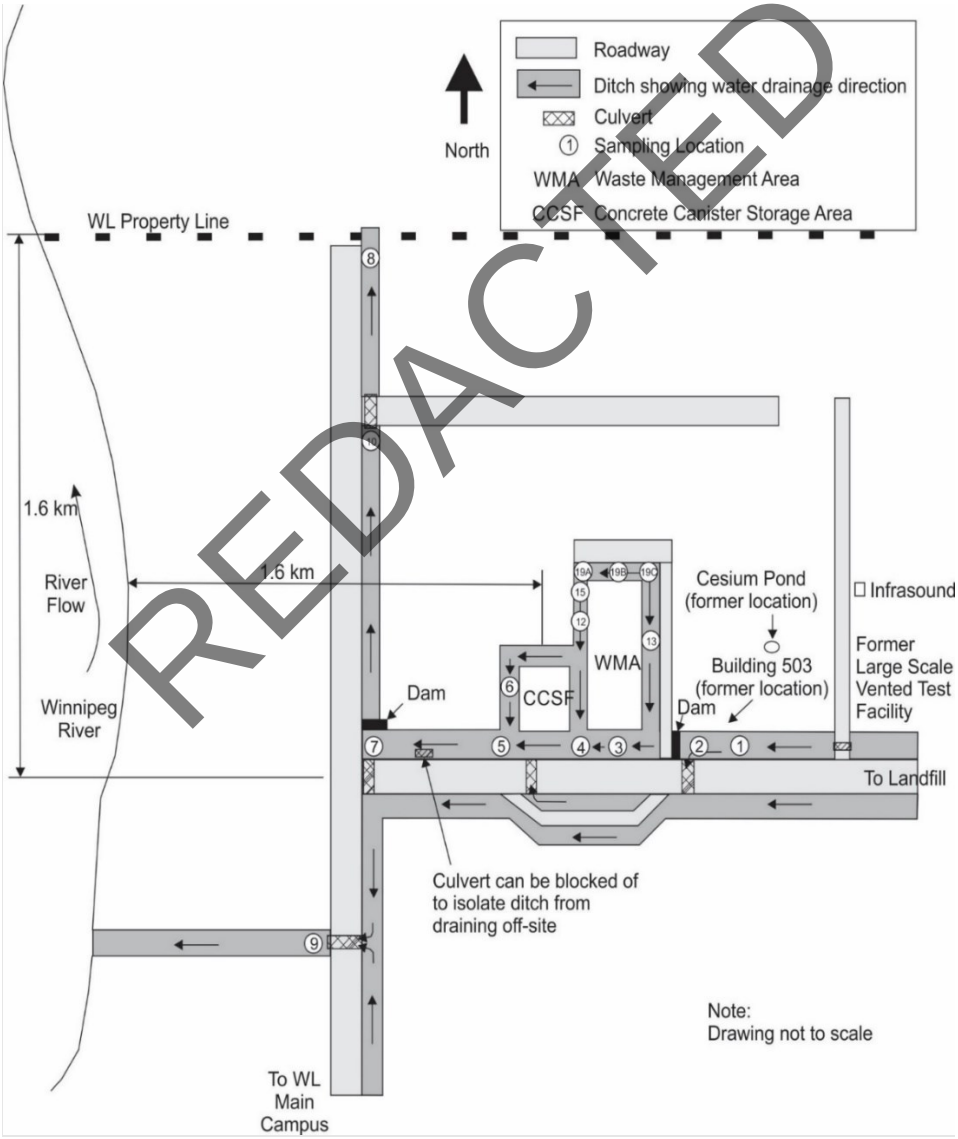
Each canister has a closed air-circulating system to monitor the internal space between the canister liner and the sealed fuel basket for the presence of fission products and moisture. Canisters are monitored for one week per month between April and November, dependent on weather. In 2025, readings began in May and concluded in September. Unlike previous years, limited airflow was established in Canister C8 by using a former thermocouple conduit to access the canister interior. This was successful in the trial, and a Change Request was initiated following Engineering Change Control to install an alternate air sampling line to this port. The installation is planned for 2026.

The gross beta activity was below or near the detection limit of 0.04 Bq/m^3 for all canisters that were measured.

There was no visible moisture detected from the internal canister space during 2025 monitoring from the canisters with air circulation; however, the silica gel used in the counting did change colour from blue to pink, indicating moisture in the air is present.

Monitoring of Ground and Surface Water

Figure 11 shows the drainage area surrounding the CCSF. Further details on monitoring and results of monitoring surface water can also be found in Sections 9.4.3.2 and 9.5.1.4, and compliance results for the CCSF are described below. Note that groundwater results are compiled for wells in the CCSF and WMA and are discussed in Appendix D.



REDACTED

Figure 11: Surface Water Drainage Sample Locations

Groundwater samples from deep-well sites in the vicinity of the CCSF are obtained twice yearly; the results are reported and discussed in Appendix D of this report.

Surface drainage water samples would provide the first indication of any abnormal activity levels attributed to the canisters. The frequency of surface drainage sampling is controlled by the amount of spring runoff and the amount of rainfall throughout the spring-to-fall period.

Table 73, Table 74, Table 75, and Table 76 list the results of the surface-water samples taken from the vicinity of the CCSF and WMA during 2025. Operational control monitoring data from previous years has been included for completeness.

If the beta activity in the surface water is above 10 Bq/L, an aliquot of the sample is submitted for gamma spectrometry analysis and processed for strontium (Sr)-90. Gamma spectrometry analysis provides individual results for cobalt (Co)-60, niobium (Nb)-94, antimony (Sb)-125, cesium (Cs-134, Cs-137), barium (Ba)-137m), promethium (Pm)-147 and americium (Am)-241.

If the alpha activity in the surface water is above 0.5 Bq/L, the sample is submitted for gamma spectrometry analysis and uranium analysis. In 2025, uranium analysis was also conducted for other sampling locations below the limit. Any detected gamma isotopes are evaluated against the applicable Maximum Acceptable Concentration established by Health Canada [42]. If uranium is detected, the result is evaluated against the Maximum Acceptable Concentration for uranium (0.5 Bq/L).

Ditch Location 5 and Ditch Location 6 samples (see Figure 11 for sampling locations) receive surface drainage from the CCSF. The were no samples taken at Ditch Location 6 due to ongoing low flow ditch water. Ditch Location 5 only had one measurable flow on 2025 October 21. The alpha activity at Ditch Location 5 (Table 74) was below the trigger level of 0.5 Bq/L. The uranium analysis was 18.90 ppb (Table 76).

Locations 5 and 10 contained elevated levels of tritium when compared to background measures obtained remote from the WMA (background is listed as a tritium value of 3 which is the background value at the limit of detection). In no cases was the Maximum Acceptable Drinking Water concentration of 7,000 Bq/L [42] exceeded. The activity seen is from the WMA as discussed in Appendix D.

REDACTED

Table 73: Gross Beta Activity of Surface Water Sample from Ditches around the Canister and Waste Management Area

Sample Locations	Sampling Data (total beta [a] Bq/L) in 2025	
	Apr 15	Oct 21
1	IF	IF
2	IF	0.77
3	IF	IF
4	IF	IF
5	IF	9.73
6	IF	IF
7	IF	IF
10	0.35	IF
19 A	IF	IF
19 B	IF	IF
19 C	IF	IF
Background	0.37	0.36

Historical Beta Data (average [b] Bq/L)						
Sample Location	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
5	0.61	IF	2.39	1.03	2.66	9.73

a The reference nuclide for total beta is Sr-90.
b Arithmetic average of samples collected.
IF = insufficient flow, water was stagnant in the ditch or ditch was dry.
ND – Non-Detectable Value below Minimum Detectible Concentration

REDACTED

Table 74: Gross Alpha Activity of Surface Water Sampled from Ditches around the Canister and Waste Management Area

Sample Locations	Sampling Data (total alpha [a] Bq/L) in 2025	
	Apr 15	Oct 21
1	IF	IF
2	IF	0.30
3	IF	IF
4	IF	IF
5	IF	0.22
6	IF	IF
7	IF	IF
10	0.23	IF
19 A	IF	IF
19 B	IF	IF
19 C	IF	IF
Background	0.25	0.38

Historical Alpha Data (average [b] Bq/L)						
Sample Location	2020	2021	2022	2023	2024	2025
5	0.36	IF	0.37	0.34	0.47	0.22

a The reference nuclide for total alpha is total uranium.
b Arithmetic average of samples collected.
IF = insufficient flow, water was stagnant in the ditch or ditch was dry.
ND – Non-Detectable Value below Minimum Detectible Concentration

REDACTED

Table 75: Tritium Activity of Surface Water Samples from Ditches around the Canister and Waste Management Area

Sample Locations	Sampling Data (total tritium Bq/L) in 2025	
	Apr 15	Oct 21
1	IF	IF
2	IF	4.71
3	IF	IF
4	IF	IF
5	IF	175
6	IF	IF
7	IF	IF
10	39	IF
19 A	IF	IF
19 B	IF	IF
19 C	IF	IF
Background	3	4.69

Historical Tritium Data (average[a] Bq/L)						
Sample Location	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
5	67	IF	157	198	143	175

a Arithmetic average of samples collected.
IF = insufficient flow, water was stagnant in the ditch or ditch was dry.
ND – Non-Detectable Value below Minimum Detectible Concentration

REDACTED

Table 76: Uranium in Surface Water Samples from Ditches around the Canister and Waste Management Area

Sample Locations	Sampling Data (uranium ppb) in 2025	
	Apr 15	Oct 21
1	IF	IF
2	IF	14.20
3	IF	IF
4	IF	IF
5	IF	18.90
6	IF	IF
7	IF	IF
10	39.13	IF
19 A	IF	IF
19 B	IF	IF
19 C	IF	IF
Background	1.49	11.60

Historical Uranium Data [a] (uranium ppb)						
Sample Location	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
5	11.3	IF	8.55	18.44	10.70	18.90

a Arithmetic average of samples collected.
IF = insufficient flow, water was stagnant in the ditch or ditch was dry.
ND – Non-Detectable Value below Minimum Detectible Concentration.

REDACTED

A.3 Facility Changes

All facility changes were performed as per the *Engineering Change Control* procedure [19]. There were no Category 1 and 2 changes in 2025. An IAEA MUND was installed in Building 435, a steel shed type structure, and was energized and commissioned. Temporary trailers were placed on the CCSF grounds to support fuel retrieval activities.

Table 77: Facility Changes

Building	Description	Category	Permanent / Temporary	Detailed Status
B435	MUND installed into B435 and building energized. Ensures compliance with IAEA Safeguards requirements and international non-proliferation commitments.	3	Permanent	Complete

A.4 Equipment Performance, Planned Maintenance Testing and Inspections

All canisters are checked for deviation from vertical annually. Out of 16 canisters, all displayed slight deviations from vertical in 2025. None of the canisters had a deviation greater than 1°. In 2025, Canister C5 had a deviation of 0.6° to the east and no deviation to the south (C5 is the most visible canister, and was the first noticed to be slightly off vertical). This deviation and those observed on other canisters show that they all display slight movements in response to changing soil moisture conditions and related swelling and contraction of the clay layer. If a canister was noted either through vertical deviation measurements or visually to be trending beyond a 2° to 3° deviation, corrective measures such as bracing would be considered.

As required by Section 8 of the Facility Authorization [65], all routine maintenance for systems required to be operational was carried out as per the Facility Maintenance Plan, and all equipment tests were complete. All monthly housekeeping and fire prevention inspections were completed.

Whiteshell Laboratories staff conducted general site inspections during each quarter of 2025.

Quarterly inspections of fuelled canisters have shown no significant cracking or spallation of concrete; however, existing cracks and pour pockets were regularly checked for changes, and it has been noted since 2020 that edges of many pour pockets are more brittle. Inspections of recently recoated canisters (C7, C16) show the coating is stable, and so the same material may be used to recoat other canisters in the future. No canisters were recoated in 2025.

Canister Site Monitoring and Surveillance

Gamma Field Surveys

Gamma exposure rates from the canisters were measured quarterly in 2025. These readings were taken in compass directions north-east-south-west, on contact, and 2.0 m from the canister wall at an elevation of 2.0 m above grade level.

No gamma field anomalies were found during 2025.

REDACTED

Table 78 shows the averaged gamma near contact exposure rates measured during 2025, and for the previous four years.

Table 78: Summary of Average Gamma Radiation for Near Contact Measurements from Fuelled Canisters (mrem/h)

Canister Number	Contact Measurements [a]					Canister Number	Contact Measurements [a]				
	Direction						Direction				
	North	East	South	West	Year		North	East	South	West	Year
C5	0.06	0.05	0.04	0.07	2025	C13	0.14	0.15	0.11	0.11	2025
	0.07	0.08	0.09	0.06	2024		0.16	0.18	0.10	0.11	2024
	0.08	0.03	0.05	0.08	2023		0.12	0.16	0.11	0.13	2023
	0.08	0.05	0.05	0.07	2022		0.16	0.15	0.15	0.18	2022
	0.08	0.08	0.07	0.08	2021		0.16	0.18	0.12	0.14	2021
C6	0.10	0.06	0.05	0.06	2025	C14	0.10	0.12	0.12	0.09	2025
	0.09	0.07	0.07	0.08	2024		0.11	0.14	0.12	0.10	2024
	0.06	0.06	0.02	0.04	2023		0.07	0.12	0.09	0.10	2023
	0.05	0.08	0.07	0.06	2022		0.08	0.13	0.12	0.10	2022
	0.08	0.08	0.08	0.08	2021		0.11	0.09	0.09	0.07	2021
C7	0.14	0.10	0.09	0.11	2025	C15	0.20	0.33	0.25	0.28	2025
	0.15	0.13	0.13	0.13	2024		0.25	0.32	0.26	0.28	2024
	0.13	0.12	0.10	0.11	2023		0.19	0.24	0.20	0.23	2023
	0.14	0.13	0.11	0.15	2022		0.24	0.33	0.27	0.31	2022
	0.11	0.14	0.09	0.14	2021		0.20	0.32	0.23	0.21	2021
C8	0.07	0.13	0.05	0.10	2025	C16	0.13	0.17	0.14	0.11	2025
	0.09	0.10	0.09	0.11	2024		0.16	0.20	0.14	0.14	2024
	0.07	0.06	0.06	0.05	2023		0.12	0.16	0.09	0.10	2023
	0.07	0.09	0.08	0.12	2022		0.19	0.17	0.13	0.13	2022
	0.11	0.12	0.10	0.10	2021		0.17	0.21	0.15	0.15	2021
C9	0.17	0.16	0.16	0.12	2025	C17	0.12	0.07	0.14	0.23	2025
	0.19	0.18	0.14	0.18	2024		0.13	0.10	0.17	0.17	2024
	0.14	0.16	0.13	0.14	2023		0.10	0.09	0.17	0.15	2023
	0.18	0.16	0.12	0.17	2022		0.10	0.10	0.19	0.18	2022
	0.23	0.18	0.16	0.18	2021		0.12	0.12	0.20	0.20	2021
C10	0.18	0.17	0.17	0.17	2025	C18	0.56	0.52	1.02	0.51	2025
	0.20	0.25	0.19	0.18	2024		0.56	0.68	1.10	0.58	2024

REDACTED

Canister Number	Contact Measurements [a]					Canister Number	Contact Measurements [a]				
	Direction						Direction				
	North	East	South	West	Year		North	East	South	West	Year
	0.15	0.21	0.14	0.13	2023		0.48	0.46	1.01	0.44	2023
	0.15	0.22	0.15	0.11	2022		0.65	0.64	1.39	0.49	2022
	0.16	0.20	0.17	0.13	2021		0.52	0.70	0.94	0.55	2021
C11	0.14	0.19	0.16	0.21	2025	C19	0.14	0.12	0.14	0.17	2025
	0.21	0.17	0.21	0.22	2024		0.15	0.13	0.11	0.16	2024
	0.15	0.15	0.14	0.19	2023		0.11	0.12	0.14	0.16	2023
	0.18	0.18	0.20	0.24	2022		0.17	0.13	0.17	0.19	2022
	0.25	0.17	0.21	0.27	2021		0.16	0.18	0.16	0.17	2021
C12	0.17	0.18	0.14	0.12	2025	C20	0.10	0.09	0.10	0.11	2025
	0.15	0.20	0.11	0.12	2024		0.15	0.12	0.13	0.15	2024
	0.10	0.16	0.09	0.10	2023		0.11	0.11	0.12	0.11	2023
	0.16	0.17	0.14	0.11	2022		0.16	0.09	0.12	0.14	2022
	0.16	0.15	0.12	0.08	2021		0.11	0.09	0.13	0.13	2021

a The measurements were made using a BOT P200 survey meter. The instruments are calibrated in milliroentgens per hour (mR/h), and it is assumed 1 mR/h = 1 millirem per hour (mrem/h).

REDACTED

Air Monitoring

Air monitoring was conducted on all but one of the canisters in the CCSF in 2025. This involved an air pump that circulates air from an outlet line on the canister through a Dexter filter and returns it through an inlet line. These readings are taken once per month over a period of approximately one work week during warm weather months. Typically, this is the six months of the year when air temperatures are normally above 0°C. Only five measurements were made in 2025 (May through September). As discussed in Section A.2, flow could not be established in the Canister 8 air lines from 2021 to 2025. In late 2025 an alterative approach to clearing the air line was attempted using a former thermocouple conduit into the canister interior. This was successful in the trial, and a Change Request was initiated following Engineering Change Control to install an alternate air sampling line to this port. The installation is planned for 2026.

Table 79 shows the averaged beta readings on each dexter filter measured during 2025, and for the previous four years.

Table 79: Summary of Average Beta Radiation Measurements from Fuelled Canisters (Bq/filter)

Canister Number	Average Air Sampling Measurements			Canister Number	Average Air Sampling Measurements		
	Number of Readings	Average Value (Bq/filter)	Year		Number of Readings	Average Value (Bq/filter)	Year
C5	5	<0.02	2025	C13	5	<0.02	2025
	5	<0.02	2024		5	0.02	2024
	5	0.02	2023		5	0.03	2023
	5	<0.02	2022		5	0.02	2022
	7	<0.02	2021		7	0.25	2021
C6	5	<0.02	2025	C14	5	<0.02	2025
	5	<0.02	2024		5	<0.02	2024
	5	<0.02	2023		5	<0.02	2023
	5	<0.02	2022		5	0.02	2022
	7	0.02	2021		7	<0.02	2021
C7	5	<0.02	2025	C15	5	<0.02	2025
	5	<0.02	2024		5	0.02	2024
	5	<0.02	2023		5	<0.02	2023
	5	<0.02	2022		5	<0.02	2022
	7	<0.02	2021		7	0.12	2021
C8	5	No Flow	2025	C16	5	<0.02	2025
	5	No Flow	2024		5	<0.02	2024
	5	No Flow	2023		5	<0.02	2023
	5	No Flow	2022		5	0.02	2022
	7	No Flow	2021		7	0.16	2021
C9	5	<0.02	2025	C17	5	<0.02	2025
	5	<0.02	2024		5	<0.02	2024
	5	<0.02	2023		5	0.02	2023
	5	<0.02	2022		5	<0.02	2022
	7	0.02	2021		7	<0.02	2021
C10	5	<0.02	2025	C18		<0.02	2025
	5	<0.02	2024			<0.02	2024
	5	<0.02	2023		5	0.02	2023
	5	<0.02	2022		5	0.02	2022

REDACTED

Canister Number	Average Air Sampling Measurements			Canister Number	Average Air Sampling Measurements		
	Number of Readings	Average Value (Bq/filter)	Year		Number of Readings	Average Value (Bq/filter)	Year
	7	<0.02	2021		7	0.03	2021
C11	5	<0.02	2025	C19	5	<0.02	2025
	5	<0.02	2024		5	<0.02	2024
	5	0.02	2023		5	<0.02	2023
	5	<0.02	2022		5	<0.02	2022
	7	0.03	2021		7	<0.02	2021
C12	5	<0.02	2025	C20	5	<0.02	2025
	5	0.02	2024		5	<0.02	2024
	5	0.02	2023		5	0.021	2023
	5	0.02	2022		5	<0.02	2022
	7	<0.02	2021		7	1.81	2021

A.5 Wastes Generated

Solid radioactive and/or hazardous waste was generated in the CCSF as part of routine operations. Volumes generated are captured as part of the waste volumes generated in the WMA. Refer to Section 11.1 Waste Management Program for summaries of the volume of radioactive solid waste generated in the WMA in 2025.

A.6 Effluents Released

There were no radioactive and/or hazardous effluents (gaseous or liquid) released into the environment from the CCSF as part of routine operations. Releases from WL facilities are provided and discussed in Section 9.

REDACTED

Appendix B Active Liquid Waste Treatment Centre

B.1 Operations

The ALWTC in Building 200 was previously demolished. This facility has been removed from the Licence Conditions Handbook [3].

Demolition of Building 200 above grade and 1.5 m below grade were completed in 2021 October. The demolition footprint is still fenced and protected. The fence will remain until the potentially contaminated ground can be remediated.

There were five waste bins containing Building 200 demolition waste that were waiting for repackaging and a disposition path to be shipped. These were all being stored inside the fenced-in demolition footprint and were monitored. These five bins were repackaged and shipped offsite in 2025. Five other bins of Building 200 waste were shipped offsite as well. There is some ILW waste, tanks AD-TK807 and AD-TK819, stored in containers in the Building 200 fenced-in demolition footprint waiting for a disposition path.

REDACTED

Appendix C Shielded Facilities

C.1 Operations

The WL SF operates under the WL Site Licence [2], in accordance with the requirements of the Facility Authorization [66]. The SF, consisting of the HCF and the IFTF, are located in the R&D Complex (Building 300).

The HCF Cells 1 to 5 and IFTF Cell 13 remain operational, while HCF Cells 6 to 11 have been shut down and partially dismantled.

Operations activities were conducted throughout the year. Operations activities included:

- maintenance of HCF and IFTF ventilation system equipment
- replacement of high-efficiency particulate air filters
- packaging and storage of radioactive waste
- cleanup activities
- routine maintenance to help ensure compliance with the WL Site Licence

Routine operations in the SF were carried out by operations staff. In 2024, a Facility Manager and Facility Authority were hired and began training. In 2025, the Facility Authority in training completed their training and is now a qualified and approved Facility Authority for the SF and WR-1. A new Facility Manager was hired in 2025 to replace the previous Facility Manager trainee and has begun their training. An Operations Technician was hired and has also begun training.

In 2025, the SF continued to maintain the minimum staffing requirements outlined in the SF Facility Authorization [66]. Staffing was maintained at levels to provide the needed operational and safety support.

No program changes were made for the SF in 2025. Procedures are updated as necessary as part of the five-year review cycle for WL Nuclear Facilities operating procedures. The SF has completed the five-year procedure update cycle on all of the facilities' operating procedures.

The Facility Authorization [66] document for the SF was revised and issued for use in 2025 (see Section 3.1).

Work has been done in the facility in preparation for the cancellation of Criticality Safety Documents CSD-24 and CSD-64. The process of formal cancellation is scheduled to be completed in 2026.

C.2 Facility Changes

All facility changes were performed as per the *Engineering Change Control* procedure [19]. There were no Category 1 or Category 2 changes to the SF in 2025.

REDACTED

C.3 Equipment Performance, Planned Maintenance Testing and Inspections

In 2025, routine maintenance for systems required to be operational was carried out as per the Facility Maintenance Plan including the building fire dampers, which were discovered during the Fire Protection Program internal self-assessment in 2023 as not being completed.

The Hot Cells Fixed Fire Suppression System had a Technical Operability Evaluation (TOE) conducted, and the Hot Cells were taken out of service until the replacement system/process is installed. In 2024 the TOE was completed, and a Fire Hazard Analysis for Building 300 Hot Cells' Dry Chemical Addition was submitted to and accepted by the CNSC. ABC and D fire powder were placed into Cells 1, 2, 4, and 5 as a replacement for the fixed fire suppression system. In 2025, ABC and D fire powder was placed into Cell 3 and all Cells 1-5 are back in service. Equipment tests and inspections were completed as per schedule. Monthly housekeeping and fire prevention inspections were also completed.

Ventilation System

Maintenance activities requiring part of the ventilation system to be taken down occurred without incident. In 2024, the IFTF Active exhaust system was impaired. The backup exhaust fan was out of service pending replacement of corresponding air flow damper. The installation of the replacement damper and return of a proper backup exhaust capability was completed in 2025 and the IFTF Active exhaust system is now fully operational.

The required annual routine poly-alpha-olefin testing of the HCF high-efficiency particulate air filters was successfully conducted.

REDACTED

C.4 Wastes Generated

Refer to Section 11.1 for summaries of the volume of low level and intermediate level radioactive solid waste generated in the SF in 2025. There was a campaign to remove all PCB containing equipment from the site. All PCBs were removed from the SF except for some ballasts in the fume hoods. These will be removed in early 2026.

Low-Level Liquid Waste Treatment System

Appendix E summarizes the volumes of LLLW processed through the LLLW system.

In 2025, 61.7 m^3 of LLLW was processed through the Building 300 LLLWTS.

Intermediate-Level Liquid System

All the ILLW from the HCF cells collects in the HCF sump tank, Active Drain Tank 1. The liquid is transferred via a manually controlled pump from Active Drain Tank 1 through a filtration system to Active Drain Tank 14 in the IFTF. The liquid from all other HCF ILLW drains and all IFTF ILLW drains flow by gravity to Active Drain Tank 14.

In 2025, there were no transfers of ILLW.

C.5 Effluents Released

Liquid radioactive and hazardous effluents discharged from the SF as part of routine operations are provided and discussed in Section 9.

REDACTED

Appendix D Waste Management Area

D.1 Operations

The WMA operates under the WL Site Licence [2], in accordance with the requirements of the *Facility Authorization for the Operation of the Waste Management Area at the Whiteshell Laboratories* [67]. During 2025, the WMA at WL was operated and monitored by WL staff.

In 2025, the WMA was operated in compliance with approved practices and procedures.

Routine operations in the WMA were carried out by the Facility Manager, Facility Supervisor, WMA Operators and two WMA-based utility workers, with support from WL personnel as required.

A Facility Manager began training in 2025, and a Facility Authority completed training and replaced the previous Facility Authority. An Operator hired in 2024 completed training and a new trainee began training based on the approved training plan in 2025.

In 2025, the WMA continued to maintain the minimum staffing requirements outlined in the WMA Facility Authorization [67]. Staffing was maintained at levels to provide the needed operational and safety support.

No program changes were made for the WMA in 2025. Procedure updating was completed as part of the five-year review cycle for WL Nuclear Facilities operating procedures. The WMA Safety Analysis Report underwent revision in 2024 and was under review in 2025. The Facility Authorization was revised based on the SAR and is in review.

Inventory Additions and Deletions

Changes in inventory are reported in Table 80 and for the purposes of reporting WMA inventory (fission products are defined as radioactive material originating from irradiated fuel).

Activation products are defined as any material that has been activated in a neutron flux, including corrosion products. The radioactivity values listed are those recorded at the time of storage.

Low-Level Solid Waste

Details of wastes transferred to the WMA are provided in Section 11.1.1. Waste generated from decommissioning work on the site was generally shipped to CRL for storage, although some waste was stored in the WMA in various locations. The stored volume of LLW is listed in Table 80.

Intermediate-Level Solid Waste

Details of wastes transferred to or from the WMA are provided in Section 11.1.1. One standpipe had all waste removed and a second had three waste items removed. Cemented drums of TFRE and Amine formerly stored in ILW8 and transferred to SF in 2020 was sent from site beginning in 2025.

REDACTED

Industrial Waste

There were no additions of industrial waste during 2025.

Table 80: Additions to Low-Level Waste Inventory

Period	Storage Locations	Volume (m^3)	Fission Products (GBq)	Activation Products (TBq)
Total Accumulation to 2024 December 31	Trenches 1 to 23, LLW 1 to 6, Buildings 431 to 433.	18,283.04[1]	1,963.21	330.58
Additions for 2025	Buildings 431 to 433	0	0	0
Removals for 2025	WMA General	429	4.21	0.01
	LLW Bunker 5	0	0	0
	Buildings 431 to 433	0	0	0
Total Accumulation as of 2025 December 31	Trenches 1 to 23, LLW 1 to 6, Buildings 431 to 433	17,854.04	1,959.00	330.57

1 – Volume removal based on container used in waste transport from site.

REDACTED

D.2 Compliance Monitoring

Monitoring and Surface Water

Surface Water

Figure 12 shows the drainage area surrounding the WMA.

Surface drainage water samples would provide the first indication of any abnormal activity levels attributed to the WMA. The WMA and CCSF share a network of perimeter compliance monitoring ditches with designated sampling locations. Water samples are collected in these sample locations for analyses when there is sufficient flowing water present but only once in a given week during flow events. This avoids putting particular emphasis on a given week for sample results. The frequency of surface drainage sampling is controlled by the amount of spring runoff and the amount of rainfall throughout the spring-to-fall period.

In 2025, there were two sampling periods where the ditch flow met the required flow conditions in at least some WMA-CCSF sample locations. Precipitation in 2025 (393 mm) was lower than in 2024 (494 mm) with little to no snow melt to create running water in the ditches.

In an effort to streamline the operational environmental monitoring process, surface water samples are initially analyzed for gross beta, gross alpha, and tritium. The results are then evaluated using the following screening criteria:

- If the beta activity in the surface water is above 10 Bq/L, an aliquot of the sample is submitted for gamma spectrometry and processed for Sr-90. Gamma spectrometry provides individual results for Co-60, Nb-94, Sb-125, Cs-134, Cs-137 (Ba-137m), Pm-147, Am-241.
- If the alpha activity in the surface water is above 0.5 Bq/L, the sample is submitted for gamma spectrometry and uranium analysis; however, as was the case for the last several years, all water samples were tested for uranium. Any detected gamma isotopes are evaluated against the applicable Maximum Acceptable Concentration established by Health Canada [42]. If uranium is detected, the result is evaluated against the Maximum Acceptable Concentration for uranium (0.5 Bq/L or 20 ppb).

Levels of beta activity at ditch sample Locations 1 to 7 (Table 81) all remained below 10 Bq/L. Based on historical data, it is conservatively assumed that the beta activity in the surface water is Sr-90 in secular equilibrium with yttrium (Y)-90. While some locations showed beta activity levels in the ditch water remaining below the drinking water screening level of 1 Bq/L, all were below the drinking water limit of 5 Bq/L for Sr-90 and 10 Bq/L for Cs-137 [68]. Compliance with Guidelines for Canadian Drinking Water [42] may be inferred if the measurement for gross alpha and gross beta is less than 0.5 Bq/L and 1.0 Bq/L, respectively. There was one exceedance of the Canadian Drinking Water [42] standard of 1.0 Bq/L gross beta (Table 81) in 2025 at Sample Location 5.

The alpha activity levels in the surface water are presented in Table 82. There were no flow results for Location 3.

Uranium results are presented in Table 83. Sample Location 3, which collects surface water from the south swale inside the WMA, did not have any flow at this location due to dry conditions. Sample Locations 19 A, B, and C along the north ditch of the WMA had been established to monitor for the uranium values believed to result from the use of local Lac du Bonnet Batholith granitic rock as base material for the Shielded Modular Above Ground Storage (SMAGS) foundation, as well as Cs-137 from the soil recovered from the former Cesium Pond that was previously stored in the area. Lac du Bonnet Batholith granitic rock had been also used for berm support material for the Cesium Pond pile; however, that material was removed from the WMA in 2018. The Lac du Bonnet Batholith granite is noted to have elevated naturally occurring uranium. Due to the dry conditions, no samples were obtained in 2025 (Table 83).

The tritium results are below the Maximum Acceptable Concentration of 7,000 Bq/L [42], as shown in Table 84. The WMA contains a number of trenches with varying amounts of low-level radioactive waste. Tritium was identified as potentially capable of migrating to the ditches surrounding the WMA. Based on the initial modelling [1], it was proposed that tritium would be present in the ditches (including the Locations 3 through 7 and 19 A, B, and C) and possibly reach levels as high as 37 kBq/L. While tritium has been noted to be elevated at some locations

REDACTED

immediately around the WMA, periodic monitoring of the ditches has indicated that the levels of tritium at the points (Locations 8 and 9) leaving CNL property remain quite low with the maximum value of 24.8 Bq/L in 2025 at Location 8.

The data include continuing documentation of a spill incident that occurred in 1979 near ILW Bunker 3, from the reference sample point (Location 3) in the southeast section of the WMA, as shown in Figure 12 and Figure 13. In 2017, sampling Location 3 was reconfigured to allow preparations for future bunker and standpipe remediation. Surface water at this location serves as an indicator of movement of water from ILW Bunkers 1, 2, and 3. No flow occurred at this location in 2025; when flow occurs it is compared to the radiation screening criteria used for identifying contaminants of potential ecological concern of 1.27E+07 Bq/L [69].

The Cesium Pond soil (Cs-137) that was stored in the WMA adjacent to Building 923 was removed in 2017. This area drained towards the north ditch and Locations 19 A, B, and C were designated to sample the ditch. Typically, there is seldom flow meeting monitoring requirements as shown in Table 85. Measurements taken in 2022, showed that no migration of Cs-137 to these ditches had occurred.

As Trench 16 has a known quantity of technetium-99 (Tc-99), Tc-99 measurements are performed as part of ditch water monitoring when flow occurs. No flow occurred in the east ditch in 2025. The Tc-99 limit for drinking water is 200 Bq/L [68]. Due to the low anticipated values, Tc-99 is not measured at the control point.

REDACTED

Table 81: Gross Beta Activity of Surface Water Samples from Ditches around the Concrete Canister Storage Facility and Waste Management Area

Sample Locations	Sampling Data (total beta [a] Bq/L) in 2025	
	Apr 15	Oct 21
1	IF	IF
2	IF	0.77
3	IF	IF
4	IF	IF
5	IF	9.73
6	IF	IF
7	IF	IF
10	0.35	IF
19 A	IF	IF
19 B	IF	IF
19 C	IF	IF
Background	0.37	0.36

ND – Non-Detectable Value below Minimum Detectible Concentration

IF – Insufficient Flow for a sample to be taken

Historical Beta Data (average [b] Bq/L)						
Sample Location	2020	2021	2022	2023	2024	2025
3	1.96	IF	1.52	IF	1.00	IF
19 A	IF	IF	0.51	IF	IF	IF
19 B	IF	IF	0.59	IF	IF	IF
19 C	IF	IF	0.31	IF	IF	IF

a The reference nuclide for total beta is Sr-90.
b Arithmetic average of samples collected.
c Single data point.
IF – insufficient flow, water was stagnant in the ditch, or ditch was dry.

REDACTED

Table 82: Gross Alpha Activity of Surface Water Samples from Ditches around the Concrete Canister Storage Facility and Waste Management Area

Sample Locations	Sampling Data (total alpha [a] Bq/L) in 2025	
	Apr 15	Oct 21
1	IF	IF
2	IF	0.30
3	IF	IF
4	IF	IF
5	IF	0.22
6	IF	IF
7	IF	IF
10	0.23	IF
19 A	IF	IF
19 B	IF	IF
19 C	IF	IF
Background	0.25	0.38

ND – Non-Detectable Value below Minimum Detectible Concentration

IF – Insufficient Flow for a sample to be taken

Historical Alpha Data (average [b] Bq/L)						
Sample Location	2020	2021	2022	2023	2024	2025
3	0.06	IF	0.30	IF	0.40	IF
19 A	IF	IF	0.54	IF	IF	IF
19 B	IF	IF	0.43	IF	IF	IF
19 C	IF	IF	0.36	IF	IF	IF

a The reference nuclide for total alpha is total uranium.

b Arithmetic average of samples collected.

c Single data point.

IF – insufficient flow, water was stagnant in the ditch, or ditch was dry.

REDACTED

Table 83: Uranium of Surface Water Samples from Ditches around the Concrete Canister Storage Facility and Waste Management Area

Sample Locations	Sampling Data (uranium ppb) in 2025	
	Apr 15	Oct 21
1	IF	IF
2	IF	14.20
3	IF	IF
4	IF	IF
5	IF	18.90
6	IF	IF
7	IF	IF
10	0.10	IF
19 A	IF	IF
19 B	IF	IF
19 C	IF	IF
Background	1.49	11.60

ND – Non-Detectable Value below Minimum Detectible Concentration.
IF – In sufficient Flow for a sample to be taken.

REDACTED

Historical Uranium Data (average [a] ppb)						
Sample Location	2020	2021	2022	2023	2024	2025
3	10.06	IF	8.50	IF	9.19	IF
19 A	IF	IF	21.32	IF	IF	IF
19 B	IF	IF	19.36	IF	IF	IF
19 C	IF	IF	13.23	IF	IF	IF

a Arithmetic average of samples collected.
b Based on single sample analyses.
IF – insufficient flow, water was stagnant in the ditch, or ditch was dry; NR = Analysis not required.

Table 84: Tritium Activity of Surface Water Samples from Ditches around the Concrete Canister Storage Facility and Waste Management Area

Sample Locations	Sampling Data (total tritium Bq/L) in 2025	
	Apr 15	Oct 21
1	IF	IF
2	IF	4.71
3	IF	IF
4	IF	IF
5	IF	175
6	IF	IF
7	IF	IF
10	39	IF
19 A	IF	IF
19 B	IF	IF
19 C	IF	IF
Background	3	4.69

ND – Non-Detectable Value below Minimum Detectible Concentration.
IF – Insufficient Flow for a sample to be taken.

REDACTED

Historical Tritium Data (average [a] Bq/L)						
Sample Location	2020	2021	2022	2023	2024	2025
3	348	IF	288	IF	406	IF
19 A	IF	IF	536	IF	IF	IF
19 B	IF	IF	534	IF	IF	IF
19 C	IF	IF	393	IF	IF	IF

a Arithmetic average of samples collected.
b Single data point.
IF – insufficient flow, water was stagnant in the ditch, or ditch was dry.

Table 85: Cesium-137 Results from Sample Locations 19 A, B, and C at the Waste Management Area

Sample Locations	Sampling Data (total Cs-137 Bq/L) in 2025	
	Apr 15	Oct 21
19A	IF	IF
19B	IF	IF
19C	IF	IF

Historical Cs-137 Data (average [a] Bq/L)						
Sample Location	2020	2021	2022	2023	2024	2025
19 A	IF	IF	<1	IF	IF	IF
19 B	IF	IF	<1	IF	IF	IF
19 C	IF	IF	<1	IF	IF	IF

a Arithmetic average of sample collected.
b Single data point.
IF – insufficient flow, water was stagnant in the ditch, or ditch was dry.

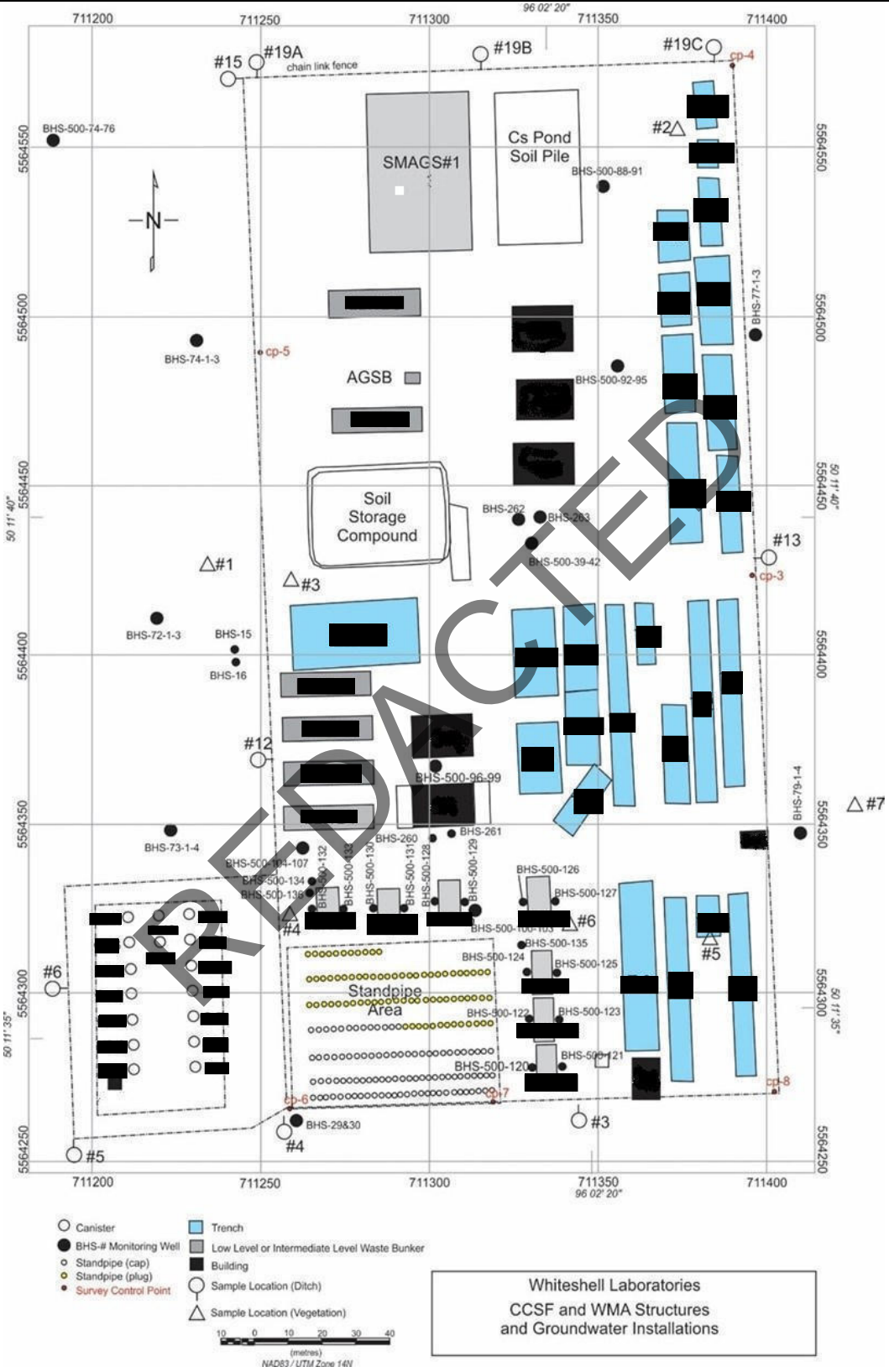
REDACTED

Table 86: Technetium-99 Results from Surface Water Samples from Ditches around the Concrete Canister Storage Facility and Waste Management Area

Sample Locations	Sampling Data (total Tc-99 Bq/L) in 2025	
	Apr 15	Oct 21
1	IF	IF
2	IF	IF
3	IF	IF
4	IF	IF
5	IF	IF
6	IF	IF
7	IF	IF
10	ND	IF
19 A	IF	IF
19 B	IF	IF
19 C	IF	IF
Background	NM	NM

ND – Non-Detectable Value below Minimum Detectible Concentration
IF – Insufficient Flow for a sample to be taken
NM – not measured at the location

REDACTED



REDACTED

Figure 12: Groundwater Sample Locations

Intermediate-Level Waste Bunker Near Field Wells

A series of shallow near field wells were installed adjacent to the ILW bunkers in the WMA in 2015 (Figure 11). Groundwater samples were taken from the wells and from water in the ILW Bunkers for comparison. Cesium-137, Sr-90, and tritium were selected as the radionuclides for monitoring of the potential for contaminant migration. Cesium-137 was selected as the least mobile, with a high affinity for bonding with clay-based minerals, Sr-90 is more mobile but will bond with sand, and tritium is the most mobile that moves with water. Cesium-137 and Sr-90 require a pathway (e.g., a construction joint or crack) to migrate from a bunker. In 2025, Sr-90 was noted to be a maximum of 21 Bq/L adjacent to ILW Bunker 1, and 188 Bq/L adjacent to ILW Bunker 3. This is an increase at ILW Bunker 3 where the maximum recorded value in 2024 was 116 Bq/L. For all other sampling locations, the Sr-90 and Cs-137 levels were minor or negligible. Tritium can move through concrete without cracks by diffusion with water movement. The results indicate no migration of Cs-137 (Table 87) from the ILW Bunkers, and Sr-90 (Table 88) showing limited migration at ILW Bunker 1 and 3. The tritium levels (Table 89) are orders of magnitude below the levels observed in the water in the adjacent ILW Bunkers. At ILW Bunker 3, the tritium results remain high (177,000 Bq/L), increasing substantially from the previous year (73,096 Bq/L). This value also represents a new 5 year high - the previous high was 150,411 Bq/L in 2022. At ILW Bunker 5, tritium was a maximum of 9,480Bq/L. The changes are likely resulting from a much drier year which lowers groundwater tables so diffusion of tritium from bunker is increased due to an increased hydraulic gradient. Tritium does not require a crack in the concrete and can move by diffusion. An existing well approximately 1 m from the northwest corner of ILW Bunker 3 shows 2,660 Bq/L indicating the elevated tritium adjacent to ILW Bunker 3 is occurring locally.

REDACTED

Table 87: Cesium-137 Activity of Near Field Wells Adjacent to Intermediate-Level Waste Bunkers

Wells	Bunker[a]	Well Sample Values (Bq/L)				
	Bq/L	2021	2022	2023	2024	2025
ILW Bunker 1	31,762					
BHS 500-120		<1	<1	<1	<1	<1
BHS 500-121		<1	<1	<1	<1	<1
ILW Bunker 2	1,170					
BHS 500-122		<1	<1	<1	<1	<1
BHS 500-123		<1	<1	<1	<1	<1
ILW Bunker 3	413					
BHS 500-124		<1	<1	<1	<1	<1
BHS 500-125		<1	<1	<1	<1	<1
BHS 500-135		<1	<1	<1	<1	<1
ILW Bunker 4	12,240					
BHS 500-126		<1	<1	<1	<1	<1
BHS 500-127		<1	<1	<1	<1	<1
ILW Bunker 5	45,100					
BHS 500-128		<1	<1	<1	<1	<1
BHS 500-129		<1	<1	<1	<1	<1
ILW Bunker 6	1,363,275					
BHS 500-130		<1	<1	<1	<1	<1
BHS 500-131		<1	<1	<1	<1	<1
ILW Bunker 7	2,794,750					
BHS 500-132		<1	<1	<1	<1	<1
BHS 500-133		<1	<1	<1	<1	<1
BHS 500-136		<1	<1	<1	<1	<1

a Bunker values from 2015 samples.

REDACTED

Table 88: Strontium 90 Activity of Near Field Wells Adjacent to Intermediate-Level Waste Bunkers

Wells	Bunker [a]	Well Sample Values (Bq/L)				
	Bq/L	2021	2022	2023	2024	2025
ILW Bunker 1	98,300					
BHS 500-120		33.9	25.7	29.4	29.1	21.2
BHS 500-121		4.15	6.91	3.70	3.85	3.25
ILW Bunker 2	865					
BHS 500-122		0.68	0.38	0.71	1.05	0.62
BHS 500-123		1.08	1.57	1.23	1.86	1.51
ILW Bunker 3	26,950					
BHS 500-124		19.8	38.9	38.5	116	188
BHS 500-125		0.69	<0.10	0.19	<0.10	0.31
BHS 500-135		0.75	1.61	1.04	0.998	0.45
ILW Bunker 4	2,485					
BHS 500-126		0.7	0.21	0.24	0.11	0.55
BHS 500-127		0.56	0.15	0.32	0.31	0.39
ILW Bunker 5	3,850					
BHS 500-128		<0.10	<0.10	0.05	<0.10	0.37
BHS 500-129		<0.10	<0.10	0.04	<0.10	0.72
ILW Bunker 6	157,500					
BHS 500-130		<0.10	<0.10	<0.10	<0.10	0.31
BHS 500-131		<0.10	<0.10	0.51	<0.10	0.43
ILW Bunker 7	3,335					
BHS 500-132		<0.10	<0.10	<0.10	0.15	0.34
BHS 500-133		<0.10	<0.10	<0.10	<0.10	0.49
BHS 500-136		<0.10	<0.10	<0.10	<0.10	0.47

a Bunker values from 2015 samples

REDACTED

Table 89: Tritium Activity of Near Field Wells Adjacent to Intermediate-Level Waste Bunkers

Wells	Bunker [a]	Well Sample Values (Bq/L)				
	Bq/L	2021	2022	2023	2024	2025
ILW Bunker 1	42,000					
BHS 500-120		700	105	168	306	446
BHS 500-121		1,230	1,514	603	962	1,010
ILW Bunker 2	6,100					
BHS 500-122		966	6,697	7,738	857	3,131
BHS 500-123		2,942	2,833	3,793	2,703	3,950
ILW Bunker 3	4,600,000					
BHS 500-124		126,326	150,411	76,569	73,096	177, 000
BHS 500-125		2,349	2,457	2,328	2,002	1,900
BHS 500-135		3,372	7,579	3,282	3,783	2,660
ILW Bunker 4	41,000					
BHS 500-126		20	36	132	116	228
BHS 500-127		45	ND	135	62	519
ILW Bunker 5	5,500,000					
BHS 500-128		2,748	2,916	2,860	3,098	2,650
BHS 500-129		11,051	7,092	10,345	9,840	9,480
ILW Bunker 6	210,000					
BHS 500-130		50	19	22	15	13
BHS 500-131		4	20	16	21	8
ILW Bunker 7	970,000					
BHS 500-132		94	93	73	70	59
BHS 500-133		20	4	19	5	5
BHS 500-136		97	87	130	92	66

a Bunker values from 2015 samples

ND = not detected; NR = analysis not required.

REDACTED

Water Table Wells and Deep Wells

Water samples were collected from wells in and around the WMA (Figure 12) in the spring and fall of 2025. The averaged gross alpha and gross beta results are summarized in Table 90. The average beta activity levels in the clay, clay till, and basal zone wells remained below the drinking water screening level of 1 Bq/L. All clay, clay till, and basal zones were below the drinking water limit for Sr-90 (5 Bq/L) and Cs-137 (10 Bq/L) [42].

The average alpha activity in the samples collected from the wells showed a slight decrease or were similar compared to results from the past year.

Uranium concentrations in the basal zone wells ranged from 0 to 0.09 Bq/L. The concentrations in the clay zone wells ranged from 0.19 to 1.43 Bq/L, and in the clay till from 0.21 to 2.87 Bq/L.

Since it is known that the local well waters within the Canadian Shield contain naturally occurring uranium [70], the presence of uranium and its progeny are not unexpected and are considered to account for the levels of alpha.

Low levels of tritium were noted in the clay (averaging 10.50 Bq/L) and clay till (averaging 10.00 Bq/L). This is not unexpected as these overburden layers are impacted by tritium in the WMA. The basal layer averaged 6.00 Bq/L. Some tritium results showed higher values as indicated by the large range.

Table 90: Monitoring Data Water Table Wells and Deep Wells

WMA Sample Locations	2021 Avg. (Bq/L)	2022 Avg (Bq/L)	2023 Avg (Bq/L)	2024 Avg (Bq/L)	2025 Avg (Bq/L)	2025 Avg. Range (Bq/L)
Total Beta [a]						
Clay	0.43	0.48	0.61	0.47	0.53	0.19 – 1.43
Clay Till	0.45	1.23	0.64	0.65	0.86	0.21 – 2.87
Basal	0.25	0.46	0.37	0.34	0.26	0.10 – 0.44
Total Alpha [b]						
Clay	0.67	0.64	0.67	0.49	0.44	0.12-0.95
Clay Till	0.58	3.44	0.94	0.95	1.39	0.16-6.48
Basal	0.19	0.32	0.29	0.21	0.19	0.06-0.37
Total Uranium [c]						
Clay	0.82	0.76	0.80	0.63	0.72	0.25-1.40
Clay Till	0.55	0.77	0.91	1.20	1.56	0.003-6.18
Basal	0.03	0.02	0.02	0.02	0.014	0.003-0.09
Total Tritium						
Clay	10.37	9.02	10.39	6.65	10.50	3.00-53.70
Clay Till	11.33	12.78	10.11	7.67	10.00	3-39
Basal	3.59	4.77	4.51	12.70	6.00	3.00-45.67

a The reference nuclide for total beta is Sr-90.
b The reference nuclide for total alpha is natural uranium.
c The value calculated from the concentration of uranium in the water sample.

REDACTED

High-Level Liquid Waste Tray Water

Monitoring of the high-level liquid waste tank tray water associated with Building 417 was carried out to confirm there is no leakage from the residue remaining in the storage tanks. This water is sampled in the summer months. The sample results indicated no leakage has occurred from the tanks. The data are summarized in Table 91. In the late fall of 2004, the high-level liquid waste was removed from high-level liquid waste Tank 2 and transferred to the SF for cementation. A heel of waste remains to be removed. High-level liquid waste Tank 1 remains empty.

Table 91: Monitoring Data High-Level Liquid Waste Tank Tray Water

WMA Sample Locations	2021 Avg (Bq/L)	2022 Avg (Bq/L)	2023 Avg (Bq/L)	2024 Avg (Bq/L)	2025 Avg (Bq/L)	2025 Range (Bq/L)
Total Beta [a]						
Tank Tray Water	17.7	7.0	13.6	13.5	13.1	12.0-14.2
Total Alpha [b]						
Tank Tray Water	0.2	0.2	0.3	0.27	0.22	0.07-0.41

a The reference nuclide for total beta is Sr-90; gamma results indicate that approximately 13 Bq/L of the gross beta activity is due to potassium (K)-40.
b The reference nuclide for total alpha is Pu-239.

Radiation Field Measurements

Radiation field measurements are taken semi-annually at established points (normally every 38 m) along the perimeter fence. The 2025 radiation field measurements were similar to those in 2024. The data are summarized in Table 92.

REDACTED

Table 92: Perimeter Fence Monitoring Data

WMA	Radiation Field (µSv/h)					
	2021 Avg	2022 Avg	2023 Avg	2024 Avg	2025 Avg	2025 Range
Spring Survey						
South Fence	0.2	0.1	0.2	0.3	0.2	0.1-0.2
West Fence	0.3	0.3	0.3	0.4	0.2	0.1-0.5
North Fence	0.2	0.2	0.3	0.2	0.1	0.1-0.2
East Fence	0.4	0.3	0.1	0.4	0.3	0.1-0.6
Fall Survey						
South Fence	0.3	0.1	0.4	0.4	0.3	0.3-0.4
West Fence	0.4	0.3	0.2	0.2	0.4	0.2-0.7
North Fence	0.3	0.3	0.2	0.2	0.3	0.2-0.3
East Fence	0.2	0.3	0.3	0.3	0.3	0.2-0.4

Vegetation

In 2025, vegetation samples were collected at monitoring locations within the WMA (Figure 12), and at a control location unaffected by WL operations. The gross beta results are summarized in Table 93. Potassium (K)-40 represents the majority of gross beta activity in most of the samples. The levels of gross beta in the samples are due to a combination of K-40 and Sr-90/Y-90, with a minor contribution from Cs-137. The average Sr-90 contribution for the vegetation samples in the WMA is 6% (12% for Sr-90/Y-90).

REDACTED

Table 93: Waste Management Area Vegetation Monitoring Data

WMA Sample Locations	Average Gross Beta [a] (Bq/kg)				
	2021 Avg	2022 Avg	2023 Avg	2024 Avg	2025 Avg
North-East Area [b]	207	205	63	243	466
Mid-West Area	190	183	76	217	220
South-West Area	243	340	168	179	467
South-East Area	246	325	80	257	531
Control Sample [c]	171	102	58	168	248
Background Sample [d]	157	115	41	232	308
East of ILW Bunkers 3 and 4	218	224	79	341	189

a The reference nuclide for beta is Sr-90.
b Until 2012 this sampling location was in the North-West Area; after 2012 it was moved to the North-East Area.
c Adjacent to the WMA outside of the fence boundary.
d Ambient radiation monitoring stations background samples.
NA = sample not available.

D.3 Facility Changes

All facility changes are performed as per the approved *Engineering Change Control* procedure [19]. Category 1 and 2 changes are provided in Table 94. An overview of changes currently in progress is provided in the text following the table.

Table 94: Waste Management Area Facility Changes

Description	Category	Permanent / Temporary	Detailed Status
B923 – SMAGS Reconfiguration for Shipping Cask Loading	1	Permanent	16 Phases: 12 in Construction, 2 in commissioning and 2 complete
Handling Equipment for Intermediate-Level Waste Shipments	1	Permanent	6 Phases in construction
Remediation of ILW Bunkers 1-7 and Standpipes at WMA	1	Permanent	6 Phases in Construction
Intermediate Level Liquid Waste (ILLW) Processing System	1	Permanent	Under scope review for Best Available Technique
B430 Reconfiguration	1	Permanent	In design to set up the space for liquid waste holding from standpipes and ILW Bunkers
Shielded Flask and Adapter Pad for WL Standpipe Retrievals	2	Permanent	In design for mechanical equipment development

REDACTED

Work to prepare for extraction of waste from the ILW Bunkers and standpipes began in 2017, with most of the off-site physical preparatory work done with continued off site testing of extraction equipment. Non-automated retrieval of selected standpipe contents was continued. This required installation of temporary ground mats and equipment to allow for recovery of the waste.

An engineered granular pad was installed northwest of the WMA to serve as a Soil Management Area. This will accept likely clean soil excavated from the WMA and elsewhere on site. Soil will be spread out, confirmed to be radiologically cleared, and sampled for chemical contamination. It will then be piled and held pending results. Once cleared it will be transported for use elsewhere on site. If not cleared it will be directed to the appropriate waste pathway. The Soil Management Area has a perimeter compliance ditch to monitor for any potential contamination in surface water.

Work adjacent to the WMA for installation of additional power reached the commissioning phase. The generators for Class III power have not yet completed commissioning. The power feeds will eventually feed Building 923 and Building 202, LLW Bunkers 1 to 4, LLW Bunker 5, the standpipe and ILW bunker area, and the CCSF.

Class IV power for Building 923 was completed in 2025.

Building 923 is in the process of being converted to the Cask Loading Facility. Secondary electrical work continued in 2025. A transfer station for safe assay and transfer of waste from and to shielded containers was installed in the Cask Loading Facility.

REDACTED

D.4 Equipment Performance, Planned Maintenance Testing and Inspections

During 2025, the bunkers and other structures in the WMA remained fit for service. Excavations were done at select locations along ILW Bunkers 1 to 3 as part of the assessment for waste retrieval work, no issues were noted with the exposed portion of the bunker walls from hammer soundings. Building 421 was available as a waste examination and re-packaging area, but no waste was processed in 2025.

Intermediate-Level Waste Bunker 4 did not have new waste placed in 2025 and remains approximately 70% full. Intermediate-Level Waste Bunker 6 is approximately 60% full; however, it is not accepting waste due to water ingress issues. Intermediate-Level Waste Bunker 7 is approximately 86% full. The percentage full values are estimates only.

Road-transportable totes of liquid waste were shipped to CRL for processing; two additional liquid waste totes were filled from ILW Bunker sump pump outs.

None of the historical or legacy waste in Buildings 431, 432, or 433 was processed in 2025. Asbestos was noted in Building 432 and 433 and a remediation approach was developed that will be implemented in 2026.

A small seepage of an oily substance was first noted in 2020 on the south side of LLW Bunker 1. The substance was sampled in 2020 and found to contain oil and likely degraded liquid organic (no radiation hazard). The volume was small in 2020. Seepage only occurred during hot

weather, and as weather cooled the seepage stopped. A caulking sealant was applied to limit seepage, and it appeared to function through 2025.

The Soil Storage Compound remained empty of stored waste.

In the 2025 field season, waste packages were retrieved from two standpipes. Twenty-two standpipes were visually inspected by the end of 2025.

In-service storage facilities were inspected for water ingress during routine operations. Filled storage facilities with accessible drainage sumps were inspected monthly during the summer months, when water ingress is most likely. Caulking of the roofs of all the WMA Quonset buildings with waterproof sealant was done in 2025.

In 2015, shallow wells were installed beside each of the ILW Bunkers. These near field wells have been sampled annually. Results are discussed in Section D.2 under "Intermediate-Level Waste Bunker Near Field Wells" and indicate limited migration of tritium beside the ILW Bunkers, in particular ILW Bunker 3. There is no evidence that would lead CNL to conclude there is currently any significant contaminant migration pathway from the ILW Bunkers, however minor seepage noted by the presence of Sr-90 in well water is occurring at ILW Bunkers 1 and 3.

Compliance monitoring in the WMA and CCSF perimeter ditches had only minor limited flows, which found limited levels of contaminants, below drinking water guidelines. Limited contaminant levels suggest the waste storage structures, and natural barriers of low permeability clay soil and upwards groundwater flow are performing as expected.

As required by Section 8 of the Facility Authorization [67], routine maintenance for systems required to be operational was carried out as per the Facility Maintenance Plan. All monthly housekeeping and fire prevention inspections were completed. An annual inspection of WL WMA concrete bunkers was conducted, in accordance with the Periodic Inspection Plan [27], and is further discussed in Section 6.

REDACTED

D.5 Wastes Generated

Solid radioactive waste was generated in the WMA as part of routine operations. This was mostly bagged waste generated from routine operations.

Refer to Section 11.1 for summaries of the volume of radioactive solid waste generated in the WMA in 2025.

Liquid radioactive waste was generated in the WMA as part of routine operations.

In 2025, a total of 1078 L of water was pumped from ILW Bunker 4, and a total of 1212 L of water was pumped from ILW Bunker 6. No water was pumped from ILW Bunker 7. The sumps are pumped out by Operations personnel using pump rig to a steel double walled tote. The totes are retained in Building 430 until sent for processing.

The Soil Storage Compound was sampled as required and the water found not to be active in all cases. No other storage facilities and collection sumps at the WMA required pumping.

D.6 Effluents Released

There were no radioactive and/or hazardous effluents (liquid or gaseous) released into the environment from the WMA as part of routine operations. Any liquid and/or gaseous releases from WL facilities are provided and discussed in Section 9.

REDACTED

Appendix E Auxiliary Operation Facilities

E.1 Operations

The Auxiliary Operating Facilities are operated under the WL Site Licence [2].

In 2025, staffing was maintained at levels to provide the needed operational and safety support. The only change in the operating staff responsible for the auxiliary facilities was the addition of an Operations Technician trainee. There were no organizational changes.

No program changes were made for the auxiliary facilities in 2025. Procedures are to be updated as necessary as part of the five-year review cycle for WL Nuclear Facilities operating procedures. All procedures requiring updates in 2025 were completed. The Building 300 procedures are captured under the SF section in Appendix C.

Research and Development Facilities Complex (Building 300)

Building 300 was the primary research laboratory for the site, housing a wide range of nuclear R&D programs. The building comprised an area of approximately 17,000 m^2 and was built in seven stages from 1964 to 1982. The building contained 68 laboratories as well as numerous offices. The south end high-bay area contained experimental activities that required large areas and significant headroom; RD-14M and RD-17 experimental loops were located in the South High Bay.

During 2025, WL staff and user groups in Building 300 carried out routine operations which included:

- non-radiological laundry activities;
- respirator fit test / maintenance activities;
- sample management office lab;
- environmental lab;
- cleanup activities associated with decommissioning;
- waste clearance area to radiologically survey and clear likely clean waste;
- routine building and system maintenance;
- surveillance to help ensure compliance with the WL Site Licence; and
- training/work area for equipment to be used for standpipe manual retrievals.

Health and Safety Facilities (Buildings 402 and 305)

Building 402 had three floors comprising an area of approximately 2,162 m^2, housing WL dosimetry services and Environmental Management laboratories. The CNL facilities in Building 402 included a whole-body counting facility, TLD readers, environmental laboratories, and a Cs-137 gamma calibrator. Building 305 was constructed adjacent and connected to the west end of Building 402, and housed an electron accelerator and a Co-60 gamma cell.

REDACTED

Demolition of Buildings 402 and 305 worked around the whole-body counter until the whole-body counter structure was moved into its new location, Building 543, in 2022 January. Building 543 was completed, turned over to the RP Branch, and put back into service in 2025, and is listed in Appendix G. Demolition of Building 402 was completed in 2022 March. In 2025, a office trailer complex was completed within the fenced area where B402 was located. The fence was removed, and the area was released from decommissioning and turned over to site operations. The office trailers are labeled as buildings 536 A-H and two washroom facility trailers 537 A-B, and are listed in Appendix G.

E.2 Facility Changes

All facility changes were performed using the *Engineering Change Control* procedure [19]. There were no Category 1 and 2 changes in 2025.

E.3 Equipment Performance, Planned Maintenance Testing and Inspections

All maintenance and non-routine work in these facilities that may affect the safe operation of facilities, systems, and laboratories, or that may present a hazard to the general public are conducted in accordance with CNL's work control system.

All routine maintenance for systems required to be operational was carried out in Building 300, and all equipment tests and inspections were completed. During 2024 Engineering walked down facilities to evaluate fire dampers for assessment. Following this the Fire Protection program evaluated the fire dampers for functionality as fire protection devices and completed this in 2025. The fire dampers that have been deemed required in the current configuration of the building have been tested and put into the Computerized Maintenance Management System to ensure testing and regular maintenance at the required intervals.

E.4 Wastes Generated

There were minimal amounts of radioactive and/or hazardous wastes generated in the facilities as part of routine operations. A campaign to remove all sources of potential PCB contaminated equipment was completed. Refer to Section 11.1 for summaries of the volume of radioactive solid waste generated in the facilities in 2025.

There was no liquid radioactive and/or hazardous waste generated in 2025 in these facilities.

Research and Development (Building 300) Low-Level Liquid Waste Treatment System

Radioactive LLLW flows from the SF and Building 300 to the LLLW collection tanks, in Building 300 Room B-33. An accurate determination of the individual SF or Building 300 contribution cannot be made as both locations flow into these common tanks. The sources of water from Building 300 are limited and the major contributor is the radiological decontamination service facilities in the IFTF.

During 2025, 61.7 m^3 of LLLW was processed through the Building 300 LLLWTS. Table 95 shows the historical volumes of LLLW processed through the Building 300 LLLWTS and also the total volume of Building 300 and Building 100 LLLW processed. The increase in total combined

REDACTED

low-level waste liquid processed in 2025 compared to the Building 300 volume is explained in Appendix F.

Table 95: Historical Records of Low-Level Liquid Waste Processed

	2021	2022	2023	2024	2025
Total Combined Low-Level Waste Liquid Processed (m^3)	88.2	119.6	56.5	66.8	79.6
Low-Level Waste Liquid Processed in Building 300 (m^3)	78.3	117.3	53.9	64.1	61.7

The total activities given below are the combination of the SF, Building 300, and Building 100 active liquid effluents produced.

As determined by total beta analysis, the beta radioactivity content in the effluent releases to the Outfall from the holding tanks at the Building 300 and Building 100 LLLWTS during 2025 was 0.002 GBq, compared with 0.004 GBq released during 2024. The maximum release in a month during the year was 0.001 GBq, which is a small fraction of the Administrative Level of 0.48 GBq/mo. This level conservatively assumes that all the activity is due to Cs-137, which is the most restrictive radionuclide of those present, or potentially present.

As determined by total alpha analysis, the alpha radioactivity content in effluent releases to the Outfall was 0.001 GBq for 2025 compared with 0.001 GBq released during 2024. The maximum release in a month during the year was 1.36E-04 GBq, which is a small fraction of the Administrative Level of 0.56 GBq/mo. This level conservatively assumed that all the activity is due to Am-241 which is the most restrictive radionuclide of those expected to be present in this waste stream.

Table 96 provides a summary of the total activity released for both the Building 100 and Building 300 LLLWTS. Annual Release Limit values for radionuclides in liquid effluents for WL are based on the DRL [39].

REDACTED

Table 96: Building 100 and Building 300 Low-Level Liquid Waste Treatment System Radioactive Releases

Radionuclide	Total 2025 Effluent (GBq)	Annual Release Limit [a] (GBq/a)	Total 2025 Effluent as a % of Annual Release Limit	Peak Release	
				Max. Monthly Release (GBq)	% of [b] Monthly DRL
Total (total beta analysis) [c]	0.002	N/A	N/A	0.001	N/A
Sr-90	6.96E-04	1.56E+02	0.45E-03	1.39E-04	1.07E-03
Cs-137	1.16E-03	1.39E+02	0.83E-03	1.96E-04	1.69E-03
Total Alpha (as Pu-239 equivalent) [d]	7.70E-04	1.33E+01	5.8E-03	1.36E-04	1.23E-02
Historical Data Total Effluent (GBq)					
	2021	2022	2023	2024	2025
Total (total beta analysis) [c]	0.01	0.01	0.003	0.004	0.002

a The annual release limit is calculated by multiplying the DRL by 12.

b DRLs and most restrictive isotope for the LLLW systems were changed in 2016. The beta particulate emitters are considered to be Cs-137, the most restrictive isotope of those identified or potentially present. The DRL is 1.16×10^{1} GBq/mo [39].

c A total beta analysis results in a conservative (higher) estimate of the total amount of activity, which is more accurately determined by measuring the individual radionuclides by radiochemical or gamma spectrometry methods.

d The DRLs and most restrictive isotope for the LLLW systems was changed in 2016. The alpha particulate emitters are considered to be Pu-239, the most restrictive isotope of those identified or potentially present. The DRL is 1.11 GBq/mo [39].

REDACTED

E.5 Effluents Released

Radioactive wastewater generated in Building 300 was pumped to the LLLWTS in Building 300 Room B-33. Any liquid and/or gaseous releases from WL facilities are provided and discussed in Section 9.

Appendix F Whiteshell Reactor – 1 Facility

F.1 Operations

Activities in WR-1 were conducted under the WL Site Licence [2] from the CNSC, in accordance with the requirements of the *Storage with Surveillance Plan for Whiteshell Laboratories Building 100 – Whiteshell Reactor 1* [26]. The status of the WR-1 facility in its shut down, de-fuelled, and partially decommissioned state is described in *The WR-1 Reactor Phase 1 Decommissioning Project Interim End-State Report – Facility Description* [71]. The facility is monitored and maintained as defined by the *Storage with Surveillance Plan for Whiteshell Laboratories Building 100 – Whiteshell Reactor 1* [26].

Routine operations in the WR-1 facility, as defined by *Storage with Surveillance Plan for Whiteshell Laboratories Building 100 – Whiteshell Reactor 1* [26], were carried out by the four Operations Technologists assigned to Building 100. The only staffing change this year was that a Facility Manager completed training of WR-1 in 2025. Staffing was maintained at levels to provide the needed operational and safety support and the minimum staffing requirements outlined in the *Storage with Surveillance Plan for Whiteshell Laboratories Building 100 – Whiteshell Reactor 1* [26].

In 2018, approximately 20 m^3 of low concentration (3.4E06 Bq/L) tritiated water was found in the thermoshield and bioshield cooling systems. This water is still in the systems, awaiting a decision on how to remove it as the systems were not designed to be drained. Investigation is also ongoing to determine what the impact would be if this water is left in situ as part of the proposed in situ disposal of WR-1.

No program changes were made for WR-1 in 2025. CNL remains on track to bring all documents into their required review cycles by the end of 2026. Procedures for WL Nuclear Facilities are updated as needed under the five-year review cycle. Although WR-1 is still behind on its required updates, progress was made in 2025: 16 of the 42 procedures were updated, bringing the total number of procedures within the review cycle to 35. As a result, 83% of WR-1 procedures now meet the required review timeline.

REDACTED

F.2 Facility Changes

All facility changes were performed as per the *Engineering Change Control* procedure [19]. There were no Category 2 changes to the facility. There is one Category 1 change that is waiting for CNSC acceptance before it can proceed. Category 1 and 2 changes are listed in Table 97, related to the proposed in situ disposal of the WR-1 reactor.

Table 97: Whiteshell Reactor – 1 Facility Changes

Description	Category	Permanent/Temporary	Detailed Status
Grouting, Demolition and Capping for the WR-1 Disposal Facility	1	Permanent	Awaiting CNSC acceptance of concept, following which will be entry into construction.

F.3 Equipment Performance, Planned Maintenance Testing and Inspections

During 2025, the operational status of WR-1 remained unchanged. A CNL Technical Note was accepted by the CNSC in 2023 allowing CNL to remove the firewater sprinkler system in Building 100, once issues with heat detectors in restricted access rooms were resolved. A second CNL Technical Note was accepted by the CNSC (in early 2024) allowing removal of heat detection in the restricted access rooms. A third Technical Note, proposing an alternative solution to permit the removal of additional non-compliant heat detectors in Building 100, was accepted by the CNSC in 2025. The firewater sprinkler system was isolated from the site firewater system in 2024. An attempt was made to drain the system, but the underground firewater valves are not holding so draining could not be completed. The draining of the firewater sprinkler system in Building 100 is planned to be completed in 2026.

All routine maintenance for systems required to be operational was carried out in Building 100, and all equipment tests and inspections were completed.

F.4 Wastes Generated

Solid Radioactive and/or Hazardous Wastes

Refer to Section 11.1 for summaries of the volume of Solid Radioactive and Hazardous Wastes generated in WR-1 in 2025.

Solid radioactive waste was generated in WR-1 as part of routine operations, consisting primarily of operational materials such as Tyvek suits.

A PCB ballast removal campaign was completed in 2025 to eliminate all PCB containing ballasts within the facility. A small number of PCB ballasts remain in decommissioned fume hoods and are scheduled for removal in 2026.

Liquid Radioactive and/or Hazardous Wastes

During 2025, 17.9 m^3 of LLLW was generated from Building 100/WR-1 operations. This is considerably more than the 2.7 m^3 that was generated in 2024. There was an additional 13.5 m^3 processed through the Building 100 LLLLW system that came from water generated from work in the WMA. The majority of this was ground water collected into totes from work being executed in the LLW bunkers and trench areas, and brought to Building 100 to be processed through the Building 100 LLLW system after it had been sampled and approved to do so. The remaining 4.4 m^3 would have originated mostly from the WR-1 sumps. Appendix E has more

REDACTED

information on the liquid waste processed. There were no hazardous liquid wastes generated from this facility in 2025.

F.5 Effluents Released

Any liquid and/or gaseous releases from the facility are provided and discussed in Section 9.

REDACTED

Appendix G Non-nuclear Facilities

G.1 Operations

The WL non-nuclear facilities status and changes for 2025 are as noted in Table 98.

Table 98: Operating Summary of Non-nuclear Facilities

Building Number	Building Function	Operating Status	Reportable Events	Operating Status Changes	Authorized Personnel [a]	Comments
303	Containment Test Facility	Removed in 2020	None	Removed from use	Facilities	Building removed, pad retained, End-State Report to be completed
304	Waste Clearance Facility	Removed in 2020	None	Removed from use	Facilities	Building removed, pad retained, End-State Report to be completed
306	Waste Clearance Facility	Removed in 2016	None	None	Facilities	Building removed, pad retained, End-State Report to be completed
308	Large-Scale Vented Combustion Test Facility	Removed in 2019	None	None	Facilities	Decommissioned, End-State Report to be completed
309	Large-Scale Vented Combustion Test Facility – Local Services	Removed in 2019	None	None	Facilities	Decommissioned, End-State Report to be completed
310	Large-Scale Vented Combustion Test Facility – Local Services	Removed in 2019	None	None	Facilities	Decommissioned, End-State Report to be completed
311	Large-Scale Vented Combustion Test Facility Hydrogen Storage	Removed in 2019	None	None	Facilities	Decommissioned, End-State Report to be completed
401	Security, Reception, Firehall and Security Monitoring Room	Operational	None	None	All Site/ Visitors	Building is currently undergoing internal changes for better efficiency.
405	Lunchroom/Offices (formerly the Library)	Shut down	None	None	Facilities and decomm personnel	Operational cleanup in preparation for demolition

REDACTED

Building Number	Building Function	Operating Status	Reportable Events	Operating Status Changes	Authorized Personnel [a]	Comments
408	Stores	Removed in 2017	None	None	Facilities	Decommissioned, End-State Report to be completed
409	Cold Storage	Removed in 2016	None	None	Facilities	Decommissioned, End-State Report to be completed
412	Offices/Machine Shop	Operational	None	None	All Site/ Visitors	No change
413	Quonset: Cold Storage	Operational	None	None	Security and General Site Services	No change
414	Controlled Area 2 Entrance	Removed in 2019	None	None	Facilities	Decommissioned, End-State Report to be completed
415	Warm Storage	Removed in 2017	None	None	Facilities	Decommissioned, End-State Report to be completed
416	Heated Storage	Removed in 2016	None	None	Facilities	Decommissioned, End-State Report to be completed
418	Active Area Storage	Removed in 2017	None	None	Facilities	Decommissioned, End-State Report to be completed
420	Cold Garage	Operational	None	None	Transportation, Security and Stores	No change
422	Outfall Monitoring Station	Operational	None	None	Environmental Monitoring and Maintenance	No change
424	WR-1 Organic Monitoring Building	Removed in 2020	None	None	Facilities	Building removed, End-State Report to be completed
426	Quonset: Cold Storage	Operational	None	None	Utility	No change
427	Cold Mechanical Storage	Removed in 2016	None	None	Facilities	Building removed, pad retained, End-state Report to be completed
428	Cold Storage	Removed in 2016	None	None	Facilities	Decommissioned, End-State Report to be completed

REDACTED

Building Number	Building Function	Operating Status	Reportable Events	Operating Status Changes	Authorized Personnel [a]	Comments
429	Quonset: Cold Storage	Operational	None	None	Maintenance	No change
437A-B	Fabric Storage Quonset	Operational-	None	Operational-	Powerhouse Operators and Maintenance	Put into use in 2025 on former B402 grounds
505	Fire/Security Training (formerly R&D Lab)	Removed in 2016	None	None	Environmental	The building and pad were previously decommissioned, 3 environmental monitoring wells have been installed
531	Asbestos/PCB Storage	Operational	None	None	Facilities	No change
536A-H	Office Trailers	Operational-	None	Operational	Powerhouse Operators and Maintenance	Put into use in 2025 on former B402 grounds
537A-B	Washroom Trailers	Operational-	None	Operational-	Powerhouse Operators and Maintenance	Put into use in 2025 on former B402 grounds
538	Office and Washroom Trailers	Under Construction	None	Under Construction	Powerhouse Operators and Maintenance	Under Construction east of WMA
540	Modular Office Complex	Operational	None	None	Facilities	No change
543	Dosimetry Building	Operational	None	New	Facilities	Put into use in 2025
570	Hazardous Chemical Storage	Operational	None	None	Facilities, Waste Management	No change
597	Portable Boiler Building 1	Out of Operation	None	None	Powerhouse Operators and Maintenance	No change
598	Portable Boiler Building 2	Operational	None	None	Powerhouse Operators and Maintenance	No change

REDACTED

Building Number	Building Function	Operating Status	Reportable Events	Operating Status Changes	Authorized Personnel [a]	Comments
902	Pump House	Operational	None	None	Powerhouse Operators and Maintenance	A temporary diesel back-up pump was installed, and upgrading of some water pumps and engine changes are underway
903	Water Filtration Plant	Operational	None	None	Powerhouse Operators and Maintenance	No change
904	Fire Protection Water System	Operational	None	None	Powerhouse Operators and Maintenance	No change
905	Process Water System	Operational	None	None	Powerhouse Operators and Maintenance	No change
906	Storm Drainage System	Operational	None	None	Maintenance	No change
907	Sewage Lift Station and Lagoons	Operational	None	None	Powerhouse Operators and Maintenance	No change
911	Powerhouse	Operational	None	None	Powerhouse Operators and Maintenance	No change
913	Main Substation (Owned by MB Hydro)	Operational	None	None	Manitoba Hydro	No change
914	Main Power Distribution	Operational	None	None	Powerhouse Operators and Maintenance	The main line to the WMA had replacement poles installed to replace damaged and/or aged poles
916	Communications System	Operational	None	None	Security and Maintenance	No change
917	Supervisory Control and Alarm	Operational	None	None	Security and Maintenance	No change

REDACTED

Building Number	Building Function	Operating Status	Reportable Events	Operating Status Changes	Authorized Personnel [a]	Comments
918	Clarified Water System	Shut Down Mid-1980s	None	None	Powerhouse Operators and Maintenance	No change
921	Access Tunnel	Operational	None	Storage	Operations and firefighters	Storage and lockers on south half, north side cold and dark
944	Gun Range	Operational	None	None	Security and Maintenance	The backstop was rebuilt and the facility was upgraded to meet changing needs

a Security personnel perform regular patrols of all site buildings.

There were no policy, program, or procedural changes for the non-nuclear facilities in 2025. There were no changes in organization in 2025.

In 2025, the non-nuclear facilities continued to maintain the minimum staffing requirements to provide the needed operational and safety support, with two trainees continuing in training and a third new trainee beginning.

G.2 Facility Changes

All facility changes were performed as per the *Engineering Change Control* procedure [19]. There were no Category 1 changes to the non-nuclear facilities.

G.3 Equipment Performance, Planned Maintenance Testing and Inspections

No systems were impaired, and no compensatory measures were required. All equipment for the non-nuclear facilities, including any safety-related systems, performed as designed and required during 2025.

G.4 Wastes Generated

There were no radioactive and/or hazardous wastes generated in the non-nuclear facilities as part of routine operations.

G.5 Effluents Released

There were no radioactive and/or hazardous effluents (gaseous) released into the environment from the facilities as part of routine operations.

Any liquid and/or gaseous releases from these buildings are provided and discussed in Section 9.

REDACTED

Landfill Dugout Water Monitoring

The WL landfill is surrounded by six dugouts where surface water collects. These dugouts are sampled as part of the ongoing operational control monitoring for the facility. In 2025, the total precipitation was 393 mm over the year, a decrease from 2024 (494 mm). The location of the dugouts is shown in Figure 13. Dugout 22 is used as the Control and is about 300 m away from the landfill to the north-northeast and would not be affected by facility operations.

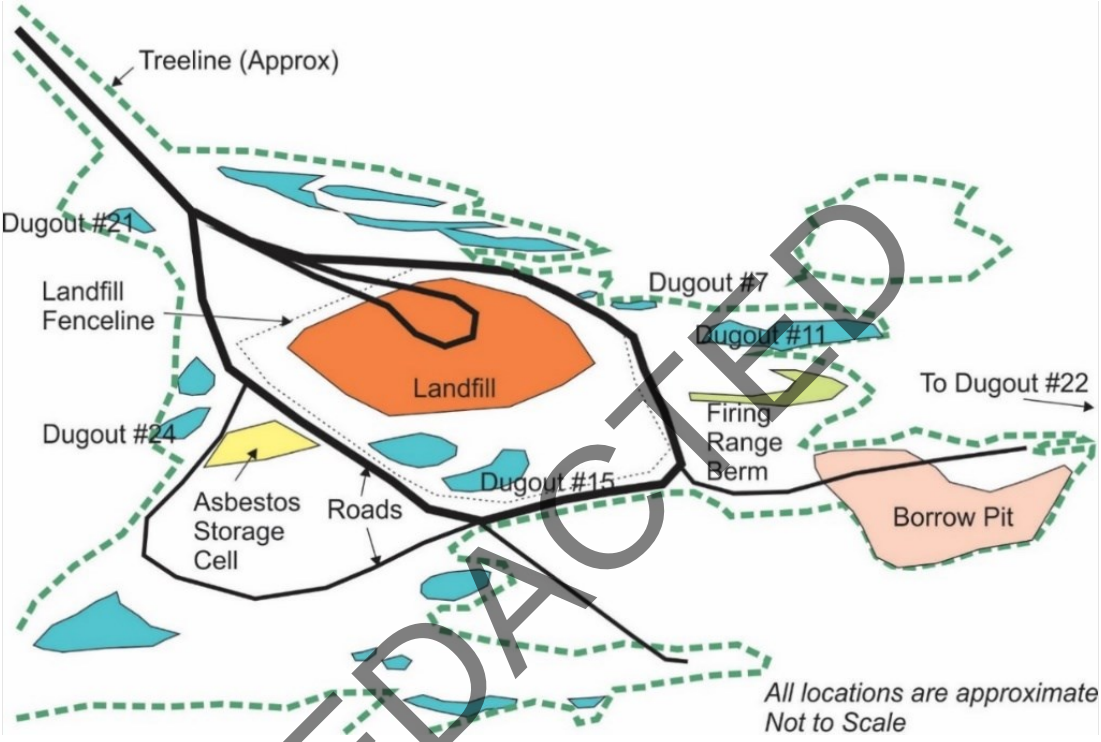


Figure 13: Whiteshell Laboratories Landfill Area Showing Approximate Locations of Monitored Dugouts

REDACTED

The results from the sample analysis for alpha and beta from these dugouts are provided in Table 99 and Table 100, respectively. All alpha results for 2025 were below the drinking water screening level of 0.50 Bq/L. All beta results were below the drinking water screening level of 1.0 Bq/L, which is consistent with previous results obtained from 2019 to 2024 (note: a single result in Dugout 7 was above 1.0 Bq/L in 2022 at 1.42 Bq/L).

Low levels of tritium (9 Bq/L) were detected in one of the landfill wells (water table) starting in 2011. Its appearance in the groundwater resulted in initiation of the surface (dugout) water sampling. Tritium has been detected in landfill Dugout 15 for the past ten years, and a low value was noted in Dugout 24 in 2011, 2012, and 2016, and although a higher amount was noted in 2018 (76 Bq/L), the value returned to background in 2019 and remained there through 2025. The tritium level in Dugout 15 was 49 Bq/L. All results were well below drinking water limits of 7,000 Bq/L. The other dugouts do not appear to contain tritium, as levels comparable to blank samples analyzed from 2013 to 2025 that contain less than 5 Bq/L of tritium were recorded. Tritium results from the landfill dugouts are shown in Table 101.

Table 99: Gross Alpha Results from the Landfill Dugouts

Sample	Gross Alpha (Bq/L)					
Location	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Dugout 7	<0.05	<0.05	0.13	0.11	<0.05	0.06
Dugout 11	<0.05	0.05	0.03	0.24	<0.05	0.10
Dugout 15	<0.05	0.05	<0.05	<0.05	<0.05	0.11
Dugout 21	<0.05	<0.05	0.18	0.10	<0.05	<0.05
Dugout 22	<0.05	<0.05	NA	<0.05	<0.05	0.05
Dugout 24	<0.05	<0.05	0.05	0.27	0.14	0.19

NA = sample not available.

Table 100: Gross Beta Results from the Landfill Dugouts

Sample	Gross Beta (Bq/L)					
Location	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Dugout 7	0.07	0.08	1.42	<0.05	0.24	0.39
Dugout 11	<0.05	0.01	0.20	<0.05	0.09	0.29
Dugout 15	0.16	0.30	<0.05	0.06	0.21	0.12
Dugout 21	<0.05	0.13	0.23	0.22	0.26	0.76
Dugout 22	0.05	0.05	NA	0.11	<0.05	0.22
Dugout 24	0.06	0.10	0.38	0.52	0.14	0.19

NA = sample not available.

REDACTED

Table 101: Tritium Results from the Landfill Dugouts

Sample	Tritium (Bq/L)					
Location	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Dugout 7	<4	<5	<3	<3	<3	<3
Dugout 11	18	<5	<4	<3	<3	<3
Dugout 15	54	93	25	78	64	49
Dugout 21	<3	<5	<4	<3	NA	<3
Dugout 22	<3	<5	NA	<3	<3	<3
Dugout 24	<4	<5	<4	<3	<3	<3

NA = sample not available.

When initially detected in the dugouts, it was assumed that it was possible that tritium emissions from the WR-1 Building 100 deposited in the ponds surrounding the landfill and were

subsequently drawn into the water table. After consideration, it was determined that the most likely source of tritium is the landfill. The presence of above background tritium in only a few dugouts cannot be explained by airborne deposition. The highest tritium activities are found in the dugouts and wells in closest proximity to the landfill. Due to its 10 m height, the landfill has a higher hydraulic head than the local terrain, including the asbestos storage cell, and thus will be more likely to contribute leached contaminants to the shallow groundwater system. Due to local groundwater flow directions (toward the south and southwest), Dugout 15 and intermittent Dugout 24 are more likely to receive contaminants from the migration of water from the landfill. As the landfill had been in operation for over 50 years, the potential for a historical error in placement is greater for the landfill than the adjacent asbestos storage cell.

The water testing conducted in 2018 included Sr-90 and Tc-99, two potentially mobile radionuclides. In 2018, near detection limit levels of Sr-90 were noted in Dugout 21 and near detection limit levels of Tc-99 were noted in Dugouts 21 and 24. In 2019, only Sr-90 was tested, and was found to be at the detection limit. In 2020, both Sr-90 and Tc-99 were again measured. Strontium-90 was at the detection limit and Tc-99 was not detected. In 2025 (see Table 102), Sr-90 and Tc-99 were monitored for and found to be below the detection limit.

Table 102: Strontium-90 and Technetium-99 Results from the Landfill Dugouts in 2025

Sample Location	(Bq/L)	
	Sr-90	Tc-99
Dugout 7	ND	ND
Dugout 11	ND	ND
Dugout 15	ND	ND
Dugout 21	ND	ND
Dugout 22	ND	ND
Dugout 24	ND	ND

Note: Tc-99 for internal investigative purposes as the gross beta was below the 5 Bq/L limit.
ND = not detected.

REDACTED

The water from the dugouts was also tested for a suite of non-radiological parameters including total metals, mercury, nitrate + nitrite, sulphate, chloride, sodium, potassium, calcium, magnesium, sulphur, total ammonia (as nitrogen), phosphorus, phenols and volatile organics (including benzene, toluene, ethylbenzene and xylene). Elevated levels of boron were detected in Dugout 15, a continuation of results from 2018 onwards (Table 103). The value in 2025 remained under the Drinking Water Guideline for Boron (5,000 µg/L) but had increased since 2023. All other dugouts showed values below detection limits.

Table 103: Boron Results from the Landfill Dugout 15

Sample Location	(µg/L)				
	2021	2022	2023	2024	2025
Dugout 15	3,760	1,170	2,800	4,760	3,640

Molybdenum remained at detection limits from 2020 through 2025. In 2025, manganese remained higher than drinking water guidelines of 50 µg/L in Dugout 15 (593 µg/L) and was also noted to be elevated in Dugouts 7 (121 µg/L), 11(608 µg/L), and 21 (152 µg/L) No other parameters were detected at concentrations of concern.

Groundwater results will be discussed in the annual Environmental Monitoring report [38]. Sediment sampling of one of the dugouts was conducted as part of the Environmental Assessment Follow-Up Program and will be reported in the annual progress report [37].

Landfill Dugout Sediment Monitoring

Sediment sampling of the dugouts was conducted in 2017 as part of the Environmental Assessment Follow-Up Program. The analysis of the sediment included a full suite of metals, mercury, lead, PCBs and for radioactivity, including Sr-90. There were elevated levels of molybdenum in the surface sediment of one dugout (Dugout 24) and no other contaminants of potential concern noted. Molybdenum can be found naturally in the environment (minerals containing iron, bismuth, or copper) as well as being a component of man-made items such as filaments, X-ray tubes, screens, grids for radios, spark plugs, contacts, induction heating elements, and/or part of a waste stream from man-made processes (burning of fossil fuels). The source of the molybdenum is being investigated as part of the assessment of the Landfill prior to closure. Monitoring of the sediments in the dugouts around the Landfill is planned to continue every five years (from 2017), as well as annual monitoring of the water, and as such, sediment sampling was conducted in 2022. Molybdenum was still slightly elevated in Dugout 24. No sampling was conducted in 2025, the next planned sampling is in 2027.

Further investigation will be conducted during the eventual closure of the landfill and will also be reported in the Environmental Assessment Follow-Up Program [37].

REDACTED

Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

Designated Representatives of the Licensee, Sites Licenses, Certificates & Permits

900-514300-LST-001

Revision 14.0

REDACTED

Approved by: Sarah Brewer — 2025/07/28

Senior Director, Compliance — Date

Effective Date: 2025/08/04
Expiry Date: 2028/08/04

Refer to ATOM for current version. Printed copies should not be considered current without first consulting ATOM.

[redacted]This Information Asset (IA) and the elements of information contained within it are the property of Atomic Energy of Canada Limited (AECL) and must be safeguarded in accordance with AECL, Canadian Nuclear Laboratories (CNL), and Treasury Board of Canada requirements. These requirements include but may not be limited to keeping the IA in a locked room or cabinet when not in use, limiting access to personnel who have a need to know, and special handling, storage and destruction measures.

This page is for Content Controls that apply to this document. If no Content Controls apply, none will be listed.

Intellectual Property NOTICE: The attached documents/files/information includes information owned/developed by CNL which has particular value to CNL's business interests (CNL IP). Access is restricted to authorized persons for authorized purposes only. Third party disclosure or use of CNL IP requires a license or nondisclosure agreement, depending on the nature of the information, failing which such disclosure or use is strictly prohibited.

REDACTED

Revision History

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
14	2025/07/23	Issued as "Approved for Use"	B. Scott	S. Brewer	S. Brewer
14D1	2025/05/15	Issued for "Review and Comment" Major changes Document has been renamed. 1 Scope and Applicability have been updated to reflect inclusion of other regulators and removal of Licensing Basis Documents 3.2 DROLs – responsibilities further identified for other regulators 3.4 – responsibility for maintaining this document moved from 3.3 to 3.4 4.1.6 Facilities Under Construction section added 4.2 Buildings, Facility and Other Contacts was removed 4.1.6 Facilities Under Construction has been added Section 5 Renamed to Facilities & Laboratories, Licensing Basis documents removed to site-specific Licensing Basis Document LSTs Appendix A now provides the list DROLs for other regulators	B. Scott	C. Gallagher R. Swartz K. Leroux S. Morris A. Dash	
13.1	2025/01/10	Cancelled at approver stage in order to make major changes. Some updates made as part of 13.1D1 were carried into Rev 14D1.			
13.1D1	2024/06/21	Issued for "Review and Comment" Minor changes The following sections were updated: 1 Scope and Applicability wording corrected 3.4 Clarified role of Manager, Regulatory Affairs	B. Scott	A. Coulas R. Dufour C. Gallagher S. Faught K. Leroux B. Phillips K. Schruder R. Swartz J. Therrien	

REDACTED

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
		4.1 Update DROL list for DROLs who have left, are newly appointed or changed facilities 4.3 Removed expired Licences & Certificates 5 Updated Facility & Laboratory Documentation to latest revisions			
13	2023/06/16	Issued as "Approved for Use"	B. Scott	S. Brewer	S. Brewer
13D1	2023/04/14	Issued for "Review and Comment" Major revision The following Sections were updated: 1. Scope and Applicability 2. Purpose 3.1 Added Site Licence Holder to Roles & Responsibilities 3.3 Changed Compliance FSA to Chief Regulatory Officer 3.4 Removed 4.1 Updated DROL list as per DROL Reduction Briefing Note, 61137373 4.2 Moved Primary & Secondary Contacts List to Appendix A 5.1 Condensed sections 5.1.1 to 5.1.8 into 1 table 5.2 Condensed sections 5.2.1 to 5.2.5 into 1 table 5.4 Renamed to Port Hope Area Initiatives Updated template	B. Scott	R. Corby A. Dash R. Dufour S. Faught C. Gallagher W. Graydon K. Leroux K. Lundie S. Morris B. Phillips P. Pottelberg R. Rao D. Ryland K. Schruder G. Snell R. Swartz J. Therrien T. Wieclawek	
12	2022/06/29	Issued as "Approved for Use" Minor comments to update new DROL assignments. Updated template.	B. Scott	K. Leroux	C. Gallagher for S. Brewer
12D1	2022/06/13	Issued for "Review and Comment" Minor comments to update new DROL assignments. Updated template. DROLs/Contacts in the following sections in 4. LISTS were updated:	B. Scott	L. Adams K. Barks M. Boileau M. Crowe D. Delano M. Deloughery	

REDACTED

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
		4.1, 4.2.1 (added CSO), 4.2.2, 4.2.3 (added Dir. Ind. Relations), 4.2.4, 4.2.6, 4.2.8, 4.2.13 to 4.2.16 (updated names and removed FM Designate column), 4.3.1, 4.5.3, 4.5.5. Dates and Revision numbers for Documents in the following sections in 5. FACILITY AND LABORATORY DOCUMENTATION were updated: 5.1.2 (GDIs removed) 5.5.3, 5.4 (date column removed)		J. deRuiter R. Dufour C. Gallagher D. Garrick M. Hammell K. Leroux D. Meldrum S. Morris B. Phillips R. Rao A. Rehman T. Scott J. Slade G. Snell P. Stirbys R. Swartz J. Therrien D. Woods	
11	2021/12/24	Issued as “Approved for Use”	B. Scott	S. Cotnam	S. Cotnam
11D1	2021/12/10	Issued for “Review and Comment” Updated template. Updated DROL names, document revisions, licences, and certificate. Added Director, Indigenous Engagement to 4.2.2.	B. Scott	R. Swartz T. Scott S. Brewer K. Lundie S. Morris S. Cotnam K. Barks D. Delano A. Coulas M. Hammell W. Graydon R. Dufour P. Pottelberg J. Therrien K. Leroux D. Ryland D. Woods M. Crowe R. Corby C. Gallagher	
10	2021/03/01	Issued as “Approved for Use”	K. McGee	S. Karivelil	S. Cotnam
10D1	2021/02/05	Issued for “Review and Comment” Updated template. Updated DROL names, document revisions, licences, and certificates. Removed first initials with name in brackets format from document.	K. McGee	S. Karivelil R. Swartz S. Brewer T. Scott S. Morris K. Lundie	

REDACTED

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
		Moved NRX from 4.2.15 to 4.2.15 Moved NRU from 4.2.6 to 4.2.15 Revised CRL labs to match ACMR submission. Formatted table 4.7 to match table in 4.6.		S. Cotnam L. Nel D. Delano K. Barks M. Hammell A. Coulas R. Dufour W. Gaydon J. Therrien K. Leroux B. Phillips P. Pottelberg M. Crowe D. Woods A. Bilton	
9	2020/07/24	Issued as “Approved for Use”	K. McGee	S. Karivelil	S. Cotnam
9D1	2020/05/15	Issued for “Review and Comment” Updated DROL names, document revisions, licences, and certificates. Removed designated role column from facility tables and separated Facility Manager and Designates into separate columns.	K. McGee	S. Karivelil R. Swartz S. Brewer T. Scott S. Morris K. Lundie S. Cotnam G. Hamilton D. Delano K. Barks M. Hammell A. Coulas R. Dufour W. Graydon N.MacDonald M. Patterson B. Phillips P. Pottelberg	S. Cotnam
8	2019/06/13	Issued as “Approved for Use”	K. McGee	S. Karivelil	S. Cotnam
8D1	2019/05/11	Issued for “Review and Comment” Updated DROL names, document revisions, licences, and certificates	K. McGee	S. Karivelil D. Delano S. Brewer M. Hammell S. Morris R. Dufour A. Coulas R. Swartz K. Leroux K. Barks D. Garrick	S. Cotnam

REDACTED

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
				N. Wang J. Turcotte T. Gorman M. Burke-Legge T. Scott W. Graydon S. Cotnam Y. Dube P. Pottelberg G. Hamilton	
7	2019/01/31	Issued as "Approved for Use"	S. Karivelil		S. Cotnam
7D1	2018/01/12	Issued for "Review and Comment" Updated DROL names, document revisions, licences, and certificates	K. McGee	S. Karivelil D. Pilgrim N. Mantifel I. Castillo P. Pottelberg J.D. Garrick J. Gibb S. Faught A. Drom R. Swartz K. Leroux J. Chilton K. Barks A. Coulas G. Hamilton S. Brewer	S. Cotnam
6	2018/10/31	Issued as "Approved for Use"	K. McGee	S. Karivelil	S. Cotnam
6D1	2018/10/26	Issued for "Review and Comment" Updated DROL names, document revisions, licences, and certificates	K. McGee	S. Karivelil N. Yazdani N. Mantifel I. Castillo P. Pottelberg S. Needham J. Gibb S. Faught A. Drom R. Swartz K. Leroux J. Chilton K. Barks A. Coulas G. Hamilton S. Brewer	S. Cotnam
5	2018/07/27	Issued as "Approved for Use"	K. McGee	S. Karivelil	S. Cotnam

REDACTED

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
5D1	2018/07/06	Issued for "Review and Comment" Updated documents, licences and certificates throughout section 5 and included staff changes throughout section 4. Added sections that were missed during the combination in Revision 4. Updated formatting. Changed the location of a few sections for better flow.	K. McGee	S. Karivelil N. Yazdani N. Mantifel I. Castillo P. Pottelberg S. Needham J. Gibb S. Faught A. Drom R. Swartz K. Leroux J. Chilton	S. Cotnam
4	2018/03/21	Issued as "Approved for Use"	K. McGee	S. Karivelil	S. Cotnam
4D1	2018/03/06	Issued for "Review and Comment" Combined 900-508200-LST-001 into this LST.	K. McGee	S. Karivelil R. Swartz S. Cotnam R. McNamara K. Leroux B. Sanderson A. Coulas M. Scheer A. Bakewell K. Daniels J. West S. Needham S. Faught D. Cox T. Gorman S. Suppiah N. Mantifel K. Lundie D. Murphy M. Hammell N. Yazdani J. D. Garrick S. Brewer N. Wang I. Bainbridge A. McIvor P. Heeney A. Drom M. Vickerd	
3	2017/09/29	Issued as "Approved for Use" No R&C required. Quarterly update.	J. Hunt	S. Karivelil	S. Cotnam
2	2017/05/31	Issued as "Approved for Use"	J. Hunt	S. Karivelil	S. Cotnam

REDACTED

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
		No R&C required. Quarterly update.			
1	2017/01/24	Issued as “Approved for Use” No R&C required Update DROL listing and licences	J. Hunt	S. Cotnam	S. Cotnam
0	2017/01/06	Issued as “Approved for Use”	J. Hunt	S. Cotnam	S. Cotnam
D1	2016/12/12	Prepare D1 for review	J. Hunt	S. Karivelil K. Leroux R. Swartz B. Sanderson J. West A. Coulas	

REDACTED

Table of Contents

Section **Page**

1. Scope and Applicability 11
2. Purpose 11
3. Roles and Responsibilities 11
   - 3.1 Site Licence Holder 11
   - 3.2 Designated Representatives of the Licensee (DROL) 11
   - 3.3 Chief Regulatory Officer 12
   - 3.4 Manager, Regulatory Affairs 12
4. List 12
   - 4.1 Designated Representative of the Licensee (DROL) 12
     - 4.1.1 Executive/Senior Team 12
     - 4.1.2 Licence Holders 13
     - 4.1.3 Licensing & Regulatory Programs 13
     - 4.1.4 Safety and Control Areas 14
     - 4.1.5 Projects 15
     - 4.1.6 CRL Nuclear Facilities 15
     - 4.1.7 Whiteshell Nuclear Facilities 17
     - 4.1.8 Prototype Reactors 17
     - 4.1.9 Port Hope Area Initiative 17
     - 4.1.10 La Prade 18
   - 4.2 Licences & Certificates 18
     - 4.2.1 CNSC Licences and Certificates 18
     - 4.2.2 Other Licences, Certificates and Permits 20
5. Facilities & Laboratories 27
   - 5.1 CRL Nuclear Facilities 27
   - 5.2 Whiteshell Nuclear Facilities 29

REDACTED

5.3 Prototype Reactors 30

5.4 Port Hope Area Initiative 30

5.5 La Prade..... 30

6. References 30

Appendix A DROLS for Other Regulators 32

REDACTED

1. Scope and Applicability

Information contained in this list is applicable to all licensed activities, and those who perform them, managed by Canadian Nuclear Laboratories (CNL) Ltd.

This document captures the current listing of Site Licence Holders, appointments to Designated Representatives of the Licensee (DROL) as defined in the *General Nuclear Safety and Control Regulations* (GNSCR) [1] (Clauses 15 (a) and (b)), and the current status of appointments to Facility Authorities. These lists identify CNL staff who are designated and authorized to communicate with and make commitments to CNSC staff and other regulators on behalf of CNL.

This document also provides a listing of licences, certifications, and permits held by various branches of CNL, and issued by other regulators, certification bodies, or other governmental organizations who issue licences, certifications, and permits to CNL facilities and laboratories for the activities conducted therein.

Note: Licensing Basis documentation has been removed from this document and can now be found in the associated Licensing Basis Lists for each site ([2][3],[4] and [5])

2. Purpose

The purpose is to capture in one document:

- the list of CNL staff who are designated and authorized to communicate with and make commitments, on behalf of CNL, to CNSC staff and other regulators, and
- the listing of all licences, certifications, and permits issued to CNL by other governmental organization, certification bodies or regulators.

This document is not used to assign an individual to a role. Appointments are covered by other Management System processes.

3. Roles and Responsibilities

3.1 Site Licence Holder

The Site Licence Holder is the designated Executive and/or Senior Management responsible for their respective site, with overall responsibility for the management and control of licensed activities at that site. The Site Licence Holder has the necessary functional authority to discharge responsibility for assuring the safe conduct of all licensed activities at their respective site, including authority for operating or shutting down nuclear facilities and radioisotope laboratories on the site. Further responsibilities are defined in the *Canadian Nuclear Laboratories Management System Manual* [6].

3.2 Designated Representatives of the Licensee (DROL)

A DROL is a CNL staff member who is designated and authorized to communicate with, and make commitments to, CNSC staff and other regulators, as identified in Appendix A, on behalf

of CNL for their Functional Support Area (FSA) (and associated Safety and Control Area (SCA)) organizational unit, facility, project, or program within their financial authority to do so.

The DROL is responsible for ensuring that all submissions to CNSC staff and other regulators are coordinated, complete, and factual.

The DROL is also designated and authorized to make and submit unplanned situation or event reports to CNSC staff or other regulators, as required by the act or regulations in Appendix A. The DROL is responsible for ensuring that CNSC staff have been copied on all scheduled and unplanned event reports to other regulators, per *CNL Reporting to Regulatory Agencies* [7]

DROLs may only temporarily delegate their authority to other DROLs listed in this document. DROLs are responsible for ensuring that a completed, signed Delegation of Authority [8] has been provided to Regulatory Affairs, within 5 calendar days, when a permanent or acting change (longer than 6 months) has been made.

The overall responsibilities of the DROL are identified in the *Compliance* Program Description Document [9].

3.3 Chief Regulatory Officer

Responsibilities of the Chief Regulatory Officer are defined in Management System Manual [6].

3.4 Manager, Regulatory Affairs

The Manager, Regulatory Affairs is responsible for maintaining the controlled list of DROLs and Facility Authorities for CNL-Managed Facilities & Sites and for ensuring that CNSC staff have been updated, within 15 days, of all changes to DROLs listed in section 4.1. This includes sending appropriate correspondence to CNSC staff, as per *Managing Regulatory Communications and Commitments* [10].

4. List

4.1 Designated Representative of the Licensee (DROL)

The following table identifies CNL staff who are designated and authorized to communicate with and make commitments to CNSC staff on behalf of CNL, as defined in3.2.

4.1.1 Executive/Senior Team

Name	Designated Role/ Title	Area of Representation
Jack Craig Jr.	President and Chief Executive Officer	Canadian Nuclear Laboratories
Jan Preston	Chief Operating Officer	Chief Operating Officer
Andrew Tisler	Vice President, Central Technical Authority and Chief Nuclear Officer	Central Technical Authority
Kathy Leroux	Deputy Vice President, Central Technical Authority	Central Technical Authority

REDACTED

Name	Designated Role/ Title	Area of Representation
Stephen Bushby	Vice-President, Science and Technology	Science & Technology (S&T)
Monica Steedman	Vice-President, Environmental Remediation Management and Stewardship and Renewal Group	Environmental Remediation Management (ERM) & Stewardship and Renewal Group (SRG)
Kenneth Whitham	Vice-President, Health, Safety, Security and Environment	Health, Safety, Security and Environment (HSSE)
Douglas McIntyre	Vice-President, Legal and Insurance	Legal and Insurance
Lou Riccoboni	Vice-President, Corporate Affairs	Corporate Affairs

4.1.2 Licence Holders

Name	Designated Role/ Title	Site and Licence
Andrew Tisler	Vice President, Central Technical Authority and Chief Nuclear Officer	Chalk River Laboratories Licence NRTEOL-01.00/2028
Brian Wilcox	General Manager and Whiteshell Site Licence Holder	Whiteshell Laboratories Licence NRTEDL-W5-8.00/2027
Kristan Schruder	Deputy Vice President, Decommissioning & Site Operations	Gentilly-1 Waste Facility Licence WFDL-W4-331.00/2034 Douglas Point Waste Facility Licence WFDL-W4-332.03/2030 Nuclear Power Demonstration (NPD) Waste Facility Licence WFDL-W4-342.00/2034
Stephen Morris	Director, Programs & Compliance	Port Hope Area Initiative Licence WNSL-W1-2310.00/2032 Low Level Radioactive Waste Management Office (Historic Waste) WNSL-W2-2202.0/2026
Richard Dufour	Director, Science &Technology Facilities Operations	La Prade Site Licence 15193-4-26.1
Michel Boileau	Manager, CRL Dosimetry Services	Dosimetry Services Licence 15193-1-26.4
Gabrielle Kaufmann	Deputy Vice President, Legal & Insurance	Export & Import Compliance (see section 4.3.1 for Licences)

4.1.3 Licensing & Regulatory Programs

Name	Designated Role/ Title	Area of Representation
[redacted]	Chief Regulatory Officer	Canadian Nuclear Laboratories
[redacted]	Chief Security Officer	Canadian Nuclear Laboratories

REDACTED

Name	Designated Role/ Title	Area of Representation
[redacted]	Manager, Regulatory Affairs	Chalk River Laboratories
[redacted]	Manager, ERM Licensing Support	Environmental Remediation Management
[redacted]	Manager, WL Licensing and End State	Whiteshell Laboratories
[redacted]	Director, Programs & Compliance	Port Hope Area Initiative (PHAI)

4.1.4 Safety and Control Areas

Name	Designated Role/ Title	Area of Representation
[redacted]	Director, Governance Systems and Control	1.1 Management System 2.1 Human Performance Management 2.2 Training Program 2.3 Staffing and Certification 13.1 Safeguards and non-Proliferation
[redacted]	Deputy Vice President, Central Technical Authority	3.1 Operating Performance
[redacted]	Manager, Regulatory Affairs	3.2 Reporting Requirements
[redacted]	General Manager, Engineering	4.1 Safety Analysis 4.2 Nuclear Criticality Safety 5.1 Physical Design 5.2 Pressure Boundary and Authorized Inspection Agency 6.1 Fitness for Service
[redacted]	Senior Manager, Radiation Protection Operations	7.1 Radiation Protection
[redacted]	Director, Corporate Occupational Health & Safety	8.1 Conventional Health and Safety
[redacted]	Director, Corporate Environmental Services	9.1 Environmental Protection
[redacted]	Director, Corporate Fire & Emergency Preparedness	10.1 Emergency Management 10.2 Fire Protection
[redacted]	Director, Corporate Security	12.1 Security
[redacted]	Chief Information Officer	12.1 Nuclear Cyber Security

[1] TBD (to be determined) - Until a DROL has been identified, qualified, and appointed, all reporting will be done through the associated Licensing Manager, Facility Authority, or SCA DROL.

REDACTED

Name	Designated Role/ Title	Area of Representation
[redacted]	Acting Director, ERM Integrated Functional Support Service	11.1 Waste Management 11.2 Decommissioning 14.1 Packaging and Transport
[redacted] [redacted]	Director, Corporate Communications Director, Communications & Engagement	G.6: Public Information and Disclosure Program (Including Indigenous Engagement)
[redacted]	Director, Ethics, Conduct of Business	Import/ Export Compliance

4.1.5 Projects

Name	Designated Role/ Title	Area of Representation
[redacted]	Director, Fuel Programme & Projects Development	Fuel Programme & Projects
[redacted]	General Manager & WL Site Licence Holder	WR-1 Reactor Decommissioning
[redacted]	Acting Director, NPD Closure Project	NPD Closure Project
[redacted]	Acting, Project Director, CRL Decommissioning	Affected Lands

4.1.6 CRL Nuclear Facilities

Name	Designated Role/ Title	Area of Representation
[redacted]	EOC Commanders[2]	Emergency Operations Centre (EOC) – Chalk River Laboratories
Class I Facilities		
[redacted]	Facility Authority	Recycle Fuel Fabrication Laboratories (RFFL) Tritium Laboratory [redacted]
[redacted]	Facility Authority	ZED-2 Reactor Fuels and Materials Cells Nuclear Fuel Fabrication Facility (NFFF), [redacted]
[redacted]	Facility Authority	Universal Cells

[2] Employees listed are only considered DROLs when they are acting in the position of EOC Commander

REDACTED

Name	Designated Role/ Title	Area of Representation
		Molybdenum-99 Production Facility
[redacted]	Facility Authority	Waste Treatment Centre and Associated Facilities
[redacted]	Facility Authority	Waste Management Areas
Class II Facilities		
[redacted]	Facility Authority	Gamma Beam 150C Irradiation Facility Gamma Beam Irradiators Model GC60 Health Physics Neutron Generator
[redacted]	Facility Authority	Van de Graaff Accelerator
Nuclear Facilities in Extended Shutdown State		
[redacted]	Facility Authority	MAPLE 1 and 2 Reactors New Processing Facility
Nuclear Facilities Undergoing Decommissioning Activities		
[redacted]	Facility Authority	NRX Reactor [redacted] NRX Reactor Ancillary Building [redacted] NRX Reactor Ancillary Buildings [redacted] NRX Reactor Ancillary Buildings [redacted] NRX Reactor Ancillary Building [redacted] Former Reactor Bay Deionization System [redacted] NRX Fuel Storage and Handling Bays [redacted] Plutonium Recovery Laboratory [redacted] Plutonium Tower [redacted] Waste Water Evaporator [redacted] Active Waste Disposal [redacted] [redacted] including former Tritium Laboratory and Radio Isotope labs Nuclear Fuel Fabrication Facility (NFFF) [redacted]
[redacted]	Facility Authority	Combined Electrolysis Catalytic and Exchange Upgrade and Detritiation Test Facility (CECEUD)
Permanently Shut Down Facilities		
[redacted]	Facility Authority	NRU
Facilities Under Construction		

REDACTED

Name	Designated Role/ Title	Area of Representation
[redacted]	Facility Authority	Near Surface Disposal Facility (NSDF)
[redacted]		Advanced Nuclear Materials Research Centre (ANMRC)
[redacted]		Modernized Combined Electrolysis Catalytic and Exchange (MCECE) Facility

4.1.7 Whiteshell Nuclear Facilities

Name	Designated Role/ Title	Area of Representation
[redacted]	EOC Commanders[2]	Emergency Operations Centre (EOC) – Whiteshell Laboratories
Nuclear Facilities		
[redacted]	Facility Authority	Concrete Canister Storage Facility Waste Management Area
[redacted]	Facility Authority	Research and Development [redacted] Shielded Facilities
Permanently Shut Down Facilities		
[redacted]	Facility Authority	WR-1 Reactor

4.1.8 Prototype Reactors

Name	Designated Role/ Title	Area of Representation
[redacted]	Facility Authority	Gentilly-1 Waste Facility Douglas Point Waste Facility
[redacted]	Facility Authority	NPD Waste Facility

4.1.9 Port Hope Area Initiative

Name	Designated Role/ Title	Area of Representation
[redacted]	Director, Programs & Compliance	Long-Term Low-Level Radioactive Waste Management Facility – Port Hope

[3] TBD (to be determined) - Until a DROL has been identified, qualified, and appointed, all reporting will be done through the Manager, Regulatory Affairs.,

REDACTED

4.1.10 La Prade

Name	Title	Area of Representation
[redacted]	Director, S&T Facilities Operations	La Prade Site

4.2 Licences & Certificates

4.2.1 CNSC Licences and Certificates

Number	Title	Expiry	Comment
Chalk River Laboratories			
NRTEOL-01.01/2028	Nuclear Research and Test Establishment Operating Licence, Chalk River Laboratories	2028 Mar 31	
NRTEOL-LCH-01.01/2028	Licence Conditions Handbook for Chalk River Laboratories	N/A	Revision 5 Effective 2024 Nov 1
15193-1-26.4	Dosimetry Service Licence	2026 May 31	
EL-01.00/2031	Export Licence	2031 Jul 31	
EL-B3-27925.0/2025	Export Licence	2025 Dec 31	
EL-B3-28731.0/2023	Export Licence	2025 Aug 1	
EL-A4-28928.0/2027	Export Licence	2027 Apr 30	
EL-A4-29920.0/2028	Export Licence	2028 May 31	
EL-A1-A4-29984.0/2026	Export Licence	2026 Dec 31	
EL-A1-B1-29987.0/2026	Export Licence	2026 Jan 31	
EL-B2-29997.0/2025	Export Licence	2025 Oct 31	
IL-01.00/2031	Import Licence	2031 Jul 31	
IL-A4-28929.0/2027	Import Licence	2027 Apr 30	
IL-A4-29579.0/2028	Import Licence	2028 May 31	
IL-A1-30129.0/2025	Import Licence	2025 Dec 31	
IL-B1-30143.0/2025	Import Licence	2025 Dec 31	
IL-A1-B1-30230.0/2026	Import Licence	2026 Jan 31	
C2-234-0002-4-2047	Class II Prescribed Equipment Certificate - Hopewell Designs GC60 Series Gamma Beam Irradiator	2047 Jan 31	
C2-041-0001-1-2036	Class II Prescribed Equipment Certificate - Texas Nuclear Neutron Generator 150-1H	2036 Jan 31	

REDACTED

Number	Title	Expiry	Comment
C2-513-0001-0-2036	Class II Prescribed Equipment Certificate - Adelphi Technology DD-109 Neutron Generator	2036 Nov 30	
C2-513-0005-0-2045	Class II Prescribed Equipment Certificate - Adelphi Technology DT108API Neutron Generator	2045 May 31	
C2-005-0027-1-2036	Class II Prescribed Equipment Certificate - MDS Nordion Gammabeam 150C	2036 Nov 30	
C2-234-0006-0-2037	Class II Prescribed Equipment Certificate - Hopewell Designs GC60-1000	2037 Sep 30	
Van de Graaff Electron Accelerator	Class II Prescribed Equipment	N/A	As per 153-NOAC-12-0001-L no certification is required.
R-005-0016-3-2032	Radiation Device Certificate - MD Nordion Gammacell 220/220 Excel	2032 May 31	
R-005-0031-2-2032	Radiation Device Certificate - MDS Nordion Gammacell 200	2032 May 31	
R-061-2032-5-2026	Radiation Device Certificate - QSA Global Models 680B and 680E	2026 May 31	
Whiteshell Laboratories			
NRTEDL-W5-8.00/2027	Nuclear Research and Test Establishment Decommissioning Licence, Whiteshell Laboratories	2027 Dec 31	
NRTEDL-LCH-08.00/2027	Licence Conditions Handbook for Whiteshell Laboratories	N/A	Revision 0 Effective 2025 Jan 1
Prototype Reactors			
WFDL-W4-342.00/2034	Waste Facility Decommissioning Licence, Nuclear Power Demonstration (NPD)	2034 Dec 31	
WFDL-LCH-W4-342.00/2034	Licence Conditions Handbook for Nuclear Power Demonstration (NPD)	N/A	Revision 2 Effective 2023 Aug 15
WFDL-W4-332.03/2030	Waste Facility Decommissioning Licence, Douglas Point	2030 Dec 31	
WFDL-LCH-W4-332.03/2030	Licence Conditions Handbook for Douglas Point	N/A	Revision 1 Effective 2021 Jun 11
WFDL-W4-331.00/2034	Waste Facility Decommissioning Licence, Gentilly-1	2034 Dec 31	
WFDL-LCH-W4-331.00/2034	Licence Conditions Handbook for Gentilly-1	N/A	Revision 1 Effective 2019 Jul 15

REDACTED

Number	Title	Expiry	Comment
Port Hope Area Initiative			
WNSL-W1-2310.00/2032	Waste Nuclear Substance Licence, Port Hope Area Initiative Waste Management Project	2032 Dec 31	
WNSL-W1-2310.00/2032	Licence Conditions Handbook for Port Hope Area Initiative	N/A	Revision 0 Effective 2023 Jan 01
WNSL-W2-2202.0/2026	Waste Nuclear Substance Licence, Low Level Radioactive Waste Management Office (Historic Waste)	2026 Nov 30	
La Prade			
15193-4-26.1	Nuclear Substance and Radiation Devices Licence, La Prade	2026 Sep 30	
Transport Packages and Licences			
Shipping Certificates	Various CNSC certificates for transport packages used by CNL for shipping off-site.		List is maintained by the Transportation of Dangerous Goods Functional Support Area
TL-S-15193-49.00/2025	CRL Onsite Licence to Transport	2025 Dec 31	
TL-S-15193-48.00/2025	Licence to Transport	2025 Oct 31	For transportation between G1WF and CRL

4.2.2 Other Licences, Certificates and Permits

Number	Title	Expiry	Comment
ISO Certifications and Accreditations			
Intertek CERT-0139267	ISO 9001:2015 Quality Management System Certification for Canadian Nuclear Laboratories	2027 April 20	Scope of activities and CNL sites is defined on certificate.
Intertek CERT-0121355	ISO 14001:2015 Environmental Management System Certification for Canadian Nuclear Laboratories	2027 Jul 17	Scope of activities and CNL sites is defined on certificate.
Intertek-SAI Global CERT-0172186 (file no. 2023-137137)	CNL – Chalk River Laboratories Conformance to Drinking Water Quality Management Standard Version 2 -2017	2027 Apr 11	Effective 2024 Apr 11
Canadian Association for Laboratory Accreditation Inc. (CALA)	ISO/IEC 17025:2017 for CNL, CRL Analytical Chemistry Branch	2027 May 05	Accreditation is limited to those tests in the laboratory's scope of testing.

REDACTED

Number	Title	Expiry	Comment
Cert: 1002677			
TSSA & Pressure Boundary Certifications			
QA 84	Manufacture of pressure vessels at CRL only in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 and CSA Standard B51, Boiler, Pressure Vessel and Pressure Piping Code	2028 Mar 20	CRL
QA 230	Repair of ASME Section VIII, Div.1, pressure relief valves using original equipment manufactured parts at CRL only in accordance with CSA Standard B51, Boiler, Pressure Vessel and Pressure Piping Code. Special Processes are limited to Machining. Test Media shall include Air/Gas and Liquid.	2028 Mar 20	CRL
QA 379	Construction and Shop Assembly of Class 1, 1C, 2, 2-C, 3, and 3-C Piping Systems at CRL only in accordance with CSA Standard N285.0, General Requirements for Pressure Retaining Systems and Components in CANDU Nuclear Power Plants.	2028 Mar 20	CRL
QA 00547	Repair and alteration of boilers, pressure vessels, piping and Category A, B, D, E and H type fittings at CRL only in accordance with CSA Standard B51, Boiler, Pressure Vessel and Pressure Piping Code.	2028 Mar 20	CRL
QA 00548	Fabrication, assembly and erection of power piping at CRL only in accordance with CSA Standard B51, Boiler, Pressure Vessel and Pressure Piping Code and ASME B31.1 Power Piping	2028 Mar 20	CRL
QA 00549	Fabrication, assembly and erection of process piping at CRL only in accordance with CSA Standards B51, Boiler, Pressure Vessel and Pressure Piping Code and ASME B31.3 Process Piping.	2028 Mar 20	CRL
QA 02107	Fabrication of Class 1, 2, 3, and 4 Welded and Non-welded Supports; with and without Design Responsibility; At CRL only in accordance with CSA Standard N285.0, General Requirements for Pressure Retaining Systems and	2028 Mar 20	CRL

REDACTED

Number	Title	Expiry	Comment
	Components in CANDU Nuclear Power Plants.		
QA 05178	Fabrication of Class 1, 1C, 2, 2C, 3, 3C and 4 Welded and Non-welded Category A, B, D, E, and H type Fittings, with and without Design Responsibility at CRL only in accordance with CSA Standard N285.0, Requirements for Pressure Retaining Systems and Components in CANDU Nuclear Power Plants.	2028 Mar 20	CRL
QA 02716	Fabrication of welded and non-welded Category A, B, D, E & H type Fittings at CRL only in accordance with CSA Standard B51, Boiler, Pressure Vessel and Pressure Piping Code.	2028 Mar 20	CRL
QA 03880	Fabrication, assembly and erection of refrigeration piping at CRL only in accordance with CSA Standard B52, Mechanical Refrigeration Code and ASME B31.5 Refrigeration Piping.	2028 Mar 20	CRL
QA 02108	Repairs, Modifications or Replacements of Class 1, 1C, 2, 2C, 3, 3C and 4 Nuclear Items; At CRL only in accordance with CSA Standard N285.0, General Requirements for Pressure Retaining Systems and Components in CANDU Nuclear Power Plants.	2028 Mar 20	CRL
TSSA	Various certificates of inspection (C of I) for pressure vessels issued by TSSA		CRL
TSSA R-1415	Certificate of Registration of a Plant (CRL, [redacted] (Powerhouse))		CRL Effective 2024 May 13
TSSA	Various Licences for Elevators and Lifting Devices – Issued by TSSA, posted on the applicable equipment	N/A	CRL
MB-24-062	Certificate of Authorization Issued in Accordance with Manitoba Steam and Pressure Plants Act S210 and CSA B51	2027 Nov 25	WL
Environment			
ENVP-ECCN-18-001-L	Letter of Advice issued by ECCC to ensure that the four Barn Swallow condos are available to the species at least until 2027.	2027 Dec 31	A letter resulting from the Barn Swallow monitoring activities under prior permit

REDACTED

Number	Title	Expiry	Comment
			application (EnvP-18-004).
SARA-OR-2022-0692	Injured SAR Transport, Turtle Egg Shell Collection, and Dead SAR Possession	2027 Oct 01	CRL - The permit authorizes CNL to capture, collect and handle injured, or orphaned species at risk listed on the permit (14 species).
FHR-PER-23001 through FHR-PER-23016	Federal Halocarbon Regulations Permits to Charge a Fire-Extinguishing System; issued by Environment and Climate Change Canada (ECCC)	2026 May 10	A total of 16 permits to charge fire-extinguishing systems at CRL's Recycled Fuel Fabrication Laboratories; permits are good for three years
A 413105	Ontario Ministry of the Environment, Provisional Certificate of Approval – Waste Disposal Site	N/A	CRL
Permit No. WB26588	Wildlife Scientific Permit - Issued by Fisheries Branch of Manitoba Conservation and Water Stewardship	2028	WL
File No. 23-HCAA-01821	Alexander Street Ravine Letter of Authorization – Issued by Department of Fisheries and Oceans Canada to undertake Remediation of the Alexander Street Ravine (North of the Rail Lines) (Letter of Authorization Not Required)	2025 Dec 31	PHAI
License No. 1104997	Alexander Street Ravine License to Collect Fish for Scientific Purposes – Issued by Ontario Ministry of Natural Resources (Alexander Creek North of the Rail Lines)	2025 Dec 31	PHAI
Authorization No. 1104998	Alexander Street Ravine Wildlife Scientific Collector's Authorization – Issued by Ontario Ministry of Natural Resources (Alexander Creek North of the Rail Lines)	2025 Dec 31	PHAI
Permit No. 0537-D6YQLZ	Alexander Street Ravine Permit to Take Water, Issued by Ontario Ministry of the Environment, Conservation and Parks	2029 Dec 31	PHAI

REDACTED

Number	Title	Expiry	Comment
Permit No. 23-HCAA-00407	Waterworks West/West Beach Outlet Letter of Authorization – Issued by Department of Fisheries and Oceans Canada for the Permanent Alteration to Alexander Creek	2032 Jan 31	PHAI
Licence No. 1104994	Waterworks West/West Beach Outlet Licence to Collect Fish for Scientific Purposes – Issued by Ontario Ministry of Natural Resources	2025 Dec 31	PHAI
License No. 1105007	Waterworks West/West Beach Outlet Licence to Stock Fish, Issued by Ontario Ministry of Natural Resources	2025 Dec 31	PHAI
Permit No. 6418-CGQPPF	Waterworks West/West Beach Outlet Permit to Take Water, Issued by Ontario Ministry of the Environment, Conservation and Parks	2032 Aug 04	PHAI
Permit No. 2018-400192	Port Hope Harbour Navigable Waters Permit (Dredging) – Issued by Transport Canada	N/A	PHAI
File No. 4.05.02 e-Doc: 5583191	Port Hope Harbour Request for Review – PHAI – Dredging of Port Hope Inner Harbour – Letter of Advice Issued by the Canadian Nuclear Safety Commission under Department of Fisheries and Oceans Memorandum of Understanding	N/A	PHAI
File No. 23-HCAA-02412	Port Hope Harbour (Outer Harbour) Authorization to Proceed, Issued by the Department of Fisheries and Oceans (Letter of Authorization Not Required)	N/A	PHAI
Permit No. 2514-B37PM6	Port Hope Harbour Permit to Take Water for Hydraulic Dredging, Issued by the Ministry of the Environment, Conservation and Parks	2028 Nov 16	PHAI
Permit No. 6732-BGJNDE	Port Hope Harbour Permit to Take Water for Centre Pier Remediation, Issued by the Ministry of the Environment, Conservation and Parks	2029 Sep 30	PHAI
File No. 23-HCAA-01852	Highland Drive South Ravine Authorization to Proceed, Issued by the Department of Fisheries and Oceans (Letter of Authorization Not Required)	N/A	PHAI

REDACTED

Number	Title	Expiry	Comment
Permit No. 1046-BUYJXF	Highland Drive South Ravine Environmental Compliance Approval – Air and Noise (PRB Installation and Maintenance), Issued by the Ministry of the Environment, Conservation and Parks	N/A	PHAI
Permit No. 1104970	Highland Drive South Ravine Licence to Collect Fish for Scientific Purposes, Issued by Ontario Ministry of Natural Resources	2025 Dec 31	PHAI
Authorization No. 1104974	Highland Drive South Ravine Wildlife Scientific Collector's Authorization, Issued by Ontario Ministry of Natural Resources	2025 Dec 31	PHAI
1130-D7GRL2	Highland Drive South Ravine Permit to Take Water, Issued by Ontario Ministry of the Environment, Conservation and Parks	2034 Aug 13	PHAI
Permit No. 5073-CGQPWV	Chemetron Lagoon Permit to Take Water, Issued by the Ministry of the Environment, Conservation and Parks	2032 Aug 03	PHAI
Permit No. 2550-CGXRPG	Former Coal Gasification Plant Permit to Take Water, Issued by the Ministry of the Environment, Conservation and Parks	2032 Aug 22	PHAI
Transportation			
181-307-638117	Ontario Ministry of Transportation - Commercial Vehicle Operator Registration (CVOR) Certificate		CRL
MVIS 41-55210	Ontario Ministry of Transportation - Motor Vehicle Inspection Station Licence		CRL
0076522978-C	Propane Conversion Licence		CRL
Engineering			
100216258	Professional Engineers of Ontario Certificate of Authorization	N/A	
5993	Engineers Geoscientists Manitoba Certificate of Authorization	N/A	
F1402	Association of Professional Engineers and Geoscientists of New Brunswick	N/A	

REDACTED

Number	Title	Expiry	Comment
	Certificate of Authorization		
Various Certificates	Stationary Engineer Certificates for the Power Plant Chief Operating Engineer, Shift Engineers and Operators		CRL
Canadian Border Services Agency			
12060	Canadian Border Services Agency (CBSA) Partners in Protection (PIP) Program	N/A	A Signed Memorandum of Understanding (MoU) 2013 Dec
47302992	U.S. Customs and Border Protection (CBP) Customs – Trade Partnership Against Terrorism (C-TPAT) Program	N/A	Accepted to program 2012 Mar
Radiobiology & Health			
Canadian Council on Animal Care	Good Animal Practices (GAP)	2024 Dec (awaiting confirmation of successful audit, CNL is still considered in compliance)	Issued 2023 Mar 27
L-R2-55355-23-YL-00	Public Health Agency of Canada Risk Group 2 Pathogen and Toxin Licence Risk Group 2 Terrestrial Animal Pathogen Permit	2028 Feb 07	
SCC File No: 151230	Good Laboratory Practices (GLP) Recognition	2029 Feb 19	Test Facility Test Site
Various Other Licences			
EW-2022-0316	Electricity Wholesaler Licence issued by Ontario Energy Board for CRL	2027 Dec 14	
AECLR1	Canadian Welding Bureau CSA W47.1 Certification of Companies for Fusion Welding of Steel	2026 Feb 05	
CA-00296	Canadian Wood Packaging Certification Program Participation – issued by Canadian Food Inspection Agency	N/A	CRL
Company Code 80002690	Site Radio Licences (various) issued by Industry Canada		CRL and WL
010041105-001	UHF Radio Licence		Gentilly-1
010321051-001	CB Radio Licence		La Prade
010469485-001	CB Radio Repeater Licence		La Prade

REDACTED

5. Facilities & Laboratories

This section identifies the Facilities at CRL, WL, the Prototype Reactors as well as other off-site locations listed from Section 4.1.6 to Section 4.1.10, along with Radioisotope Laboratories.

The information below is organized based on the organization (S&T or ERM) responsible for the safe operation or decommissioning of the facility or laboratory.

5.1 CRL Nuclear Facilities

Operating Class I Nuclear Facilities
Nuclear Fuel Fabrication Facility (NFFF), [redacted]
Recycle Fuel Fabrication Laboratories (RFFL)
ZED-2 Reactor
Universal Cells (UC)
Fuels and Materials Cells (FMC)
Molybdenum-99 Production Facility (MPF)
Tritium Laboratory
Waste Treatment Centre and Associated Facilities
Waste Management Areas
Operating Class II Nuclear Facilities
Health Physics Neutron Generator (HPNG)
Gamma Beam 150C Irradiation Facility (GC-150)
Gamma Beam Irradiator Model GC60 (GC60)
Van de Graaff Accelerator (VdG)
Nuclear Facilities in Extended Shutdown
MAPLE 1 and 2 Reactors
New Processing Facility (NPF)
Nuclear Facilities Undergoing Decommissioning Activities
Plutonium Tower
NRX Reactor
NRX Ancillary Buildings
Waste Water Evaporator
Plutonium Recovery Laboratory
NRX Fuel Storage and Handling Bays
Nuclear Fuel Fabrication Facility (NFFF), [redacted]

REDACTED

Tritium Laboratory [redacted]
Active Waste Disposal
Combined Electrolysis and Catalytic Exchange Upgrading and Detritiation Test Facility (CECEUD)
Permanently Shutdown Facilities
NRU Reactor
Facilities Under Construction
Advanced Nuclear Materials Research Centre (ANMRC)
Modernized Combined Electrolysis Catalytic and Exchange (MCECE) Facility
Near Surface Disposal Facility (NSDF)
Radioisotope Laboratories
Class A
Tritium Laboratory
Class B
Active Wet Chemistry Laboratory
Chalk River Advanced CANDU Fuel Development Laboratories
Chalk River Advanced Fuel Technology (CRAFT) - Ceramics Laboratories
Chromatography Laboratory
Containment Chemistry & Gammacell Laboratories
Coulometric Titration Laboratory
Focused Ion Beam Facility
Hydrogen and Deuterium (H&D) Analysis Laboratories
ICP-MS Laboratory
Imaging-XPS Laboratory
Material Sciences Radioactive Specimen Preparation Laboratories
Medium Activity Material Testing Lab (MAMTL)
Molten Fuel Moderator Interaction Laboratory
Neutron Activation Analysis and Radiochemistry Laboratory
[redacted]ACB Satellite Laboratories
Radiochemical Analysis Laboratory
Radiochemical Analysis Laboratory
Radiochemistry Applications Laboratory
Research Reactor Fuel Development Laboratories
SIMS, SEM and Radioactive Specimen Preparation Laboratories

REDACTED

TIMS Sample Preparation Laboratory
Waste Processing Technology Development Laboratory
Class B
Biological Research Facility Laboratory
Decontamination Test Loops
Class C Radioisotope Laboratory Protocol for [redacted] Chalk River Laboratory
Environmental Analysis Laboratory
Fission Gas Laboratory
Fission Product Release Group Laboratory
Fuel Assembly Science and Technologies Laboratory
Metallographic Services Laboratory
Radiochemistry Applications Laboratory
Radiochemistry Research Laboratory
Radiochemistry Research Laboratory
Small Scale Mechanical Testing Laboratory
Medium Activity Material Testing Laboratory
Surface Science Laboratory
Wet Chemistry Laboratory
Radioisotope Laboratories (Health, Safety, Security & Environment)
Class C
Bioassay Laboratories
Environmental Radiochemistry Laboratory
Tritium Instrument Calibration Laboratory

REDACTED

5.2 Whiteshell Nuclear Facilities

Whiteshell Nuclear Facilities
Concrete Canister Storage Facility (CCSF)
Shielded Facilities (SF, IFTF, HCF)
Waste Management Area (WMA)
[redacted] (Research and Development)
Permanently Shutdown Facilities
WR-1 Reactor
Radioisotope Laboratories

Class B
Radioisotope Laboratory Room [redacted]
Class C
Radioisotope Laboratory Room [redacted]
Other Facilities and Laboratories
Radiation and Industrial Safety Instrumentation Shop
WL Laundry and Decontamination
Waste Transshipment Area
Environmental Management Radiochemical Counting Lab [redacted]
Sample Management Office Sample Receiving Office [redacted]

5.3 Prototype Reactors

Prototype Reactor Facilities
Nuclear Power Demonstrator (NPD) Waste Facility Located: Rolphton Ontario
Douglas Point Waste Facility Located: Bruce Nuclear Power Development, Tiverton Ontario
Gentilly-1 Waste Facility Located: Ville de Bécancour, Québec

5.4 Port Hope Area Initiative

Port Hope Area Initiative
Port Hope Area Initiative Waste Management Project Located: Port Hope, Ontario
Historic Waste Program Management Office Located: Port Hope, Ontario
Historic Waste Program Environmental Laboratory Located: Port Hope, Ontario

5.5 La Prade

La Prade
La Prade Site Located: Ville de Bécancour, Québec

6. References

[1] *General Nuclear Safety and Control Regulations*, SOR/2000-202.

REDACTED

[2] *Licensing Basis List for Chalk River Laboratories*, 900-514300-LST-006300, 68568956.

[3] *Licensing Basis List for Gentilly-1, Douglas Point and Nuclear Power Demonstration Waste Facilities*, 900-514300-LST-006805, 68597117.

[4] *Licensing Basis List for Port Hope Area Initiative*, 900-514300-LST-006823, 68597159.

[5] *Licensing Basis List for Whiteshell Laboratories*, 900-514300-LST-006931, 68597204.

[6] *CNL Management System Manual*, 900-514100-MAN-001, 12489834.

[7] CNL Reporting to Regulatory Agencies, 900-514300-MCP-006, 41554361.

[8] *Delegation of Authority,* 900-514100-FM-004*,* 40793303.

[9] *Compliance,* 900-514300-PDD-001, 51425535.

[10] *Managing Regulatory Communications and Commitments*, 900-514300-MCP-005, 50978336.

[11] *Codes, Regulations, Standards, and Other Documents*, 900-514100-LST-00, 49883204.

REDACTED

Appendix A DROLS for Other Regulators

The following table is a list of DROLs for Acts and Regulations as they apply to sites and activities at CNL. They are derived from sections 4.2 and 4.3 of the *Codes, Regulations, Standards, and Other Documents* [11]

Document Number	Title /Description	Act or Regulation	Associated DROL
C.C.S.M. c. E111	The Endangered Species and Ecosystems Act (Manitoba)	Act	[redacted]
C.C.S.M. c. E125	The Environment Act (Manitoba)	Act	[redacted]
C.C.S.M. c. S210	The Steam and Pressure Plants Act (Manitoba)	Act	[redacted]
R.S.C., 1985, c. 1 (2nd Supp.)	Customs Act	Act	[redacted]
R.S.C., 1985, c. 15 (4th Supp.)	Non-smokers' Health Act	Act	[redacted]
R.S.C., 1985, c. A-1	Access to Information Act	Act	[redacted]
R.S.C., 1985, c. C-11	Canada Water Act	Act	[redacted]
R.S.C., 1985, c. C-34	Competition Act	Act	[redacted]
R.S.C., 1985, c. C-42	Copyright Act	Act	[redacted]
SOR/99-325	Exception for Education Institutions, Libraries, Archives and Museums Regulations	Regulation	[redacted]
R.S.C., 1985, c. C-44	Canada Business Corporations Act	Act	[redacted]
R.S.C., 1985, c. E-19	Export and Imports Permits Act	Act	[redacted]
C.R.C., c. 604	Import Control List	Regulation	[redacted]
SOR/89-202	Export Control List	Regulation	[redacted]

REDACTED

[4] Until a DROL has been identified, qualified, and appointed, all reporting will be done through the Manager, Regulatory Affairs.

Document Number	Title /Description	Act or Regulation	Associated DROL
R.S.C., 1985, c. F-14	Fisheries Act	Act	[redacted]
SOR/2012-139	Wastewater Systems Effluent Regulations	Regulation	[redacted]
R.S.C., 1985, c. H-6	Canadian Human Rights Act	Act	[redacted]
R.S.C., 1985, c. L-2	Canada Labour Code	Act	[redacted]
C.R.C., c. 986	Canada Labour Standards Regulations	Regulation	[redacted]
SOR/86-304	Canada Occupational Health and Safety Regulations	Regulation	[redacted]
SOR/2015-164	Policy Committees, Work Place Committees and Health and Safety Representatives Regulations	Regulation	[redacted]
SOR/2020-130	Work Place Harassment and Violence Prevention Regulations	Regulation	[redacted]
R.S.C., 1985, c. N-22	Canadian Navigable Waters Act	Act	[redacted]
R.S.C., 1985, c. O-5	Security of Information Act	Act	[redacted]
R.S.C., 1985, c. R-1	Radiation Emitting Devices Act	Act	[redacted]
C.R.C., c. 296	Health of Animals Regulations	Regulation	[redacted]
S.C. 1990, c. 22	Plant Protection Act	Act	[redacted]
SOR/95-212	Plant Protection Regulations	Regulation	[redacted]
S.C. 1992, c. 34	Transportation of Dangerous Goods Act	Act	[redacted]
SOR/2001-286	Transportation of Dangerous Goods Regulations	Regulation	[redacted]
S.C. 1994, c. 22	Migratory Birds Convention Act	Act	[redacted]
SOR/2022-105	Migratory Birds Regulations, 2022	Regulation	[redacted]

REDACTED

Document Number	Title /Description	Act or Regulation	Associated DROL
S.C. 1995, c. 39	Firearms Act	Act	[redacted]
SOR/98-210	Storage, Display and Transportation of Firearms and Other Weapons by Businesses Regulation	Regulation	[redacted]
SOR/98-212	Shooting Clubs and Shooting Ranges Regulations	Regulation	[redacted]
S.C. 1995, c. 44	Employment Equity Act	Act	[redacted]
S.C. 1997, c. 9	Nuclear Safety and Control Act	Act	[redacted]
SOR/2000-202	General Nuclear Safety and Control Regulations	Regulation	[redacted]
SOR/2000-203	Radiation Protection Regulations	Regulation	[redacted]
SOR/2000-204	Class I Nuclear Facilities Regulations	Regulation	[redacted]
SOR/2000-205	Class II Nuclear Facilities and Prescribed Equipment Regulations	Regulation	[redacted]
SOR/2000-207	Nuclear Substances and Radiation Devices Regulations	Regulation	[redacted]
SOR/2000-209	Nuclear Security Regulations	Regulation	[redacted]
SOR/2000-210	Nuclear Non-proliferation Import and Export Control Regulations	Regulation	[redacted]
SOR/2013-139	Administrative Monetary Penalties Regulations	Regulation	[redacted]
SOR/2015-145	Packaging and Transport of Nuclear Substances Regulations, 2015	Regulation	[redacted]
S.C. 1998, c. 34	Corruption of Public Foreign Officials Act	Act	[redacted]
S.C. 1999, c. 33	Canadian Environmental Protection Act, 1999	Act	[redacted]
SOR/2003-289	Federal Halocarbon Regulations	Regulation	[redacted]
SOR/2006-124	Pest Control Products Regulations	Regulation	[redacted]
SOR/2008-197	Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations	Regulation	[redacted]
SOR/2008-273	PCB Regulations	Regulation	[redacted]

REDACTED

Document Number	Title /Description	Act or Regulation	Associated DROL
SOR/2012-285	Prohibition of Certain Toxic Substances Regulations, 2012	Regulation	[redacted]
SOR/2016-137	Ozone-depleting Substances and Halocarbon Alternatives Regulations	Regulation	[redacted]
SOR/2019-51	Environmental Emergency Regulations	Regulation	[redacted]
S.C. 2000, c. 5	Personal Information Protection and Electronic Documents Act	Act	[redacted]
S.C. 2002, c. 28	Pest Control Products Act	Act	[redacted]
S.C. 2002, c. 29	Species at Risk Act	Act	[redacted]
S.C. 2007, c. 15	Emergency Management Act	Act	[redacted]
SOR/2015-44	Human Pathogens and Toxins Regulations	Regulation	[redacted]
SOR/2012-147	Regulations Designating Physical Activities	Regulation	[redacted]
S.C. 2015, c. 4, s. 120	Nuclear Liability and Compensation Act	Act	[redacted]
S.C. 2018, c.27, s.416	Pay Equity Act	Act	[redacted]
S.C. 2019, c.28, S.1	Impact Assessment Act	Act	[redacted]
SOR/2019-285	Physical Activities Regulations	Regulation	[redacted]
SOR/2019-323	Designated Classes of Projects Order	Regulation	[redacted]
NR20-2/1-2010E	National Building Code of Canada 2010	Code	[redacted]
NR24-28/2015E	National Building Code of Canada 2015	Code	[redacted]
NR24-28/2020E	National Building Code of Canada 2020	Code	[redacted]
NR20-4/1-2010E	National Fire Code of Canada 2010	Code	[redacted]
NRCC-56192	National Fire Code of Canada 2015	Code	[redacted]
NR24-27/2020E	National Fire Code of Canada 2020	Code	[redacted]

REDACTED

Minister of Natural Resources | Ministre des Ressources naturelles

Ottawa, Canada K1A 0E4

JUL 31 2015

Dr. Michael Binder
President and Chief Executive Officer
Canadian Nuclear Safety Commission
P.O. Box 1046, Station B
Ottawa, Ontario K1P 5S9

Dear Dr. Binder:

I am writing in response to your letter of July 15, 2015, with respect to the Canadian Nuclear Safety Commission's (CNSC) requirement for all of its licensees to establish sufficient funds for the decommissioning of their nuclear facilities, i.e. financial guarantees under paragraph 3(1)(l) of the *General Nuclear Safety and Control Regulations* made pursuant to the *Nuclear Safety and Control Act*.

Atomic Energy of Canada Limited (AECL) is a Schedule III, Part I Crown corporation under the *Financial Administration Act* and an agent of Her Majesty in Right of Canada. As an agent of Her Majesty in Right of Canada, AECL's liabilities are ultimately liabilities of Her Majesty in Right of Canada.

While the restructuring of AECL will see the ownership of Canadian Nuclear Laboratories Limited (CNL) transferred to a private-sector contractor, AECL will retain ownership of the lands, assets and liabilities associated with CNL's licences. Specifically, this letter addresses the licences held by CNL for the Chalk River Laboratories, the Whiteshell Laboratories, the Port Hope project, the Port Granby project, and the following three prototype power reactors: Nuclear Power Demonstration, Douglas Point and Gentilly-1.

Consistent with the policy of the Government of Canada that Her Majesty need not restate her commitment in the form of a guarantee, I trust that this letter will serve to address the requirement of the Commission.

Sincerely,

The Honourable Greg Rickford, P.C., M.P.
Minister of Natural Resources and Minister for the
Federal Economic Development Initiative for Northern Ontario

c.c.: Mr. Jon Lundy, Chief Transition Officer, Atomic Energy of Canada Limited
Mr. Ramzi Jammal, Executive Vice-President and Chief Regulatory Operations Officer,
Canadian Nuclear Safety Commission

Canada

Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

DETAILED DECOMMISSIONING PLAN

THE WHITESHELL LABORATORIES DETAILED DECOMMISSIONING PLAN VOLUME 1 – PROGRAM OVERVIEW

WHITESHELL LABORATORIES DECOMMISSIONING PROJECT

WLDP-02000-DDP-001

Revision 2

REDACTED

Prepared by:	H. Athauda-Arachchige Safety & Licensing Analyst	2021-07-07 Date
Reviewed by:	R. Swartz Manager, WL Licensing & Quality Management	2021-07-07 Date
Approved by:	D. LeBoeuf Senior Project Manager, Decommissioning & Demolition	2021-07-13 Date
Approved by:	D. Gilson Senior Manager, WMA D&D	2021-07-13 Date
Approved by:	D. Fillion Facility Authority, WL Closure Project	2021 AUG 16 Date

UNRESTRICTED
© Canadian Nuclear Laboratories

This page is for Content Controls that apply to this document. If no Content Controls apply, none will be listed.

REDACTED

REVISION HISTORY

Rev. No.	Date	Details of Rev.	Prepared By	Reviewed By	Approved By
2	*2021/07/05*	*Issued as "Approved for Use (pending CNSC acceptance)".*	*H. Athauda-Arachchige*	*R. Swartz*	*D. Fillion* *D. Gilson* *D. LeBoeuf*
2D1	*2021/01/18*	*Addressed CNSC staff comments.* *Issued for "Review and Comment".*	*H. Athauda-Arachchige*	*R. Bilinsky* *D. Fillion* *D. Howlett* *D. LeBoeuf* *A. Luke* *J. Martino* *J. Reynolds* *R. Swartz* *A. Wilcox* *B. Wilcox* *L. Wojciechowski*	
1	*2019/09/12*	*Addressed SRC comments.* *No formal R&C is required.* *Issued as "Approved for Use (pending CNSC acceptance)".*	*H. Athauda-Arachchige* *S. Bukhari*	*R. Swartz*	*M. Smith* *B. Wilcox* *D. Onagi*
0	*2019/08/12*	*Issued as "Approved for Use (pending CNSC acceptance)".*	*H. Athauda-Arachchige* *S. Bukhari*	*R. Swartz*	*M. Smith* *B. Wilcox* *D. Onagi*
D1	*2019/07/11*	*Issued for "Review and Comment".* *This document will cancel and supersede WLDP-02000-DDP-001 (RC-2143-1, Rev. 4P0).*	*H. Athauda-Arachchige* *S. Bukhari*	*J. Betteridge* *R. Bilinsky* *P. Henschell* *D. Howlett* *A. Luke* *J. Martino* *J. Melillo* *L. Rasmussen* *T. Reimer* *M. Smith* *R. Swartz* *A. Wilcox* *B. Wilcox* *L. Wojciechowski*	

REDACTED

TABLE OF CONTENTS

SECTION **PAGE**

1. INTRODUCTION AND SCOPE 13
1.1 Introduction 13
1.2 Decommissioning Plan Structure 14
1.3 Graded Approach for Decommissioning 19
1.4 Acronyms 19
1.5 References 21
2. WHITESHELL LABORATORY SITE DESCRIPTION 22
2.1 General Site Layout 22
2.2 Site Facilities and Infrastructure Overview 28
2.2.1 Nuclear Facilities 28
2.2.1.1 Shielded Facilities 28
2.2.1.2 Active Liquid Waste Treatment Centre 29
2.2.1.3 Whiteshell Reactor-1 30
2.2.1.4 Concrete Canister Storage Facility 30
2.2.1.5 Waste Management Area 31
2.2.1.5.1 [redacted] (WMA Main Access Building) 32
2.2.1.5.2 LLW Processing Quonset/Building ([redacted]) 32
2.2.1.5.3 LLW Storage Bunkers ([redacted] 6) 34
2.2.1.5.4 Storage Quonset/Building ([redacted]) 34
2.2.1.5.5 LLW Storage Quonsets ([redacted]) 34
2.2.1.5.6 LLW Trenches ([redacted]) 34
2.2.1.5.7 Incinerator Complex ([redacted]) 35
2.2.1.5.8 ILLW Processing Centre [redacted]) 35
2.2.1.5.9 ILW In-Ground Concrete Bunkers ([redacted]) 35
2.2.1.5.10 ILW Storage Bunkers ([redacted]) 36
2.2.1.5.11 Above Ground Storage Bunker ([redacted]) 36
2.2.1.5.12 ILW In-Ground Concrete Standpipes 37
2.2.1.5.13 High Level Active Liquid Waste (Amine) Storage Tanks ([redacted]) 38

REDACTED

2.2.1.5.14 SMAGS Building ([redacted]), Cask Loading Facility (CLF) 39
2.2.1.5.15 Soil Storage Compound (SSC) 39
2.2.1.5.16 WMA Operations Centre ([redacted]) 39
2.2.1.5.17 Water Seacan ([redacted]) 40
2.2.1.5.18 Septic Seacan ([redacted]) 40
2.2.2 Auxiliary Facilities/Radioisotopes Facilities 40
2.2.2.1 Research and Development Facilities Complex ([redacted]) 40
2.2.2.2 Health and Safety Facilities ([redacted]) 40
2.2.3 Whiteshell Licensed Site Supporting and General Site Infrastructure 41
2.2.3.1 Non-Nuclear Facilities/Buildings 41
2.2.3.2 Inactive Landfill 42
2.2.3.3 Sewage Lagoon 42
2.2.3.4 Buried Services 42
2.2.3.5 Affected Site Lands 43
2.2.3.5.1 Active Area Soil Contamination 43
2.2.3.5.1.1 Radiological Events 43
2.2.3.5.1.2 Non-Radiological Hazardous Materials Events 45
2.2.3.5.2 Cesium Ponds 45
2.2.3.5.3 Field Irradiator Gamma (FIG) 45
2.2.3.5.4 Zoological Environment Under Stress (ZEUS) 46
2.2.3.5.5 Deep Borehole Site 46
2.2.3.5.6 Tritium Injection Sites [redacted] and [redacted] 46
2.2.3.6 Off-Site Contaminated Areas 46
2.2.3.6.1 River Sediments 46
2.2.3.6.2 North Ditch/Creek 47
2.3 Operational History 47
2.4 References 49
3. APPLICABLE PROGRAMS, CODES AND STANDARDS 50
3.1 CNL Management System and Health, Safety, Security, Environment and Quality 50
3.1.1 Occupational Safety and Health 51
3.1.2 Radiation Protection 51

REDACTED

3.1.2.1 As Low As Reasonably Achievable Approach 51
3.1.2.2 Dose Estimates and Monitoring 52
3.1.3 Environmental Protection and Monitoring 52
3.1.4 Emergency Preparedness 52
3.1.5 Fire Protection 53
3.1.6 Security 53
3.1.7 Nuclear Materials and Safeguards Management 53
3.1.8 Transportation of Dangerous Goods 54
3.1.9 Waste Management 54
3.1.10 Quality Assurance 55
3.1.11 Human Performance Management and Operating Experience 55
3.1.12 Staffing, Personnel Qualifications and Testing 55
3.1.13 Human Factors 56
3.1.14 Nuclear Criticality Safety 57
3.1.15 Pressure Boundary 57
3.2 Acts, Laws and Regulations and Codes, Guides and Standards 57
3.2.1 Acts, Laws and Regulations 57
3.2.2 Codes, Guides and Standards 58
3.3 References 58
4. HAZARDS ASSESSMENT 60
4.1 Facility Current Hazards 60
4.1.1 Radiological Hazards 60
4.1.1.1 Radiological Area and Zoning 60
4.1.1.2 Radiation Dose Rates 63
4.1.2 Facility Radiological Hazards 64
4.1.2.1 Shielded Facilities 64
4.1.2.2 Active Liquid Waste Treatment Centre 65
4.1.2.3 Whiteshell Reactor-1 65
4.1.2.4 Concrete Canister Storage Facility 66
4.1.2.5 Waste Management Area 66
4.1.2.5.1 Standpipes Area 67

REDACTED

4.1.2.5.2 Intermediate Level Waste Bunkers, [redacted] and Amine Tanks 67
4.1.2.5.3 Low Level Waste Liabilities 67
4.1.2.6 Research and Development Facilities Complex ([redacted]) 68
4.1.2.7 Health and Safety Facilities ([redacted]) 69
4.1.2.8 Underground Active Drain System 69
4.1.2.9 Storm Drain System 69
4.1.2.10 Sewage System 69
4.1.2.11 Affected Lands 69
4.1.2.12 Sewage Lagoon 69
4.1.2.13 Landfill 70
4.1.2.14 Cesium Ponds 70
4.1.3 Chemical Hazards 70
4.1.4 Industrial Hazards 72
4.1.5 Biological Hazards 72
4.1.6 Environmental Hazards 73
4.1.6.1 Environmental Emissions 73
4.1.6.2 Wastewater 73
4.2 Facility Future Hazards due to Decommissioning 74
4.2.1 Radiological Hazards 74
4.2.2 Chemical Hazards 76
4.2.3 Industrial Hazards 77
4.2.4 Biological Hazards 79
4.2.5 Environmental Hazards 79
4.3 Nuclear Criticality Control 80
4.4 External Hazards 81
4.5 Unplanned Events 81
4.6 References 81
5. DECOMMISSIONING APPROACH 82
5.1 Rationale for the WL Decommissioning Strategy 82
5.1.1 Decommissioning Alternatives 84
5.1.1.1 Alternative 1: Decommission the Site to a Final End State in a 20 Year Period (2020) 84

REDACTED

5.1.1.2 Alternative 2: Deferred Decommissioning With Completion in 100 Years (2100) 85
5.1.1.3 Alternative 3: Decommission the Site to a Final End State in a Phased Approach Over a Period 60 Years (2060) 85
5.1.1.4 Alternative 4: Decommission the Site to a Final End-State in a Phased Approach Over a Period of ~27 Years (~2027) 87
5.1.1.5 Preferred Decommissioning Approach 88
5.1.2 Decommissioning Strategy 91
5.1.3 Implementation of the Preferred Decommissioning Approach 92
5.1.4 Monitoring and Surveillance Approach 95
5.1.5 Building/Facility End-State Approach 95
5.2 Whiteshell's Decommissioning Planning Process 96
5.3 Decommissioning of Nuclear Facilities 97
5.3.1 Shielded Facilities 97
5.3.2 Active Liquid Waste Treatment Centre 99
5.3.3 Whiteshell Reactor-1 101
5.3.3.1 Complete Removal Approach (as per the original Overview DDP [5-1]) 101
5.3.3.2 In Situ Decommissioning Approach (as per Alternative 4) 102
5.3.4 Concrete Canister Storage Facility 104
5.3.5 Waste Management Area 105
5.4 Decommissioning of Radioisotopes Facilities/Auxiliary Facilities 107
5.4.1 Research and Development Facilities Complex ([redacted]) 107
5.4.2 Health and Safety Facilities ([redacted] and [redacted]) 108
5.5 Decommissioning of Whiteshell Licensed Site Supporting and General Site Infrastructure 109
5.5.1 Non-Nuclear Buildings 109
5.5.2 Inactive Landfill 110
5.5.3 Sewage Lagoon 110
5.5.4 Buried Services 110
5.5.5 Affected Lands 110
5.5.6 River Sediments 111
5.5.7 North Ditch/Creek 111
5.6 Interim and Final End-State 111
5.6.1 Interim End-State Objectives 111

REDACTED

5.6.2 Final End-State Objectives 111
5.6.3 End-State Documentation 112
5.7 References 113
6. WASTE MANAGEMENT PLAN 114
6.1 Waste Management Practices 114
6.2 Classification of Waste 115
6.3 Inventory of Stored Wastes 116
6.4 Inventory of Decommissioning Wastes 116
6.5 Operational Waste 119
6.6 Waste Streams 119
6.7 Radiological Characterization and Clearance Surveys 119
6.7.1 General 119
6.7.2 Clearance Criteria 120
6.8 Waste Processing Facilities 120
6.8.1 Active Liquid Waste Treatment 120
6.8.2 WMA Retrieval, Reprocessing and Repackaging Facility 120
6.9 Final Waste Disposition 120
6.9.1 Waste Disposition Paths 120
6.9.1.1 In Situ Disposal 121
6.9.1.2 Engineered Off-Site Facilities 121
6.9.1.3 Off-Site Landfill 121
6.9.1.4 River 121
6.9.1.5 CRL and Other Licensed Facilities 121
6.9.2 Waste Disposition Plan 122
6.10 References 123
7. REGULATORY AND ENVIRONMENTAL ASSESSMENT CONSIDERATIONS 124
7.1 References 125
8. ENVIRONMENTAL MONITORING 126
8.1 Environmental Monitoring Program 126
8.2 Effluent Verification Monitoring Program 127

REDACTED

8.3 Groundwater Monitoring Program 129
8.4 Monitoring and Surveillance 130
8.5 Factors Affecting Scope of Monitoring 130
8.6 Environmental Effects 131
8.7 References 131

9. PROGRAM MANAGEMENT 132

9.1 Organization 132
9.2 Schedule 132
9.3 Funding, Cost Estimate and Financial Guarantee 134
9.4 References 134

10. PUBLIC INFORMATION 134

10.1 Public and Indigenous Communication 134
10.2 Communication Modes 135
10.3 Whiteshell Public Liaison Committee 135
10.4 Whiteshell Closure Project 136
10.5 References 137

11. RECORDS MANAGEMENT 137

11.1 Decommissioning Records 137
11.2 References 137

APPENDIX A RADIOLOGICAL SAFETY ZONE DESCRIPTION 138

APPENDIX B TABLE OF CONTENTS FOR FINAL END-STATE REPORT 142

FIGURES

FIGURE 2-1 AREA MAP OF THE REGION 23
FIGURE 2-2 LOCATION OF WHITESHELL LABORATORIES 24
FIGURE 2-3 WHITESHELL LABORATORIES SITE LAYOUT 25
FIGURE 2-4 LICENSED PROPERTY 26
FIGURE 2-5 AFFECTED VS UNAFFECTED AREA DESIGNATION 27
FIGURE 2-6 PLAN VIEW OF THE WL WASTE MANAGEMENT AREA 33

REDACTED

FIGURE 5-1 DECAY CURVES FOR THE STEEL FUEL CHANNELS AND THE STEEL CALANDRIA VESSEL (PER KILOGRAM) 89
FIGURE 5-2 DECAY CURVES FOR THE FUEL CHANNEL AND CALANDRIA TUBES (PER CENTIMETER HEIGHT) 89
FIGURE 5-3 WHITESHELL'S DECOMMISSIONING PROCESS 97
FIGURE 8-1 EFFLUENT MONITORING LOCATIONS 129
FIGURE 9-1 PRELIMINARY WHITESHELL PROJECT SCHEDULE 133

TABLES

TABLE 1-1 LIST OF FACILITIES, DETAILED DECOMMISSIONING PLANS, END-STATE REPORTS AND THE DETAILED DECOMMISSIONING PLAN OR FACILITY STATUS 16
TABLE 2-1 AUXILIARY OPERATING FACILITIES AT WHITESHELL LABORATORIES 40
TABLE 2-2 NON-NUCLEAR FACILITIES/BUILDINGS AT WHITESHELL LABORATORIES 41
TABLE 2-3 UNUSUAL OCCURRENCES SINCE 2002 48
TABLE 4-1 WL SITE RADIOLOGICAL AREAS AND FACILITY RADIOLOGICAL SAFETY ZONE SUMMARY 62
TABLE 4-2 LOW LEVEL WASTE LIABILITIES 68
TABLE 4-3 CHEMICAL HAZARDS AT THE WHITESHELL LABORATORIES SITE 70
TABLE 4-4 RADIOLOGICAL HAZARDS AND MITIGATION MEASURES 76
TABLE 4-5 INDUSTRIAL HAZARDS AND MITIGATION MEASURES 77
TABLE 4-6 BIOLOGICAL HAZARDS AND MITIGATION MEASURES 79
TABLE 5-1 COMPARISON OF COST FOR DECOMMISSIONING ALTERNATIVES 1 TO 3 [5-1] 91
TABLE 5-2 WHITESHELL LABORATORIES DECOMMISSIONING SCHEDULE (AS PER ORIGINAL OVERVIEW DDP [5-1]) 93
TABLE 5-3 SHIELDED FACILITIES DECOMMISSIONING PHASES AND ACTIVITIES 98
TABLE 5-4 ACTIVE LIQUID WASTE TREATMENT CENTER DECOMMISSIONING PHASES AND ACTIVITIES 99
TABLE 5-5 WR-1 REACTOR DECOMMISSIONING PHASES AND ACTIVITIES FOR COMPLETE REMOVAL 101
TABLE 5-6 WR-1 REACTOR DECOMMISSIONING PHASES AND ACTIVITIES FOR IN SITU DECOMMISSIONING 103
TABLE 5-7 CONCRETE CANISTER STORAGE FACILITY DECOMMISSIONING PHASES AND ACTIVITIES 104
TABLE 5-8 WASTE MANAGEMENT AREA DECOMMISSIONING PHASES AND ACTIVITIES 105
TABLE 5-9 RESEARCH AND DEVELOPMENT FACILITIES COMPLEX DECOMMISSIONING PHASES AND ACTIVITIES 107
TABLE 5-10 NON-NUCLEAR BUILDINGS DECOMMISSIONING PHASES AND ACTIVITIES 109
TABLE 6-1 CLASSIFICATION OF WASTE 115
TABLE 6-2 SUMMARY OF WL SITE DECOMMISSIONING WASTE ESTIMATE 118

REDACTED

TABLE 6-3 KEY IWS ACTIVITIES RELEVANT TO WL DECOMMISSIONING 122

REDACTED

1. INTRODUCTION AND SCOPE

1.1 Introduction

The Whiteshell Laboratories Site (WL) site at Pinawa, Manitoba was established in the early 1960s by Atomic Energy of Canada Limited (AECL) to carry out research and development activities for higher temperature versions of the CANada Deuterium-Uranium (CANDU) reactor. The initial focus of the research program was the Whiteshell Reactor-1 (WR-1) Organic Cooled Reactor (OCR) [1-1] [1-2]. The reactor design also provided a facility for engineering tests and scientific studies on alternative fuels, fuel channels, and reactor coolants. WR-1 operated from 1965 to 1985, accumulating 120,000 operating hours during its lifetime. The reactor was permanently shut down in 1985.

Other significant programs carried out at WL included the Nuclear Fuel Waste Management Program (NFWMP), the SLOWPOKE Demonstration Reactor Project and various accelerator activities. As a result, the WL site had a range of nuclear facilities which provided support for these programs.

On 2006 June 03, the Minister of Natural Resources announced federal government funding for decommissioning and remediation of a number of facilities managed by AECL on behalf of the federal government, including the decommissioning of WL in Pinawa.

In 2013, the Minister of Natural Resources announced plans to restructure AECL, and move to a Government Owned, Contractor Operated (GoCo) management model for AECL. In 2014, AECL created Canadian Nuclear Laboratories (CNL), a wholly owned subsidiary of AECL, as the Site Operating Company and holder of all Canadian Nuclear Safety Commission (CNSC) site licences, managing all work performed at AECL sites on behalf of AECL. In 2015 September, a contract was awarded to Canadian National Energy Alliance (CNEA), and ownership of CNL was transferred to CNEA. CNL retained ownership of all CNSC licences and is the operator of all AECL sites.

The funding structure for the decommissioning of the WL site was modified from an annual government funding program, to a single target cost agreement between AECL and CNL. The responsibility for funding remains with the federal government through AECL.

WL is regulated under a CNSC Decommissioning Licence [1-3]. WR-1 is a permanently shut down facility.

Canadian Nuclear Laboratories has a requirement, as described in the WL Detailed Decommissioning Plan (DDP), Volume 1 - Program Overview [1-4], to shut down and decommission the WL site. Activities are underway to complete the orderly decommissioning of the WL site, following the general plan laid out in the Comprehensive Study Report (CSR) [1-1], which supported the approval of the Environmental Assessment (EA) of the WL Decommissioning Project. The exception to this is the change in strategy for WR-1[1] . Accordingly, the nuclear facilities and buildings on the WL site are being systematically placed in a safe shutdown state and safely decommissioned, with the view of leaving the site in a safe and secure state of Monitoring and Surveillance (M&S).

This Decommissioning Program Overview document describes the strategy planned to place the WL site in the

[1] In situ decommissioning/disposal (ISD) and grouting of WR-1 is being considered as opposed to complete removal as outlined in the CSR [1-1]. Both options are discussed in this DDP, and an environmental assessment is underway for the proposed ISD of WR-1.

REDACTED

M&S state and indicates the approach considered for the final decommissioning end state.

1.2 Decommissioning Plan Structure

The planning requirement for decommissioning WL is unique for Canada since it addresses all of the site nuclear and non-nuclear facilities. The plan strives to document a clear picture of the overall site end state condition (interim and final), and the inter-relationships between various facilities and support programs as the site is decommissioned.

The structure for the overall plan is to describe the site and facilities in general in an overview document (Volume 1) [1-4], which summarizes the decommissioning strategy and describes briefly the individual facilities, the operational status, the proposed M&S end states and the proposed final end state for the site. Other key topics such as hazards, regulatory and EA considerations, waste management plans, program management, and Quality Assurance (QA) are also covered in general terms in the overview document.

In total, twelve separate volumes of decommissioning plans address all of the facilities, buildings and areas at the WL site. Each decommissioning plan has or will be submitted to CNSC staff, with new DDPs or revisions to existing DDPs requiring CNSC acceptance prior to executing the planned decommissioning work. The facility specific decommissioning plans include:

- Volume 2: Shielded Facilities (SF)
- Volume 3: Van de Graaff Accelerator
- Volume 4: Neutron Generator (NG)
- Volume 5: Active Liquid Waste Treatment Centre (ALWTC)
- Volume 6: Whiteshell Reactor-1 (WR-1)
- Volume 7: Concrete Canister Storage Facility (CCSF)
- Volume 8: Waste Management Area (WMA)
- Volume 9: [redacted]
- Volume 10: Decontamination Centre ([redacted])
- Volume 11: Health and Safety Facilities ([redacted] and [redacted])
- Volume 12: WL Licensed Site Supporting and General Infrastructure

Table 1-1 provides information about the WL facilities, DDP volumes, End-State Reports completed by 2020 November, and the DDP or facility current status.

The decommissioning work associated with the DDP Volumes 3, 4, and 10 has already been completed and these three facilities, the Van de Graaff Accelerator, Neutron Generator, and Decontamination Centre ([redacted]), have been decommissioned.

The DDP Volume 6 is reserved for the WR-1 reactor and [redacted] Revision 3 of DDP Volume 6 describes the approved decommissioning approach of complete dismantlement and removal while a newer revision (e.g., Revision 4) provides details about the ISD approach of the WR-1 reactor which is currently undergoing an EA process.

The DDP Volume 8 is for the WMA and has three parts. Part 1 of DDP Volume 8 covers the standpipes area decommissioning. The decommissioning of Intermediate Level Waste Bunkers, [redacted] and Amine Tanks is described in part 2, and the Low Level Waste Liabilities are discussed in part 3.

For the site facilities not specifically identified as listed nuclear facilities under the WL site licence, DDP

REDACTED

Volume 12 was developed which addresses the Site General Buildings and Infrastructure. The DDP Volume 12 has five parts, which cover north-side buildings, south-side buildings, outer area buildings and facilities, site services, and site affected lands and contaminated structures.

REDACTED

Table 1-1 List of Facilities, Detailed Decommissioning Plans, End-State Reports and the Detailed Decommissioning Plan or Facility Status

WL Facility	DDP Document Title/Document #	End-State Reports (as of 2021 June)	DDP or Facility Status
	The Whiteshell Laboratories Detailed Decommissioning Plan: Volume 1 - Program Overview, WLDP-02000-DDP-001, (RC-2143-1, Rev. 4P0), January 2002		To be Cancelled and Superseded by WLDP-02000-DDP-001, Rev. 2.
	The Whiteshell Laboratories Detailed Decommissioning Plan: Volume 1 - Program Overview, WLDP-02000-DDP-001, Revision 1, 2019		Current version of DDP Volume 1 submitted to CNSC for acceptance.
Shielded Facilities	Whiteshell Laboratories Detailed Decommissioning Plan: Volume 2 - Shielded Facilities, WLDP-21400-DDP-001, Revision 1, 2016	Hot Cells Facility Storage Blocks, WLDP-21412-IES-001, Revision 1, 2009 (note this is an Interim End-State Report)	- Facility is operational and decommissioning activities ongoing. - DDP Volume is available for use.
		Decommissioning of Hot Cells [redacted] and Scanning Electron Microscope, WLDP-21414-IES-001, Revision 1, 2009 (note this is an Interim End State Report)	
		Shielded Facilities Work Plan 6 - Cells [redacted] WLDP-21417-ESDR-001, Revision 1, 2012	
		Decommissioning of the Immobilized Fuel Test Facility Canisters, WLDP-21418-ESDR-001, Revision 0, 2008	
		Shielded Facilities Work Plan 10 - Immobilized Fuel Test Facility Main Floor Operating Areas, WLDP-21421-ESDR-001, Revision 1, 2012	
		Shielded Facilities Work Plan 11 - Thorium Fuel Reprocessing Experiment (TFRE) Tanks and Piping, WLDP-21422-ESDR-001, Revision 1, 2013	
Van de Graaff Accelerator	Whiteshell Laboratories Detailed Decommissioning Plan: Volume 3 - Van de Graaff Accelerator, RC-2143-3, Revision 1, 2000	Van de Graaff Accelerator, WLDP-28500-ESDR-002, Revision 0, 2004	- Facility has been decommissioned.
Neutron Generator	Whiteshell Laboratories Detailed Decommissioning Plan: Volume 4 –– The 14-MeV Neutron Generator Facility, RC-2143-4, Revision 1, 2000	14-MeV Neutron Generator Facility, WLDP-28500-ESDR-001, Revision 1, 2004	- Facility has been decommissioned.
Active Liquid Waste Treatment Centre	Whiteshell Laboratories Detailed Decommissioning Plan: Volume 5 - Active Liquid Waste Treatment Centre [redacted] WLDP-25400-DDP-001, Revision 0, 2011		- Facility is being decommissioned. - DDP Volume is available for use.
Whiteshell Reactor-1	Whiteshell Laboratories Detailed Decommissioning Plan: Volume 6 - Whiteshell Reactor -#1: [redacted] WLDP-26400-DDP-001, Revision 3, 2015 (Complete Dismantlement and Removal Approach)		- Facility has been shut down and currently under M&S. - Complete Dismantlement and Removal approach has been approved by the CNSC. - EA process for ISD is in progress, DDP Volume (Revision 4) is to be revised with final EA and licensing submission. - DDP Volume (Revision 3) is available for use.
	Whiteshell Laboratories Detailed Decommissioning Plan: Volume 6 – Whiteshell Reactor #1: [redacted], WLDP-26400-DDP-001, Revision 4, 2017 (In Situ Decommissioning Approach)		

REDACTED

WL Facility	DDP Document Title/Document #	End-State Reports (as of 2021 June)	DDP or Facility Status
Concrete Canister Storage Facility	Whiteshell Laboratories Detailed Decommissioning Plan: Volume 7 - Concrete Canister Storage Facility, WLDP-22500-DDP-001, Revision 1, 2017		- Facility is operational. - DDP was sent to the CNSC for information and comments received (to be dispositioned).
Waste Management Area	Whiteshell Laboratories Detailed Decommissioning Plan: Volume 8 - WMA Part 1: Standpipes Area, WLDP-36500-DDP-001, Revision 0, 2016		- Facility is operational - DDP Volume not yet submitted to CNSC.
	Whiteshell Laboratories Detailed Decommissioning Plan: Volume 8 - WMA Part 2: Intermediate Level Waste Bunkers, [redacted] and Amine Tanks, WLDP-24900-DDP-001, Revision 1, 2017		- Facility is operational. - DDP Volume not yet submitted to CNSC.
	Whiteshell Laboratories Detailed Decommissioning Plan: Volume 8 - WMA Part 3: Low Level Waste Liabilities, WLDP-24400-DDP-001, Revision 3, 2018	Decommissioning and Demolition of Organic Coolant Incinerator Complex ([redacted]), WLDP-24400-ESDR-001, Revision 1, 2021	- Facility is operational. - DDP Volume is available for use.
Research and Development Facilities Complex	Whiteshell Laboratories Detailed Decommissioning Plan: Volume 9 - [redacted] WLDP-23500-DDP-001 (RC-2143-9), Revision 0, 2007 Whiteshell Laboratories Detailed Decommissioning Plan: Volume 9 - [redacted]_Addendum, WLDP-23500-DDP-001_AD, Revision 2, 2018	[redacted] Core and South High Bay Area Active Drain Line Removal, WLDP-23511-ESDR-001, Revision 0, 2009 [redacted] Core Area Shutdown & Decontamination, WLDP-23512-ESDR-001, Revision 1, 2015 Decommissioning of [redacted] Computer Centre, Machine Shop / Stores Area, & South High Bay Shutdown & Decontamination, WLDP-23513-ESDR-001, Revision 0, 2012 [redacted] Work Plan 4 - North Extension Active Drain Lines, Pneumatic Transfer Lines and Thorium-Nitric Acid Solution Storage Tank Removal, WLDP-23514-ESDR-001, Revision 0, 2013 WL [redacted] Work Plan #5 - Active Ventilation Shutdown, Removal and Penthouse Cleanup of Highbay and Stages 1, 4 and 7, WLDP-23515-ESDR-001, Revision 0, 2015 WL [redacted] WP6 Stage 4 and 7 Crawlspace Fill and Soil Remediation, Pneumatic Transfer Line Removal and MLLW Line Removal, WLDP-23516-ESDR-001, Revision 0, 2015 Whiteshell Laboratories [redacted] Work Plan 7: North Extension Shutdown and Decontamination, WLDP-23517-ESDR-001, Revision 1, 2014 WL [redacted] Work Package #9 - Segregation and Demolition of [redacted] Stages 4 and 7, WLDP-23519-ESDR-001, Revision 1, 2017	- Facility is operational. - DDP Volume is available for use.
Decontamination Centre	Whiteshell Laboratories Detailed Decommissioning Plan: Volume 10 - Decontamination Centre [redacted], WLDP-27400-DDP-001, Revision 0, 2011	Decommi[redacted]ning and Demolition of the Decontamination Centre (Building [redacted]), WLDP-27400-ESDR-001, Revision 1, 2019	- Facility has been decommissioned.
Health and Safety Facilities	Whiteshell Laboratories Detailed Decommissioning Plan: Volume 11 - Building [redacted] and [redacted], WLDP-37000-DDP-001, Revision 2, 2020		- Facility is being decommissioned. - DDP Volume is available for use.

REDACTED

WL Facility	DDP Document Title/Document #	End-State Reports (as of 2021 June)	DDP or Facility Status
DDP Volume 12	Whiteshell Laboratories Detailed Decommissioning Plan: Volume 12 - WL Licensed Site Supporting and General Infrastructure: North-Side Buildings, WLDP-32000-DDP-001, Revision 0, 2009	Building [redacted] WLDP-32010-ESDR-001, Revision 0, 2011 Building [redacted] Environmental Monitoring Storage Equipment Shed, WLDP-32020-ESDR-001, Revision 0, 2016 Fuel Oil Storage Tanks for Building [redacted] WLDP-32030-ESDR-001, Revision 1, 2016 Buildings [redacted] and [redacted] WLDP-32040-ESDR-001, Revision 1, 2012 Building [redacted] Storage Sheds and Building [redacted] WLDP-32060-ESDR-001, Revision 1, 2016	- Operational and decommissioning activities ongoing. - DDP Volume is available for use.
	Whiteshell Laboratories Detailed Decommissioning Plan: Volume 12 - WL Licensed Site Supporting and General Infrastructure-Part 1: South-Side Buildings, RC-2143-12, Revision 1, 2006	Decommissioning of Whiteshell Laboratories (WL) Internal Friction Laboratory Building [redacted] and Building [redacted] WLDP-31020-ESDR-001, Revision 0, 2007 Buildings [redacted] and [redacted] WLDP-31030-ESDR-001, Revision 0, 2011 Building [redacted] and Concrete Pads of Buildings [redacted] and [redacted] WLDP-31030-ESDR-002, Revision 0, 2017 Buildings [redacted] and [redacted] WLDP-31040-ESDR-001, Revision 1, 2010 [redacted] MET Tower Facility, WLDP-31070-ESDR-001, Revision 0, 2016 End-State Decommissioning Report for [redacted] WLDP-31070-ESDR-002, Revision 0, 2016	- Operational and decommissioning activities ongoing. - DDP Volume is available for use.
	Whiteshell Laboratories Detailed Decommissioning Plan: Volume 12 - WL Licensed Site Supporting and General Infrastructure-Part 3: Outer Area Buildings and Facilities, WLDP-33000-DDP-001, Revision 1, 2008	Decommissioning of Deep Bedrock and Selected Overburden Boreholes at WL, WLDP-03704-ESDR-002, Revision 0, 2007 Building [redacted] WLDP-33010-ESDR-001, Revision 1, 2012 Removal of Field Irradiator Gamma, Zoological Environment Under Stress and Surrounding Area Redundant Infrastructures in the Outer-Area, WLDP-33020-ESDR-001, Revision 0, 2011 Decommissioning of Deep Bedrock and Shallow Overburden Boreholes Used for Historical Tracer Experiments at Whiteshell Laboratories, WLDP-33040-ESDR-002, Revision 0, 2011 Building [redacted] WLDP-33050-ESDR-001, Revision 1, 2014	- Operational and decommissioning activities ongoing. - DDP Volume is available for use.
	Whiteshell Laboratories Detailed Decommissioning Plan: Volume 12 - WL Licensed Site Supporting and General Infrastructure-Part 4: Site Services, WLDP-34000-DDP-001, Revision 1, 2013	Removal of Abandoned Power Lines in the Outer Area, WLDP-34010-ESDR-001, Revision 0, 2013	- Operational and decommissioning activities ongoing. - DDP Volume is available for use.
	Whiteshell Laboratories Detailed Decommissioning Plan: Volume 12 - WL Licensed Site Supporting and General Infrastructure-Part 5: Site Affected Lands and Contaminated Structures, WLDP-35000-DDP-001, Revision 1, 2012		- Decommissioning activities ongoing. - DDP Volume is available for use.

REDACTED

1.3 Graded Approach for Decommissioning

Based on the complexity and the needs during decommissioning, a graded approach will be used through the WL decommissioning project [1-5].

1.4 Acronyms

ACMs	Asbestos Containing Materials
ACMR	Annual Compliance Monitoring Report
AECL	Atomic Energy of Canada Limited
ALs	Action Levels
ALARA	As Low As Reasonably Achievable
ALWTC	Active Liquid Waste Treatment Centre
CA	Controlled Area
CANDU	**CAN**ada **D**euterium-**U**ranium
CCSF	Concrete Canister Storage Facility
CEAA	Canadian Environmental Assessment Act
CED	Committed Effective Dose
CNEA	Canadian National Energy Alliance
CNL	Canadian Nuclear Laboratories
CNSC	Canadian Nuclear Safety Commission
CSA	Canadian Standards Association
CSR	Comprehensive Study Report
DDP	Detailed Decommissioning Plan
D&WM	Decommissioning and Waste Management
DRL	Derived Release Limit
EA	Environmental Assessment
EDRMS	Electronic Document Records Management System
EIS	Environmental Impact Statement
EmP	Emergency Preparedness

REDACTED

EOC	Emergency Operations Centre
FIG	Field Irradiator Gamma
FMBS	Fissionable Materials Bearing Standpipes
GoCo	Government Owned, Contractor Operated
HCF	Hot Cell Facility
HDPE	High Density Polyethylene
HEPA	High Efficiency Particulate Air
HLW	High Level Waste
HLLW	High Level Liquid Waste
HSSE&Q	Health, Safety, Security, Environment and Quality
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiation Protection
IFTF	Immobilized Fuel Test Facility
ILLW	Intermediate Level Liquid Waste
ILW	Intermediate Level Waste
ISD	In Situ Decommissioning/Disposal
LCH	Licence Condition Handbook
LLLW	Low Level Liquid Waste
LLW	Low Level Waste
LSVCTF	Large Scale Vented Combustion Test Facility
M&S	Monitoring and Surveillance
MLW	Medium Level Waste
MLLW	Medium Level Liquid Waste
MMF	Manitoba Metis Federation
NFMBS	Non Fissionable Materials Bearing Standpipe
NFWMP	Nuclear Fuel Waste Management Program
NG	Neutron Generator

REDACTED

NM&SM	Nuclear Materials and Safeguards Management
NSDF	Near Surface Disposal Facility
OCR	Organic Cooled Reactor
ODS	Ozone Depleting Substance
OSH	Occupational Safety and Health
PCBs	Polychlorinated Biphenyls
PHT	Primary Heat Transport
PLC	Public Liaison Committee
PPE&C	Personal Protective Equipment and Clothing
QA	Quality Assurance
QAP	Quality Assurance Plan
SARS	Severe Acute Respiratory System
SF	Shielded Facilities
SMAGS	Shielded Modular Above-Ground Storage
TFRE	Thorium Fuel Reprocessing Experiments
TLD	Thermoluminescent Dosimeter
URL	Underground Research Laboratory
WM	Waste Management
WMA	Waste Management Area
WL	Whiteshell Laboratories
WLDP	Whiteshell Laboratories Decommissioning Project
WR-1	Whiteshell Reactor-1
ZEUS	Zoological Environment Under Stress

REDACTED

1.5 References

The following references were current at the time of development of this DDP. Where a reference is to be complied with, ensure the latest revision is used.

[1-1] WLDP-03702-041-000-0008, *Whiteshell Laboratories Decommissioning Project Comprehensive Study Report Volume 1: Main Report*, Revision 2, 2001 March.

[1-2] WLDP-26000-ENA-001, *Environmental Impact Statement: In Situ Decommissioning of Whiteshell Reactor #1*.

[1-3] NRTEDL-W5-8.00/2024, *Nuclear Research and Test Establishment Decommissioning Licence Whiteshell Laboratories*.

[1-4] RC-2143-1, *Whiteshell Laboratories Detailed Decommissioning Plan - Volume 1 – Program Overview*, Revision 4, 2002 January.[2]

[1-5] WLD-508300-QAP-001, *Quality Assurance Plan Whiteshell Laboratories Decommissioning*.

2. WHITESHELL LABORATORY SITE DESCRIPTION

2.1 General Site Layout

Whiteshell Laboratories is located approximately 100 km northeast of Winnipeg and covers an area of approximately 4,375 hectares near the towns of Lac du Bonnet, Seven Sisters Falls and Pinawa, Manitoba (Figure 2-1). The WL site is accessed via Provincial Highway 11 and Provincial Road 211 (Figure 2-2). The WL Decommissioning Project CSR [2-1] [2-2] [2-3], and the Whiteshell Reactor, WR-1 In Situ Decommissioning Environmental Impact Statement (EIS) [2-4] describe the area in greater detail.

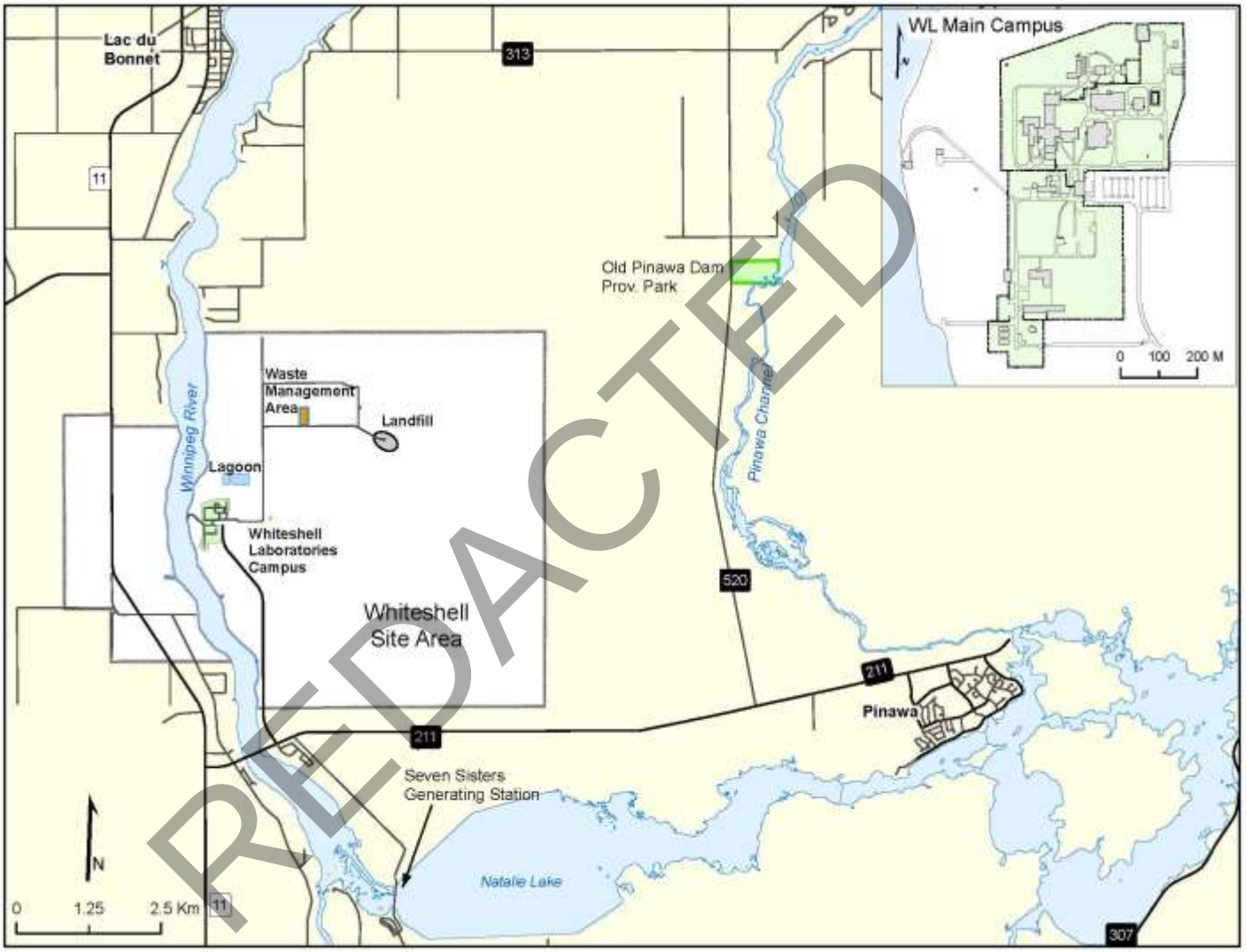
Whiteshell Laboratories infrastructure consists of seven major facilities and a number of smaller support facilities. The seven major facilities include:

- Shielded Facilities (SF)
- Active Liquid Waste Treatment Center (ALWTC)
- Whiteshell Reactor-1 (WR-1)
- Concrete Canister Storage Facility (CCSF)
- Waste Management Area (WMA)
- Research and Development Facilities Complex ([redacted])
- Health and Safety Facilities ([redacted] and [redacted])

The current WL main laboratory site layout is shown in Figure 2-3 and the entire licensed property is shown in Figure 2-4. The WMA, CCSF, recently decommissioned Large Scale Vented Combustion Test Facility (LSVCTF), and other supporting infrastructure locations are shown in Figure 2-4. The licensed site has been subdivided into areas affected by nuclear development and areas unaffected by nuclear development and operations (Figure 2-5). The unaffected area is excluded from the site decommissioning work scope.

REDACTED

[2] This document (WLDP-02000-DDP-001) will supersede RC-2143-1 once accepted by the CNSC.



REDACTED

Figure 2-1 Area Map of the Region

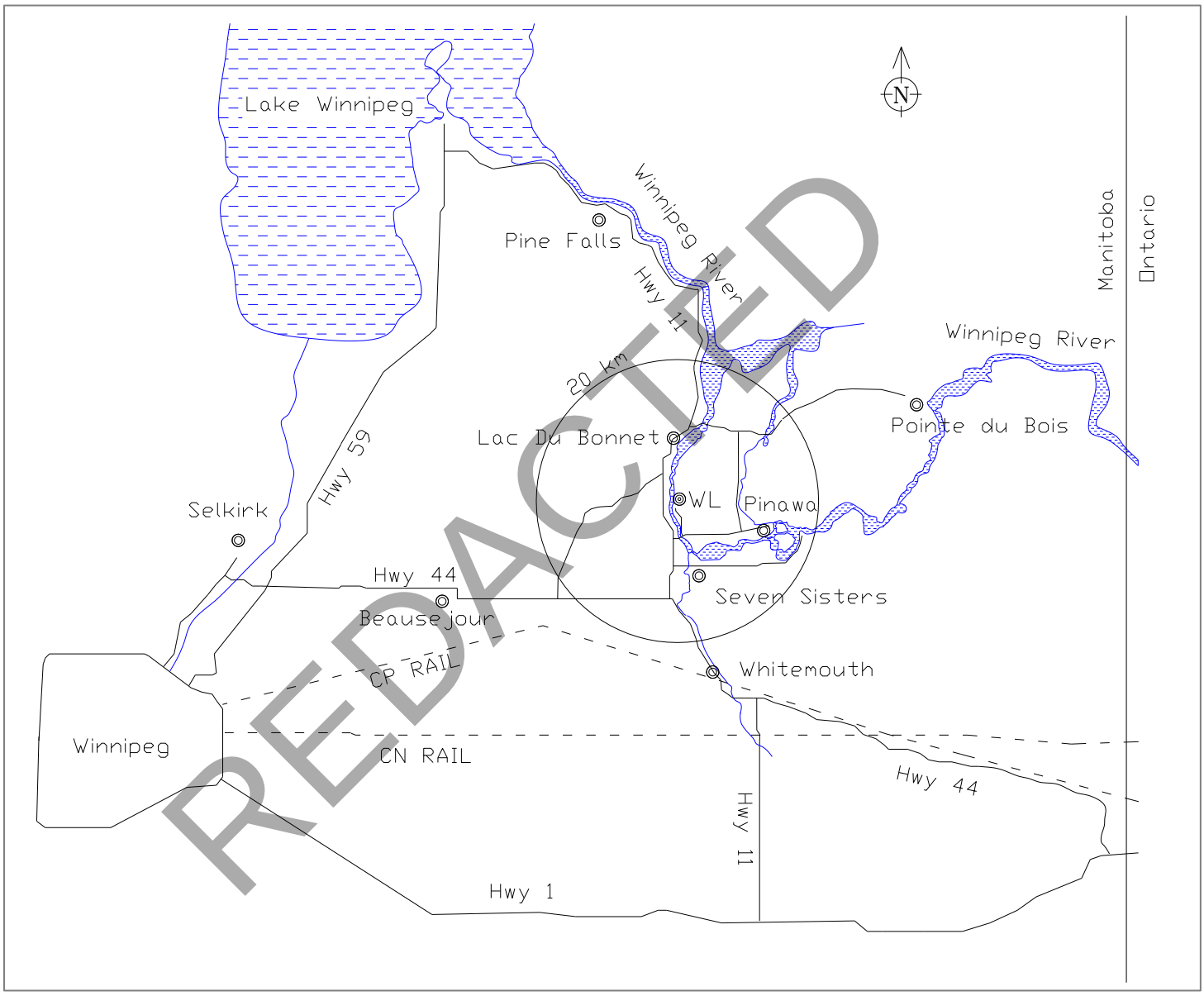
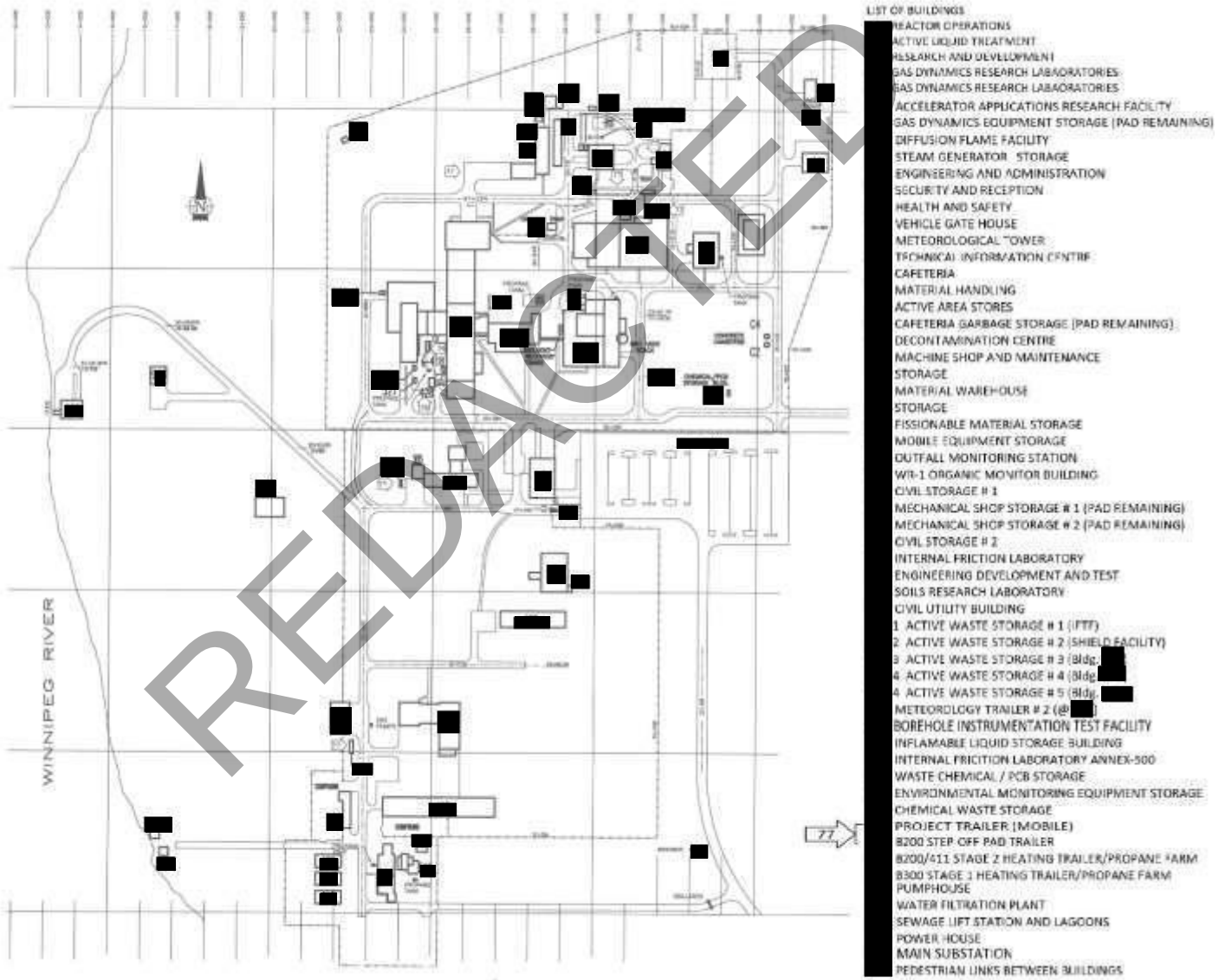


Figure 2-2 Location of Whiteshell Laboratories



REDACTED

Figure 2-3 Whiteshell Laboratories Site Layout

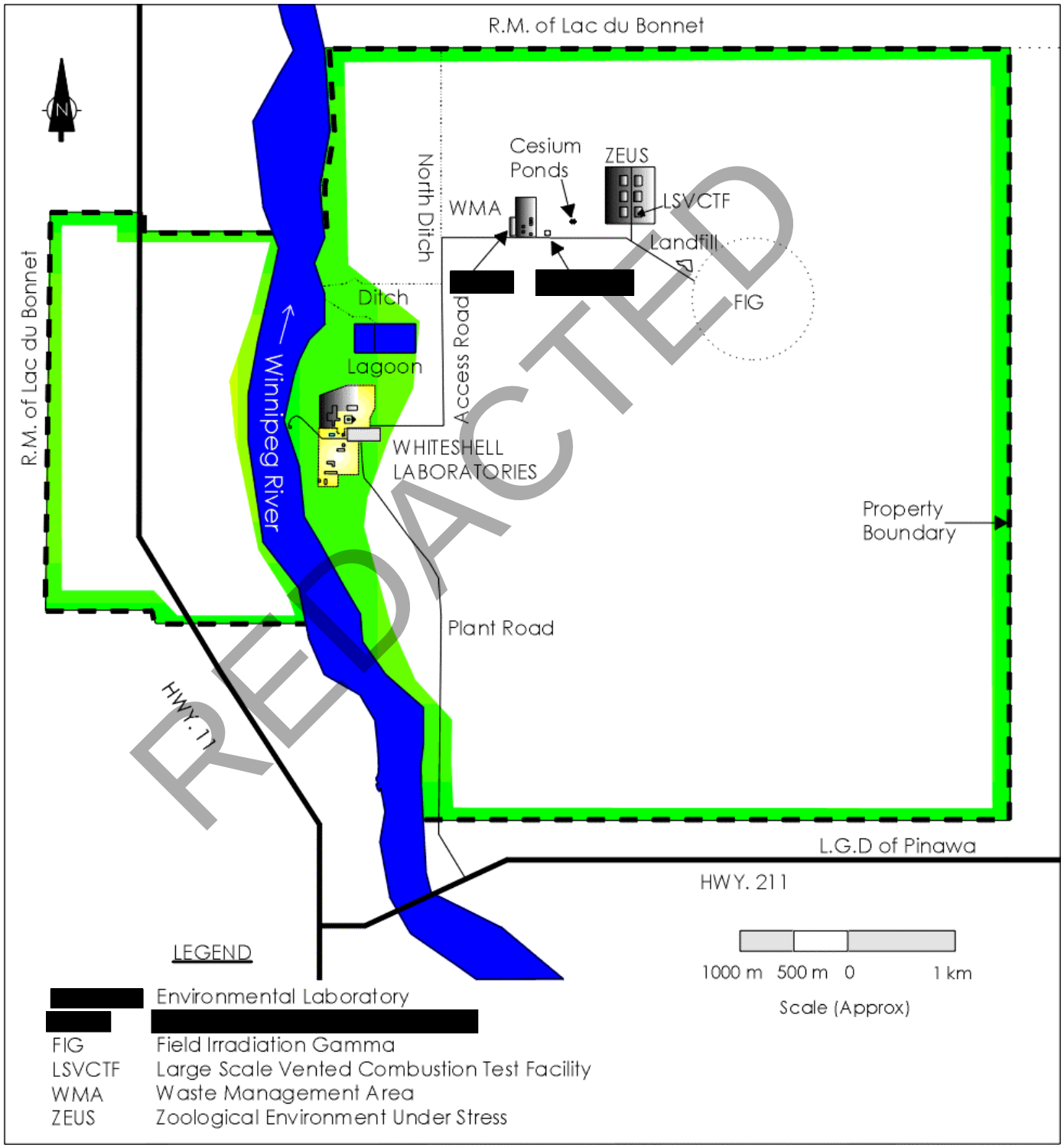
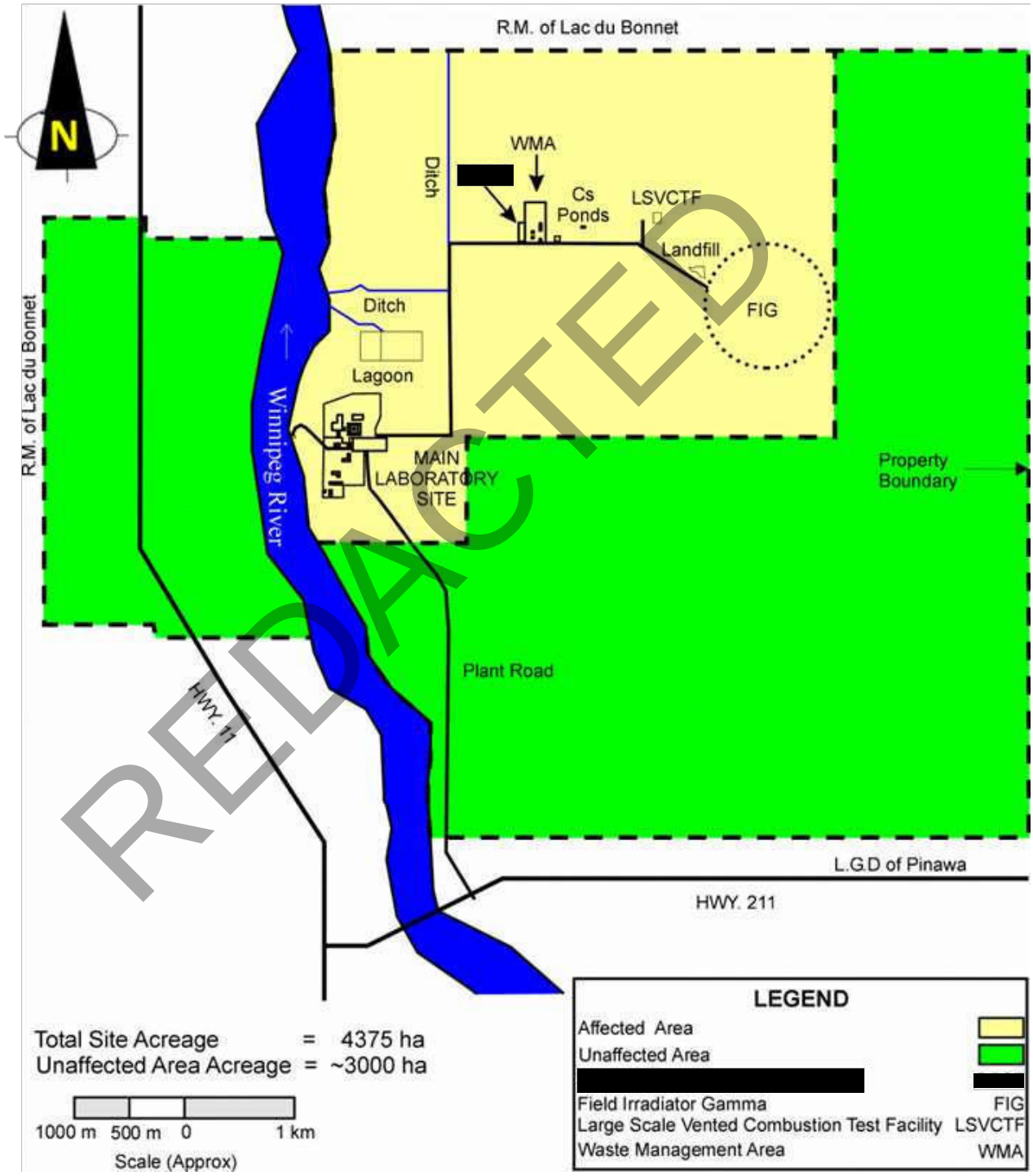


Figure 2-4 Licensed Property



REDACTED

Figure 2-5 Affected vs Unaffected Area Designation

2.2 Site Facilities and Infrastructure Overview

The WL Site operates under Decommissioning Licence NRTEDL-W5-8.00/2024, issued by the CNSC [2-5].

The original focus of the WL research program was the 60 MWt WR-1 OCR. The OCR program was terminated in the early 1970s, however, the reactor continued to operate as a research tool until 1985. The broader range of nuclear research work conducted at WL included the NFWMP, the SLOWPOKE Reactor Project and various accelerator programs. Additional facilities were established to support the site nuclear research programs. These facilities include: 1) Shielded Facilities, 2) the Active Liquid Waste Treatment Centre, 3) Concrete Canister Storage Facility, and 4) the Waste Management Area. Two other facilities were established and have been decommissioned: 1) the Van de Graff Accelerator and 2) the Neutron Generator.

General site buildings and infrastructure, also administered under the site licence are addressed under the headings of Auxiliary Operating Facilities and WL Licensed Site Supporting and General Site Infrastructure. The buildings addressed under Auxiliary Operating Facilities are the Research and Development Facilities Complex ([redacted]), and the Health and Safety Facilities ([redacted]). Brief descriptions for each facility including current status are presented below. Non-nuclear buildings, the inactive landfill, the sewage lagoon, affected site lands and off site contamination are addressed under the heading of WL Licensed Site Supporting and General Site Infrastructure.

The WL main campus buildings housing the nuclear facilities at WL are primarily of steel reinforced concrete construction. Some building components are pre-engineered steel clad construction. Roofs are generally flat, constructed over metal decking covered with insulation, a sealing membrane, tar and gravel.

Table 1-1 presents information about the WL facilities, DDP volumes, End State Reports completed by 2020 November, and the DDP or facility current status.

A summary of the key hazards, which require attention in each facility building or infrastructure area is provided in Section 4.

REDACTED

2.2.1 Nuclear Facilities

Nuclear facilities at WL include the following and these are described in detail in the following sub sections. This list does not include those facilities that are decommissioned.

- Shielded Facilities
- Active Liquid Waste Treatment Centre
- Whiteshell Reactor-1
- Concrete Canister Storage Facility
- Waste Management Area

2.2.1.1 Shielded Facilities

The SF consist of the Hot Cell Facility (HCF) and the Immobilized Fuel Test Facility (IFTF), which are located in the R&D Complex ([redacted]).

The HCF began operation in 1965, to provide shielded, remote handling facilities in support of CANDU reactor safety research programs including post irradiation examination of fuels and reactor core components, post experimental examination of radioactive materials used in Waste Management (WM) studies and services for other AECL programs or industrial work involving radioactive materials.

The HCF is a single storey structure with a main floor area of approximately 1200 m^2 and a ceiling height of 9.5 m. A 1 to 2 m deep crawlspace is located beneath the main floor Operating Area and a full basement is located beneath the balance of the HCF.

The main floor of the HCF consists of the Cells, the Decontamination Area, the Horizontal and Vertical Storage Blocks, the Manipulator Decontamination and Repair Facility, the Operating Area, a Scanning Electron Microscope facility (decommissioned), office areas, hallway, a change room and a shipping room. The cells consist of 11 steel lined, ilmenite concrete shielded cells ([redacted]) and one steel lined lead shielded cell ([redacted]) (decommissioned). All cells are equipped with remote manipulators and lead glass shielding windows.

The HCF [redacted] and IFTF [redacted] remain operational while HCF [redacted] have been shut down and partially dismantled.

The IFTF is a building extension located at the northwest corner of the HCF. The IFTF is also a single storey structure and has a main floor area of about 1300 m^2, with a high ceiling area of 9.5 m high and a low ceiling area of 3.5 m high. A 3 m deep crawlspace is located beneath the high ceiling area and a full basement is located beneath the low ceiling area.

The IFTF began operation in 1984 and provided space and facilities for a wide range of experiments using radioactive materials in support of the Canadian Nuclear Fuel Waste Management and CANDU Reactor Safety research programs. The main floor of the IFTF consisted of six warm cells (decommissioned), the Decontamination Vestibule ([redacted]), the Operating Area (decommissioned), the Canister Storage Area (decommissioned), laboratories, change rooms and several offices, with new facilities including the Waste Handling Area (operated for compaction and assaying of radioactive waste) and decontamination work area.

All safety systems remain in operation to support the shutdown operation and the decommissioning work.

2.2.1.2 Active Liquid Waste Treatment Centre

The ALWTC began operation in 1963, receiving low level liquid waste effluent from operating nuclear facilities (WR-1, SF, [redacted] Research Laboratories, Laundry/Decontamination, etc.). The ALWTC is no longer operational and has begun to be decommissioned.

The liquid effluents were transferred via underground piping connecting operational facilities to the ALWTC.

The ALWTC included a MLLW processing system, which concentrated a waste stream originating from the SF. The resulting concentrate was solidified and stored at the WMA. The processed liquid was pumped out of WMA Medium Level Waste (MLW) bunkers.

The ALWTC is a two storey building, with external dimensions of 24.7 m by 12.8 m and a height of 7.6 m. Exterior walls from grade to 3.0 m above grade are constructed of 0.30 m thick reinforced concrete on the inside, followed by 25 mm of rigid insulation and 0.10 m thick brick facing. A thicker wall (0.46 m reinforced concrete) is used in [redacted] The upper part of the building is similar except that 0.20 m thick hollow concrete blocks are used rather than reinforced concrete. Two storey shielded process cells run along both sides of the ground floor pump gallery and second-floor operating gallery. The process cells contain hold tanks, which were provided to store liquid wastes as follows:

- [redacted] Laundry Tanks Cell
- [redacted] Decontamination Tanks Cell

REDACTED

- [redacted] Evaporator Cell
- [redacted] Tanks Cell
- [redacted] Tanks Cell

The evaporator cell ([redacted]) and the adjacent areas of the building house the MLW concentration and solidification system.

2.2.1.3 Whiteshell Reactor-1

Whiteshell Reactor-1 ([redacted]) was placed in service in 1965 to demonstrate the OCR concept using heavy water as the moderator. The system also provided a facility for engineering tests on alternative fuels, fuel channels and reactor coolants.

Whiteshell Reactor-1 operated from 1965 to 1985, accumulating 120,000 operating hours during its lifetime. The reactor was permanently shut down in 1985 and it was placed in a secure shutdown state in preparation for decommissioning. The shutdown activities included defueling the reactor, placing the irradiated fuel in the storage bays and removing bulk heavy water to storage. Bulk organic coolant was removed from the reactor cooling circuits and transferred to the WL WMA for incineration. Reactor control systems were isolated. All building services and systems required for M&S were, and still are, maintained in an operating mode.

The first phase of decommissioning commenced in 1989 and was completed in 1995. Phase I work addressed the removal of easily mobilized radioactivity (fuel, fluids, etc.) from the facility and cleaning up of the main floor (600 level) and first sub level (500 level) space with potential for reuse by WL. This work substantially decreased potential hazards from the facility and reduced the M&S requirements for the deferment period. The Phase 1 end-state prepared WR-1 for a deferment period during which significant radioactivity decay will reduce the postulated dose commitment associated with future decommissioning work.

The building contains equipment for the processing of Low Level Liquid Waste (LLLW) generated in [redacted] The building is heated and important safety systems such as ventilation, fire detection and drain line system remain operational.

2.2.1.4 Concrete Canister Storage Facility

The Concrete Canister Fuel Storage Program was developed at WL to demonstrate that dry storage is a feasible alternative to water pool storage for irradiated reactor fuel. Because of the success of the demonstration program, concrete canisters have been used to store all remaining WR-1 spent fuel. The CCSF is comprised of two storage areas; 1) the canister site adjacent to the WMA and 2) the demonstration canister site within the main site north-side area.

The production canisters are located on a prepared site approximately 2.7 km to the north east of the main site (Figure 2-4). The site was excavated to a depth 0.6 m and then backfilled with gravel to the original elevation. The centre to centre canister spacing is 7.5 m within a row and the canister rows are 9 m centre to centre apart. Each canister is located on a pad of reinforced concrete 3.66 m square and 0.2 m thick. A second pad was poured over the top of each pad to prevent water accumulation around the bases of the canisters after years of service. Various weatherproofing coatings have been applied to the bases and canisters.

REDACTED

The production canister site adjacent to the WMA is surrounded by a dual heavy duty galvanized chain link fence 2.5 m high, with 3 strands of barbed wire on top. Locked gates restrict access to the canisters. The production canister site adjacent to the WMA also contained an experimental canister and control building [redacted] that housed the instrumentation, electrical, monitoring, sampling, and alarm equipment for the experimental program. The experimental program was discontinued in 1999 and the associated canister has been used for routine fuel storage.

The concrete canister demonstration site is located within the present WL north-side area approximately 140 m east of [redacted] and 85 m southeast of the central powerhouse. There are two canisters remaining at this location. They are located in a north south row immediately adjacent to an existing access road running along the east boundary of the main campus. The demonstration site is surrounded by a 2.4 m fence topped with 3 strands of barbed wire. The canisters are placed on 3.048 m square reinforced concrete pads, and 0.2 m thick. Irradiated fuel has been removed from the demonstration canister site and was transferred to the production canister site.

2.2.1.5 Waste Management Area

The WMA is located approximately 2.7 km north east of the WL site (Figure 2-1). The area is approximately 148 m by 312 m. The WMA has been in operation since 1963, providing storage for low level and intermediate level radioactive wastes, and small volumes of active liquid waste and historic small volumes of hazardous industrial chemicals. This waste is comprised of waste generated since the earliest days of WL operation, waste accepted from external sources, and waste generated during the current decommissioning activities and ongoing operations. The WMA is designated as a Controlled Area as per CNL's Radiation Protection Requirements [2-6].

The WMA is surrounded by a 2.5 m high wire mesh fence. Personnel access is through [redacted] and road access is through a normally locked north or east gate. Access to the Protected Area portion of the WMA is through [redacted] for personnel and a normally locked gate on the west side of the Protected Area.

Facilities at the WMA are designed to provide safe storage for the various waste types received at the site.

The following facilities are/were located within the WMA and are described in the sub-sections below:

- WMA main access building ([redacted])
- Low Level Waste (LLW) processing Quonset ([redacted])
- LLW storage bunkers ([redacted])
- Intermediate Level Liquid Waste (ILLW) Processing Centre ([redacted] former [redacted] in the process of being converted to its new purpose)
- Storage Quonset ([redacted]) –ILLW storage
- LLW Storage Quonsets ([redacted])
- LLW trenches ([redacted])
- Incinerator Complex ([redacted]) – (has been decommissioned)
- Intermediate Level Waste (ILW), previously termed MLW, in ground concrete bunkers ([redacted])
- ILW storage bunkers ([redacted])
- Above Ground Storage Bunker ([redacted])
- ILW in-ground concrete standpipes (171 in total)
- High level active liquid waste (Amine) storage tanks ([redacted])

REDACTED

- Shielded Modular Above Ground Storage (SMAGS) Building ([redacted]) in the process of being converted to a Cask Loading Facility
- Soil Storage Compound
- [redacted] an Operations and Office Trailer Complex adjacent to the WMA
- [redacted] a water supply system in a metal seacan to support [redacted]
- [redacted] a septic system in a metal seacan to support [redacted]
- [redacted] an electrical building immediately adjacent to the WMA perimeter fence

2.2.1.5.1 Building 423 (WMA Main Access Building)

Building [redacted] was constructed in 1977 at the entrance of the WMA and was used to control personnel entering and exiting the active area (the location of [redacted] is shown in Figure 2-6). [redacted] is wood framed, has exterior siding, insulated drywall interior walls, a shingled gable roof and a concrete floor, and has a footprint of approximately 61 m^2.

Domestic water is supplied by using a holding tank system consisting of two 2000 L insulated water tanks interconnected to insulated and heat-traced waterlines to [redacted]

Domestic sewage is gravity-fed to a two-compartment concrete septic tank and septic field.

[redacted] has been modified to serve as an entry-exit portal building now that the WMA Operations Centre (Building [redacted]) (see Section 2.2.1.5.16) is installed to replace most of the functions of the building. Two-step whole-body contamination monitors are used to monitor personnel for contamination upon exiting the WMA and prior to reaching the change rooms that are provided in Building [redacted].

2.2.1.5.2 LLW Processing Quonset/Building [redacted]

[redacted] was originally constructed in 1975 to temporarily store solid waste in the WMA. [redacted] (shown in Figure 2-6) is a quonset-type building, originally constructed on a concrete perimeter foundation with gravel floor, and has a footprint of approximately 216 m^2.

In 1985, the building was upgraded to incorporate a LLW contaminated waste baling and compaction centre by adding an insulated and heated room with a concrete floor, a sump pit, and a ventilation system and stack inside the perimeter of [redacted] Outside the room, the remainder of [redacted] was unheated.

In 2015, [redacted] was converted into a repackaging centre for contaminated materials. The baler, baler room, and drum compactor were all removed and were later processed through [redacted] as waste material. A checker plate floor was added after fixing known contamination spots on the existing concrete floor. Engineered fabric hoop structures were added on the east and west ends of the quonset to provide unheated and covered staging areas for waste handling. A ventilated enclosure was constructed of fire resistant wood and plastic sheeting. The ventilated enclosure consists of two chambers; on the east side of the building, waste material was brought in the east chamber of the ventilated enclosure and was handled by workers in protective clothing and respirators. A dedicated portable HEPA unit provided negative pressure to keep air flowing towards this space. The west chamber of the ventilated enclosure is where processed waste in bins is checked by Radiation Protection staff prior to moving the bins to the west vestibule. An office room is provided adjacent to the ventilated enclosure on the south side. [redacted] is heated and air conditioned by use of a HVAC unit.

REDACTED

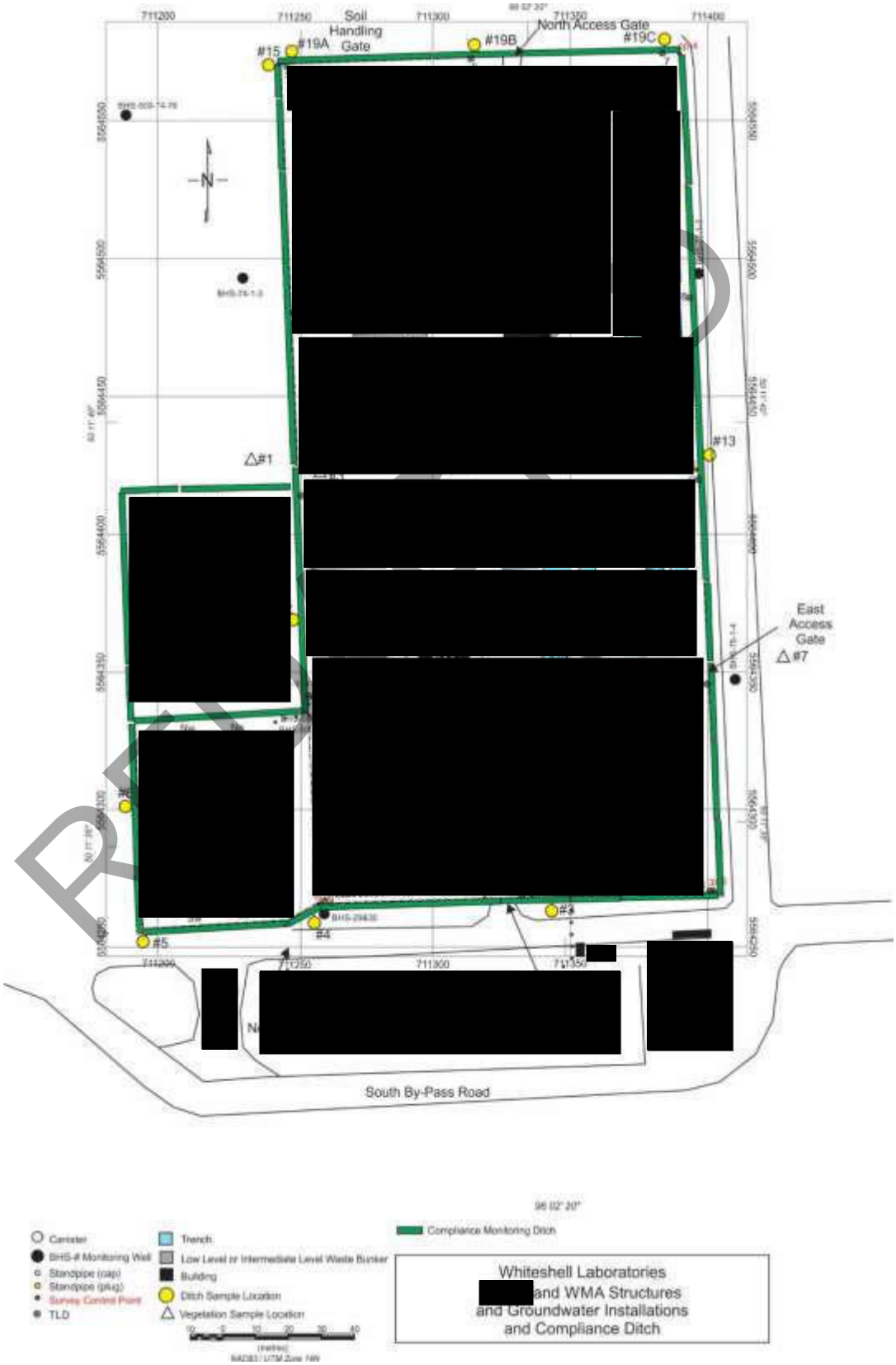


Figure 2-6 Plan View of the WL Waste Management Area

2.2.1.5.3 LLW Storage Bunkers ([redacted])

The LLW bunkers are constructed of concrete and built above grade to avoid storage in or near the water table. The LLW bunkers contain sumps with external pump-out access. Bunkers LLW-[redacted] to LLW-[redacted] are filled and concrete end walls have been installed as a final seal. Bunker LLW-[redacted] waste is largely removed and will be reconfigured into an ILLW processing system to facilitate decommissioning efforts. LLW [redacted] will be re-numbered as [redacted] (see Section 2.2.1.5.8). Figure 2-6 shows the location of LLW bunkers in the WMA.

The overall dimensions of a LLW bunker are 26.4 m long by 6.6 m wide by 5.2 m high with a wall thickness of 0.3 m. Bunkers were built in two 13.2 m long sections. A gasket seals the joint between the two sections. The foundations are 30 cm reinforced concrete slabs with 90 cm wide by 60 cm thickened edges cast on a minimum 60 cm of compacted granular fill.

The walls of the LLW bunkers are 30 cm thick and have two layers of reinforcing steel each with 25 mm of cover.

The roof slab varies in thickness from 35 cm at the outside edges to 37.5 cm to allow for drainage. The roof slab is reinforced concrete with two layers of reinforcing steel.

2.2.1.5.4 Storage Quonset/Building ([redacted])

Building [redacted] was constructed in 1985 to store WR-1 organic coolant drums. The location of [redacted] is shown in Figure 2-6. [redacted] is a quonset-type building with a concrete floor, two sump pits, and has a footprint of approximately 216 m^2.

[redacted] has been insulated and heated, and an engineered fabric hoop vestibule attached to the east end of the quonset. The area will be converted to storage of liquid waste awaiting processing in [redacted]

2.2.1.5.5 LLW Storage Quonsets [redacted]

The LLW storage quonsets [redacted] are constructed with a ribbed, metal exterior on a concrete foundation. Building [redacted] has a sloped concrete floor and a collection sump. Buildings [redacted] and [redacted] have flat concrete floors without sumps. The quonset buildings were used for placements of waste that may have required retrieval or subsequent transfer to another storage facility at the WMA and were chronologically constructed as they were needed.

[redacted] and [redacted] have footprints of approximately 216 m^2, like [redacted] and [redacted] The locations of [redacted] and [redacted] are shown in Figure 2-6.

2.2.1.5.6 LLW Trenches [redacted]

From 1963 to 1985, LLW was buried in unlined trenches excavated into the clay. Trenches were excavated with a backhoe and wastes were transferred into the trench with a front-end loader. The trenches were then backfilled and covered with approximately 1.5 m of material. There are 25 filled trenches, numbered [redacted] to [redacted] as shown in Figure 2-6. The trenching concept was discontinued completely in the fall of 1985 when above-ground low level bunker storage facilities were introduced.

Trenches were sometimes flooded with water when open and are below the water table level much of the year. The trenches are on average 4 m deep with 1 m of clay-based cover material. Some trenches were

REDACTED

covered with contaminated soil removed from other facilities on the Whiteshell site. The degree of degradation of waste is unknown.

Exceptions to the general waste storage include Trenches [redacted] and [redacted] Trench [redacted] is used to store 31 stainless steel fuel channels from WR-1.

Trench [redacted] was specially constructed for filtration of WR-1 wastewater containing small amounts of organic materials at low specific activity. The excavation was backfilled with gravel.

2.2.1.5.7 Incinerator Complex ([redacted])

The organic incinerator was used to burn organic coolant from WR-1. The incinerator is an industrial type, manufactured by Trecan Limited, with a burning capacity of about 75 L of organic liquids per hour and was used for the combustion of oil, laboratory solvents, laboratory draining, and paint thinner.

[redacted] was constructed in 1967 along the east fence of the WMA to mix fuel oil and waste organic coolant for incineration. The building originally housed a 1600 L storage tank, an 1100 L fuel oil tank, pumps, process piping and miscellaneous fixtures. [redacted] was wood framed, had interior plywood walls and metal-cladded 1.2 m high, was insulated and had exterior plywood siding interior walls, metal gable roof, a concrete floor, was electrically heated, and had a footprint of approximately 24 m^2.

The incinerator and [redacted] have been decommissioned and all material removed from its former location.

2.2.1.5.8 ILLW Processing Centre ([redacted])

The ILLW processing system consists of two storage and two mixing tanks, a pump gallery, an evaporation-mixer system to volume reduce and then solidify liquid waste for off-site transport and associated piping systems.

2.2.1.5.9 ILW In-Ground Concrete Bunkers ([redacted])

ILW Bunkers [redacted] are located adjacent to the WMA standpipes area (Figure 2-6), which is within a security controlled Protected Area fence.

These oldest ILW bunkers [redacted] were constructed between 1966 and 1977. The overall bunker dimensions are 13.6 m long by 5.6 m wide by 3 m high from its base with a 0.2 m projection above grade. The foundation of 0.076 m of granular fill was placed directly over the native soil overlain by a 0.254 m thick reinforced concrete slab. The reinforced exterior walls are 0.305 m thick. The interior is divided into four cells separated by two 0.254 m reinforced concrete walls.

ILW bunkers [redacted] were not designed with sump or pump out systems.

The waste was placed into these bunkers through the top. After a bunker's cell had been filled, it was topped with gravel and sealed with a concrete slab, a minimum of 0.25 m thick to provide shielding.

ILW bunkers [redacted] and [redacted] were constructed in 1979 and 1982, respectively. Both bunkers are based on the same design as the ILW Bunkers [redacted] and [redacted] with some modifications. ILW Bunkers [redacted] and [redacted] are grade supported, reinforced concrete structures with a footprint of 13.6 m by 6.3 m and a height of 3.3 m and are both situated nearly entirely below grade. In the design, ILW Bunker [redacted] was set to extend approximately 0.6 m above grade, however the profile of the soil was later raised around the bunker, so the ground surface slopes up to the base of the roof slab. The foundation of ILW Bunker [redacted] is 0.075 m of granular fill placed directly over native soil. The

REDACTED

fill is overlain by a layer of 6 mil polyethylene. The foundation of ILW Bunker [redacted] is 0.375 m of two thirds of gravel and sand mixture and one third of bentonite. Both measures were to reduce potential moisture intrusion into the concrete floor slabs. The floor slabs of the structures are 0.255 m thick reinforced concrete. The slabs have a one percent slope towards a concrete sump pit at the northwest corner of each of the bunkers.

The perimeter foundation walls are reinforced concrete and are 0.255 m thick. These bunkers are divided into four quadrants (cells) by 0.255 m thick interior concrete walls.

Currently, ILW Bunker [redacted] is operational. ILW Bunker [redacted] is pumped out as required as part of its operational status. ILW Bunkers [redacted] to [redacted] and [redacted] are used for continuing storage only, and these bunkers are sealed with a concrete roof and no visual inspection is possible. ILW Bunker [redacted] has roof hatches that permit visual inspection.

2.2.1.5.10 ILW Storage Bunkers (ILW [redacted])

ILW Bunkers [redacted] and [redacted] are located adjacent to the WMA standpipes area (Figure 2-6), which is within a security controlled Protected Area fence. ILW Bunker [redacted] and [redacted] were constructed in 1986 and 1989, respectively.

ILW Bunker [redacted] is a grade supported concrete structure with a footprint of approximately 11.1 m by 6.6 m. The bunker is 5.2 m in height from its base. This bunker is approximately one half below grade with 2.6 m above grade in the original drawings.

The foundation is based on 0.3 m of compacted granular fill placed directly upon native soil. Moisture protection in the form of Volclay RX® panels (bentonite clay pellets in biodegradable cardboard) was installed on top of the fill. The north and south foundation walls consist of 0.4 m thick reinforced concrete. The east and west foundation walls are 0.4 m thick at both ends and 0.65 m thick along the centre portion of each wall. The bunker is divided into three compartments by 0.255 mm thick concrete walls. The slab incorporates drainage trenches across the compartments to direct water to the sump pit.

ILW Bunker [redacted] is a grade supported, reinforced concrete structure with a 12.0 m by 6.0 m footprint. The bunker is 3.3 m in height from the top of the foundation slab, of which 1.85 m was designed to be above grade.

The foundation consists of a 0.3 m thick layer of compacted granular fill placed directly over native soil. Volclay RX® panels were used as a layer of moisture protection and a 0.4 m thick reinforced concrete slab was cast directly over the panels. The walls are 0.3 m thick reinforced concrete and are divided into three roughly equally sized compartments by 0.3 m thick interior walls.

ILW Bunker [redacted] is currently operational. ILW Bunker [redacted] is not receiving waste due to water ingress. ILW Bunker [redacted] and [redacted] are both pumped out as required as part of their operational status. The ILW Bunker [redacted] roof consists of tapered shielding plugs, which can be removed for visual inspection using a crane. ILW Bunker [redacted] has large roof slabs that can be removed for visual inspection.

2.2.1.5.11 Above Ground Storage Bunker (ILW [redacted])

Above Ground Storage Bunker (ILW Bunker [redacted]) is located between LLW [redacted] and LLW [redacted] and marked as AGSB in Figure 2-6. ILW Bunker [redacted] was built in 2006 and has a 3.0 m by 4.4 m footprint with the slab extending 2.6 m

REDACTED

beyond the edge of the structure walls on the west side and 0.5 m on the three other sides. The bunker was built entirely above grade with 0.6 m of compacted A-base granular fill.

The bunker was cast with six sites to receive drums of cemented liquid waste from historical fuel reprocessing experiments. Each of the sites has a carbon steel sleeve installed to accept cementation drums. The steel sleeve is fabricated from 0.5 m (22 inch) Schedule [redacted] steel pipe. Each site can hold two stainless steel drums, one on top of the other. At the top of each sleeve is a concrete plug with a steel edge, which seals the sleeve and provides shielding. To accommodate potential hydrogen gas generated by radiolysis of the cemented Thorium Fuel Reprocessing Experiment (TFRE) and Amine waste, the storage bunker was designed with vent lines to allow the hydrogen to vent continuously to the atmosphere. In 2020, the waste was removed to be stored in the Hot Cells Facility. The bunker is being maintained until the waste is removed from the site.

The drain line at the bottom of each storage site includes a trap to catch any water collecting in the liner. Provisions are made for sampling on an annual basis for evidence of moisture.

2.2.1.5.12 ILW In-Ground Concrete Standpipes

The ILW standpipes are located in the southwest corner of the WMA (Figure 2-6), and has dimensions of approximately 50 m (north-south) by 62.5 m (east-west). The standpipes have four internal diameters 0.46 m (16 in total), 0.61 m (118 in total), 0.76 m (17 in total), and 0.91 m (20 in total). Storage volumes are approximately 0.48 m^3, 0.89 m^3, 1.31 m^3, and 1.89 m^3, respectively.

Early standpipes were prefabricated using 2-3 unlined sections of concrete pipe and a concrete base joined via offset connections. The sections and base were held together by two steel strands that run at 90° to each other through the concrete base and through tubes inside the walls of each section of concrete pipe. The strands were tensioned in grooves at the top of the standpipe, after which the grooves were filled with grout. Apparent wall thicknesses were 0.15 m for the 0.46 m and 0.61 m-ID standpipes, 0.18 m for the 0.76 m-ID standpipes and 0.19 m for the 0.91 m-ID standpipes.

Early standpipes were externally coated with bitumen[3], and installed on freshly-poured concrete pads in augered holes. After the last waste emplacement, they were topped up with gravel, sealed with bitumen[4], and capped with poured in place concrete.

New standpipes were of a different design. These were constructed by suspending a galvanized carbon steel liner and rebar in an augered hole, and filling the annulus between the liner and the walls and bottom of the augered hole with poured concrete (nominal side wall thickness, 0.2 m; bottom wall thickness, 0.3 m; unsealed height, 3.97 m). The 76 exposed standpipes are of this design. These standpipes are not believed to have been topped with gravel or sealed with bitumen as records show that the plugs were removed on some standpipes in the 1990s to either inspect for water, or to transfer material to another location. Recent inspections by boroscope of approximately 20 non-FM bearing new style standpipes found that no gravel or bitumen was present.

Some New standpipes are also buried. After the last waste emplacement these were topped up with gravel, sealed with bitumen, and capped with concrete like the early standpipes.

REDACTED

[3] Early documentation referred to the coating as asphalt, but it is believed to be bitumen.

[4] Early documentation referred to this as asphalt, but it is believed to be bitumen.

The standpipes are arranged in 7 rows (called rows [redacted] to [redacted]) with 95 of the 171 standpipes buried under up to 0.5 m of soil[5]. The remaining 76 standpipes have their tops exposed up to 0.5 m above ground (east half of row [redacted] rows [redacted] and [redacted] and partial row [redacted]

The standpipes provide storage for historic ILW (previously called medium level waste, MLW or medium active waste, MAW) packages with permitted radiation fields up to 4.0 Gy/h (400 rad/h) at 0.3 m from the package. These packages contain typical waste that originated from the WL HCF or WR-1, equipment and scrap metal materials from experiments, sealed sources, and filters. Some standpipes also contain irradiated fuel from experiments and post irradiation examination (PIE) work conducted in the HCF, and some unirradiated fuel materials used in experiments. Almost all emplacements of these fissionable materials (FM) and special fissionable materials (SFM)[6] were made from 1967 to 1977.

Sixty-nine (69) of the 171 standpipes contain FM. The FM- and SFM-bearing standpipes (FMBS) are interspersed among the 102 standpipes not bearing these fissionable materials (NFMBS). Fifty-three (53) FMBS are buried, and 16 are in the exposed region. Many of these also contain typical non-FM waste[7] from the WL HCF or WR-1.

Three (3) of the 102 NFMBS are empty, though at least one of these has some radioactive contamination from materials formerly stored in it.

2.2.1.5.13 High Level Active Liquid Waste (Amine) Storage Tanks ([redacted])

The WMA contains two buried storage tanks, [redacted] and [redacted] constructed in the early 1970s to store High Level Liquid Waste (HLLW) derived from amine-extraction experiments conducted at WL with reactor fuel. The grade level terminal ends of the access tubes used for filling, draining and monitoring the tanks are located inside [redacted] HLLW was placed in tank [redacted] in 1974, most of which was removed in 2004 for cementation in the WL Hot Cells. There is no record of tank [redacted] ever being used.

[redacted] is an off-the-shelf metal garden shed with external dimensions of 2.6 m by 2.2 m. No services are provided to the building. Available Engineering drawings show the building is resting on a 0.61 m (2 ft) deep concrete plinth with the top surface of the plinth near grade level. However, field observations indicate the base of the building is resting on a stub wall constructed of wood studs and (assumed) plywood walls extending down about 0.9 m.

HLLW tanks [redacted] and [redacted] are located in separate concrete vaults believed to lie on a north south axis beneath [redacted] The bases of the vaults are approximately 5.33 m below grade level. A part of each vault is thought to lie beneath [redacted]

A drawing indicates the vaults are 1.88 m square and 2.13 m tall. The side walls are approximately 0.19 m thick, the concrete floor approximately 0.15 m thick and the fitted lid approximately 0.23 m thick. There is no confirmation that the vault lids contain lifting hooks, but it is presumed they exist. The vault exteriors were coated with a bitumen substance. The access pipe penetration in the vault tops was sealed using a combination of grout, epoxy and bitumen.

REDACTED

[5] Note that a few are at ground level.

[6] FM and SFM refer to reactor fuel that includes thorium and all enrichment levels of uranium, both irradiated and non-irradiated.

[7] It is important to note that NFMBS standpipes may contain non-accountable amounts of FM.

Each vault contains a drip tray with a volume capacity approximately 20% greater than the maximum capacity of the HLLW tank located within it.

2.2.1.5.14 SMAGS Building ([redacted]), Cask Loading Facility ([redacted])

Building [redacted] ([redacted]), SMAGS, was constructed for storage of contaminated wastes generated during the WL decommissioning project. The design is based on the Low Level Storage Buildings developed by Ontario Power Generation (OPG) for use at their Western Waste Management Facility, and at CNL's Chalk River Laboratories (CRL). [redacted] was constructed in 2010 to the north of LLW-[redacted] as shown in Figure 2-6. The SMAGS facility is being reconfigured to a CLF. The new CLF will stage packaged ILW wastes and load the waste packages into specially designed Type B casks for transportation off site to a licensed waste repository.

[redacted] is 47.2 m long by 30.5 m wide by 7.9 m high and provides an effective storage capacity of approximately 4,000 m^3. The building is constructed using pre-fabricated concrete technology for walls, columns, beams and roof panels. The floor is constructed such that it maintains a constant slope to a single drain point connected to an outside tank for the collection of any liquids that may accumulate within the building. In addition, a secondary collection system is in place to monitor liquids that may penetrate the concrete floor.

The concrete wall panels are 0.36 m thick, which provides adequate radiation shielding as well as a 2-hour firewall. The building is unheated but includes internal and external lighting, fire detection, and a ventilation system.

Upon conversion to the CLF, the building will host an overhead crane, bays for storage of FM canisters and ILW drums, a control room and a waste transfer-assay station. Casks on tractor trailers will be backed into the building adjacent and the overhead crane will be used to lift the cask lid, place the waste and return the lid to the cask.

2.2.1.5.15 Soil Storage Compound (SSC)

The Soil Storage Compound (SSC) is a containment area similar to the Port Hope LLW long term management mound, though much smaller in scope. The construction of the compound consisted of a perimeter berm designed to contain an estimated 2,000 m^3 volume of contaminated soil, protected with a plastic cover during filling stages. The cover system was used to minimize any spread of contaminated soil. Monitoring for potential leaks in the cover was provided by monitoring water collected by a High Density Polyethylene liner underneath the soil mound. The SSC was constructed above ground level, to prevent saturation of the mound base. The risk to groundwater and surface water from this design was negligible and is further mitigated by the integral leak detection and leachate removal system. The SSC was constructed over the location of the removed tritium inject wells.

The SSC construction footprint is 29.5 m (north-south) by 41.5 m (east-west) by 5.0 m (high). Figure 2-6 shows the location of the SSC in the WMA. A cap and cover system was used to minimize any spread of contaminated soil. All waste has been removed from the SSC.

2.2.1.5.16 WMA Operations Centre ([redacted])

The operations centre consists of 10, 60-foot long portable trailer units connected side-by-side on their long axis. The building hosts a security office for the personnel assigned to area, change rooms with domestic showers, meeting spaces, offices and lunchroom for area workers.

REDACTED

2.2.1.5.17 Water Seacan ([redacted])

A commercially available seacan was converted to host five interconnected High Density Polyethylene (HDPE) water tanks to supply domestic water for [redacted]. The water tanks provide 5000 gallons of water. The seacan is insulated and heated with electric baseboard heat.

2.2.1.5.18 Septic Seacan ([redacted])

A commercially available seacan was converted to host five interconnected HDPE septic tanks to receive domestic waste for [redacted] The septic tanks provide 5000 gallons of storage. The seacan is insulated and heated with electric baseboard heat.

2.2.2 Auxiliary Facilities/Radioisotopes Facilities

Auxiliary operating facilities at WL are listed in Table 2-1 and described in the following sub-sections (decommissioned buildings are not listed).

Table 2-1 Auxiliary Operating Facilities at Whiteshell Laboratories

Building Number	Building Description
[redacted]	Research and Development (R&D) Facilities Complex
[redacted]	Health and Safety Facilities

2.2.2.1 Research and Development Facilities Complex ([redacted])

Building [redacted] was the primary research laboratory for the site, housing a wide range of nuclear Research and Development (R&D) programs. The building comprises an area of approximately 17,000 m^2 and was built in seven stages from 1964 to 1982 (stages 2 and 5 are the Shielded Facilities (see Section 2.2.1.1). The building contained 68 laboratories as well as numerous offices. The south end high bay area contained experimental activities that required large areas and significant headroom; RD-14M and RD-17 experimental loops were located in the South High Bay.

Most of the building has been operationally shut down, decontaminated and decommissioned. The demolition of Stages 4 and 7 was completed in 2016.

Routine activities carried out in [redacted] include:

- Non rad laundry activities;
- Respirator fit test/maintenance activities;
- Processing of low level liquid waste generated in [redacted] and the SF;
- Radiation protection instruments and counting labs; and
- Decontamination Centre/Boot Washer.

2.2.2.2 Health and Safety Facilities [redacted]

Building [redacted] formerly housed a private accelerator company, Acsion Industries Inc. The building has three floors comprising an area of approximately 2,162 m^2, housing WL dosimetry services and Environmental

REDACTED

Management laboratories. The CNL facilities in [redacted] include a whole body counting facility, Thermoluminescent Dosimeter (TLD) readers, bioassay counting facilities and a Cs-137 Gamma Calibrator.

2.2.3 Whiteshell Licensed Site Supporting and General Site Infrastructure

The licensed site supporting and general site infrastructure at WL are administered under the general terms of the site licence and include a number of buildings or structures and common services that were used for a variety of purposes. These are described in the following sub sections.

2.2.3.1 Non-Nuclear Facilities/Buildings

Non-nuclear facilities/buildings at WL are listed in Table 2-2 with the exception of the buildings that were decommissioned.

Table 2-2 Non-Nuclear Facilities/Buildings at Whiteshell Laboratories

Building Number	Building Description
[redacted]	Security, Reception, Fire Hall and Security Monitoring Room
[redacted]	Lunch Room/Offices (formerly the Library)
[redacted]	Offices/Machine Shop
[redacted]	Quonset: Cold Storage
[redacted]	Cold Garage
[redacted]	Outfall Monitoring Station
[redacted]	Quonset: Cold Storage
[redacted]	Quonset: Cold Storage
[redacted]	Asbestos/PCB Storage
[redacted]	Hazardous Chemical Storage
[redacted]	Portable Boiler Building 1
[redacted]	Portable Boiler Building 2
[redacted]	Pump House
[redacted]	Water Filtration Plant
[redacted]	Fire Protection Water System
[redacted]	Process Water System
[redacted]	Storm Drainage System
[redacted]	Sewage Lift Station and Lagoons
[redacted]	Powerhouse
[redacted]	Main Substation (Owned by MB Hydro)
[redacted]	Main Power Distribution
[redacted]	Communications System
[redacted]	Supervisory Control and Alarm
[redacted]	Clarified Water System
[redacted]	Access Tunnel

REDACTED

2.2.3.2 Inactive Landfill

The inactive (i.e., non-radioactive) landfill was placed in operation when the WL site was established to contain non-radioactive and non-hazardous wastes, excluding food waste. The landfill is located at a high point in the local terrain east of WMA at the end of a service road and next to the entrance to the former Field Irradiator Gamma (FIG) facility. The surficial geology in this area is mainly sand and gravel.

The landfill is less than 10 m in height and less than 0.01 km^2 (1 ha) in area. Typical materials placed in the landfill include plastic, paper, wood, cardboard, glass, and building materials. Typical activities include dumping, ditching, and capping with sand and gravel from surrounding borrow pits. Two derelict concrete canisters (used for non-radioactive testing only) originating from the early Concrete Canister Fuel Storage Program are located just north of the landfill.

2.2.3.3 Sewage Lagoon

The lagoon system, placed in operation when the WL site was established, is located north of the main site. The lagoon system comprises a primary settling pond, a secondary pond, an outlet and the sewage lift station ([redacted]). The lagoon receives liquid wastes from washrooms, showers and non-active drains.

The lagoon was constructed of low permeability clay embankments placed on a prepared clay surface, with no additional lining. The primary and secondary ponds are connected to each other via a culvert.

There are levees around each lagoon, with a roadbed at the top. At various times of the year, the water level in the lagoons is higher than the surrounding land surface. Emergent macrophytes (primarily cattail) vegetate the water's edge. Water may be released from the pond every spring and fall, and flows from the lagoon to the Winnipeg River through a drainage way that is about 400 to 500 m in length.

2.2.3.4 Buried Services

Buried services run through the entire site, and include:

- Drainage systems.
- District heating.
- Electrical.
- Fire (250 mm diameter pipe) and process water (600 mm diameter pipe).
- Domestic water (200 mm diameter pipe).

The most significant buried services from a decommissioning perspective are the three types of drainage systems:

Sanitary drains (250 mm diameter[8] pipe): collect waste water from toilets, showers, sinks, etc., and discharge it to the site sewage lagoon. The lagoon water is retained for approximately six months to allow for settling and biodegradation. The lagoon water is analyzed for fecal coliform and biochemical oxygen demand and, if within limits, may be released in May and October each year to the Winnipeg River.

Aqueous radioactive waste collection drains (38 mm diameter pipe enclosed in 200 to 300 mm diameter pipe): collect wastewater containing radioactive (and chemical) contaminants. The waste was pumped to tanks in the ALWTC. Any leaks in the active lines would be contained within the outer wall of the transfer pipes, and

[8] This dimension only represents 30% of the length of sanitary line.

REDACTED

flow to leak collection points (man holes or sumps) located at low points along the route. No leaks have been detected since the system was placed in operation.

Storm drains (process drains, 1200 mm diameter[9] pipe): collect cooling water from experimental facilities, site runoff water, low level radioactive liquid waste from the ALWTC following sampling and monitoring, inactive effluent from non-active building sump floor drains and laboratory sinks, and process water that is used to maintain a minimum flow (50 L/s) at the outfall for a flow measurement. The storm drain water is discharged via the outfall to the Winnipeg River.

Between 1967 and 1971, drain line breaks just outside of [redacted] east side had occurred. The aqueous radioactive waste collection system was replaced by the existing double pipe system in the mid-1980s. The old system had failed and leakage from some lines adjacent to the ALWTC had occurred. The area was partially remediated through removal of excavated soil; however, in subsequent years, the vegetation in the spill area was found to have elevated levels of beta and gamma emitting radioactivity, in particular Cs-137 and Sr-90. Routine monitoring of the area is maintained to provide an indication of mobility, which will require remediation.

REDACTED

2.2.3.5 Affected Site Lands

The affected lands[10] (Figure 2-5) are those lands within the WL site (i.e., the Licensed Property Study Area) that are contaminated, potentially contaminated or affected by nuclear operation and are more than approximately 1 m away from buildings. Decommissioning of land within approximately 1 m of the buildings is considered part of the decommissioning of the building. The affected lands also include land that is retained as a buffer zone between the unaffected lands and areas impacted by nuclear operations. The affected lands may contain contamination because of proximity to facilities and unusual occurrences.

2.2.3.5.1 Active Area Soil Contamination

The following is a description of various events at WL having radiological and non-radiological hazardous material impacts of the main site grounds.

2.2.3.5.1.1 Radiological Events

1971, 1984 and 2016: Low Level Liquid Waste (LLLW) drain line breaks occurred outside of [redacted] east side, between 1967 and 1971. The lines were replaced and approximately 765 m^3 of contaminated soil remediated. In 1984, approximately 100 m of lines transporting ILLW from the HCF were removed along the east side of [redacted] to the north roadway. Approximately 35 m of the drain line pipe remains where the lines penetrated through the [redacted] Stage 1 crawlspace east wall. There are also approximately 265 m of the drain line pipe that remains north of the main access road that runs from [redacted] to [redacted] The 2016 decommissioning activities in the Stage 4 crawlspace identified Sr-90 soil and wall contamination at the east basement foundation wall penetrations for the LLLW and service lines conduits. The contamination is believed to originate from a 1997 LLLW line leak and/or is the result of residual contamination following the removal of the abandoned ILLW lines. The degree of contamination outside of the [redacted] east foundation wall is unknown. There is a potential

[9] This dimension only represents 10% of the length of storm line.

[10] Much of the affected lands located on the WL south side and outer area are likely non-impacted.

for radiological impact of underground electrical conduits, power and control concrete bus ducts, and associated electrical junction pits, that transverses these areas.

1971: An airborne radioactive emission occurred from the SF active exhaust system. As the prevailing wind was from the north, radioactive particulates were transported from the Shielded Facilities stack for up to 120 m southward, causing contamination to the lawns and topsoil on the north side of [redacted] and the south side of [redacted] The contamination plume included Cs-137 and the short half-life radionuclides (<365 days) I-131, Ce-141, Ru-103, and Zr-95/Nb-95. The release was at a low level, and no contamination above acceptable limits is expected, though residual Cs-137 contamination likely remains. There is a potential for radiological impact of exterior lighting fixtures, overhead power lines and power poles that transverse these areas and still exist.

1972: During a filter change in the SF exhaust filtration system, a gasket failed and an exhaust filter was shredded. The filter remnants were released from the exhaust stack and deposited on the grass north of [redacted] The contaminated area extended north past the active area fence. Some radioactive contamination was also found in the area northwest of the SF in 1972 mid-June. Remediation involved removal of the contaminated sod, soil, and vegetation over an area of approximately 6000 m^2 of lawn. The releases during remediation were at very low levels, and there was no detectable contamination remaining in the affected area after removal actions. There is a potential for radiological impact of exterior lighting fixtures, overhead power lines and power poles that transverse these areas and still exist.

1980: Three active drain lines near the ALWTC ([redacted]) failed, causing the release of approximately 65 GBq of mixed fission products (in liquid form) to the topsoil. This same incident affected the storm drain system as well. The release resulted in contamination of a 370 m^2 area, including lawns and a roadway area to the east and south of the building. Remediation involved removing the affected topsoil to 30 cm depth, together with some surface material from a cement curb, and approximately 860 m^3 of roadway surface. Approximately 9 GBq of Cs-137 and Sr-90 are estimated to remain in the contaminated area around [redacted] There is a potential for radiological impact of underground electrical conduits, power and control concrete bus ducts and associated electrical junction pits that transverse these areas.

1983: An incident occurred at the Organic Monitoring Building ([redacted]) when a polyethylene foam filter, which had been used in a test filtering of process water from [redacted] was mistakenly left on the ground near [redacted] The filter was allowed to drip during removal from [redacted] causing contamination of the floor and of a 2.3 m^2 area of ground outside [redacted] The topsoil from this area was removed, and subsequent monitoring confirmed that there was no detectible contamination. There is a potential for radiological impact of underground electrical conduits, power and control concrete bus, and associated electrical junction pits that transverse these areas.

1984: A spill occurred at the north side of [redacted] Active liquid (20,000 Bq/ml; primarily Cs-137) was pumped from Bunker [redacted] at the WMA into a tank mounted onto a trailer. The liquid was transferred from the trailer tank to a holding tank in [redacted] Soil was contaminated near the transfer point, probably from tank leakage at the time of transfer. The area near the transfer point was surveyed, and soil samples were collected. Contaminated soil was removed and sent to the WMA. No residual contamination or impact to the Storm Drain system is expected from this incident. There is a potential for radiological impact of underground electrical conduits, power and control concrete bus ducts, and associated electrical junction pits that transverse these areas.

REDACTED

2005: Radioactive soil contamination was discovered at numerous locations on the grass outside the IFTF ([redacted]) north wall, and also in the HCF (part of [redacted]), IFTF and the [redacted] Machine Shop roof areas. The source of the radioactivity was identified to be remnants of a paintbrush that somehow got into the ventilation system and was chopped up through the exhaust fans and released through the effluent stack. It is likely that the samples also contained mixed fission products (Cs-137, Sr-90) and actinides (Am-241, Pu). The contamination was widespread on the roof areas and on the ground along the IFTF north wall. The area was remediated. There is a potential for radiological impact of underground electrical conduits, power and control concrete bus ducts, and associated electrical junction pits that transverse these areas.

2006: The WMA tanker was used to transport 556 litres of liquid waste from ILW Bunker [redacted] sump in the WMA to the ALWTC [redacted] During transfer into the Medium Level Liquid Waste (MLLW) system at [redacted] a small spill occurred from the tanker vent. The spill was remediated, and contaminated soil was moved to the WMA. No residual contamination or impact to the underground is expected from this incident.

2006: During the excavation of a failed water pipe adjacent to the two MLLW lines outside [redacted] one of the MLLW lines broke as a result of collapse of the nearby waterlogged soil. The open ends of the broken lines were capped, and the site was remediated. There is a potential for radiological impact of underground electrical conduits, power and control concrete bus ducts, and associated electrical junction pits that transverse this area.

2.2.3.5.1.2 Non-Radiological Hazardous Materials Events

1988: A stainless steel soaking tank containing 25% nitric acid was left overnight in the [redacted] parking lot. The tank was to be used the next morning for soaking SLOWPOKE Demonstration Reactor components. The acid corroded the body of the brass drain valve, allowing approximately 500 litres of acid solution to drain onto the cement and into the storm sewer system. The cement pad was damaged but was remediated afterwards.

Multiple hydrocarbon leaks/spills have been documented (e.g., hydraulic line break on heavy machinery), and the records show that all sites were remediated.

There are also multiple operational fuel tanks at WL, including one diesel tank, one propane tank near [redacted] (north side), and one gasoline/diesel tank near [redacted] (south side). Though specific contamination events are not necessarily associated with these tanks, it is possible that undocumented spills impacted the local soil or nearby manholes.

2.2.3.5.2 Cesium Ponds

This area was located directly east of the WMA. The ponds were developed to study the distribution of dose received by organisms living at the water mud interface. The contaminated soil, which had been excavated and moved to the WMA in 2014, was then packaged into certified transportation packages and safely transported to CRL.

2.2.3.5.3 Field Irradiator Gamma (FIG)

This project was conducted in the late 1970s to early 1980s to study the ecological effects on a mixed boreal forest ecosystem from continuous exposure to gamma radiation. Only sealed sources were used and these were later placed in a standpipe in the WMA. These have been removed and there is no radioactive contamination in the FIG area. The FIG area has been decommissioned.

REDACTED

2.2.3.5.4 Zoological Environment Under Stress (ZEUS)

The ZEUS project studied the effects of ionizing radiation on small mammals. Only sealed sources were used and these were later sent to the WMA. These have been removed and there is no radioactive contamination in the area. The ZEUS area has been decommissioned.

2.2.3.5.5 Deep Borehole Site

The borehole site was located north of the CCSF. Small amounts of short half-life tracers were injected into three wells to study radionuclide transport in bedrock. The radioactivity has decayed to background by 2002. The site has been decommissioned.

2.2.3.5.6 Tritium Injection Sites [redacted] and [redacted]

Tritium was injected in both sites (located west of the north/south road near the east borehole site road) as part of groundwater flow experiments in 1969. Tritium activity measured at the associated sampling points is below drinking water limits. The site has been decommissioned.

2.2.3.6 Off-Site Contaminated Areas

Off-site contamination resulting from the operation of the WL has occurred in two areas. Routine releases (well within regulatory limits) and some spill incidents have resulted in contamination of river sediments. A second area is the north property ditch and a natural drainage creek northwest of the site boundary, which was contaminated as the result of a spill in the WMA. These off-site contamination areas are described below.

2.2.3.6.1 River Sediments

Whiteshell Laboratories is situated on the east bank of the Winnipeg River. The river in this area is wide and flows rapidly several metres below the level of the surrounding land. The average flow is approximately 950 m^3/s, although this is controlled by Manitoba Hydro control stations, and may vary from time to time according to Manitoba Hydro policies.

Liquid effluent from the ALWTC and now the LLLW systems in [redacted] and [redacted] are discharged to the Winnipeg River via the process discharge at the process outfall located about 8 m offshore in 5 m of water. The Cs-137 (the dominant radionuclide) concentration in downstream river water is well within the 10 Bq/L Canadian Drinking Water Quality Guidelines.

A reduction in the effluent particulate load was accomplished in 1998-99 by the installation of filter stations to collect the larger particulate for the most critical waste streams. The effluent from the WMA sumps was routinely filtered through 5 micron filters before being transferred by tanker to the ALWTC. The effluent is now collected and stored in totes until a disposition path is determined. In 1995, a decision was made to reduce the concentration control point for ALWTC waste by reducing the Administrative Level from 1 GBq/m^3 to 0.1 GBq/m^3. This means the overall level of releases was reduced and a significant fraction of the larger particulate (settleable solids) was collected, and therefore, prevented from being released to the river.

Elevated sediment contamination has been measured in the local outfall area (an area 20 m wide by 80 m downstream). The total inventory was estimated to be approximately 1.3 GBq. However, this is substantially less than the annual releases of Cs-137 prior to 1985 when the reactor was operating. A detailed evaluation of the sediment contamination is presented in Appendix B.1 of [2-1]. The assessment concludes that using the

REDACTED

most conservative dose estimation methods; doses to non-human biota and humans are below accepted guidelines.

2.2.3.6.2 North Ditch/Creek

A spill incident at the WMA in 1979 led to fission product contamination of a 2 km ditch system, (including the west ditch, the north ditch, and a small creek). The creek is located in the public domain north of WL, and discharges into the Winnipeg River. A follow-up ditch sampling program indicated radioactivity was deposited throughout the 5 to 10 cm of clay silt soil in the ditch system near the WMA. Surface water was present in the ditches at the time, and contamination of the water flowing down the drainage system exceeded the maximum permissible concentration in drinking water for continuous consumption. No significant increase in the level of radioactivity in the river water was attributed to this event.

The ditch flowing west from the WMA was excavated to remove contaminated soil. The entire ditch/creek system was surveyed to determine the immediate remediation required. Routine monitoring continues to be carried out in this ditch/creek system.

2.3 Operational History

To date, no significant incidents or accidents have occurred while executing decommissioning work at WL. This section summarizes the operational events/incidents that have occurred at WL since 2002.

The Intermediate Level Waste (ILW) Bunkers have a history of water ingress. Water ingress is believed to result from a combination of groundwater ingress and surface run off. Previous investigations have found that ILW Bunkers [redacted] and 5 contain water [redacted]. In 2011, surface soil contamination was discovered near ILW Bunkers [redacted] and [redacted] [2-8]. Further investigations were conducted along with the remediation of the contaminated soil. Point holes were drilled through the concrete roof slab of each of ILW Bunkers [redacted] to [redacted] and a well screen and well cap installed in the south west corner. Water was found at the base of the roof slab. The roof slabs are approximately 15 cm thick at the edges, but are thicker away from the walls due to compaction of the backfill during the concrete pour. Concrete cores were up to 0.4 m thick and water was found at the base of the cored holes indicating the bunkers were fully flooded. In 2014, the ground was landscaped to reduce the potential for surface water entering ILW Bunkers [redacted] to [redacted] grading of the surface is to the east, towards a water collection swale.

Intermediate Level Waste Bunkers [redacted] and [redacted] all experience varying degrees of water inflow [redacted]. Bunker [redacted] had water inflow, reportedly from precipitation (5774 L in 1997) until the wooden roof was installed. The wooden roof later had aluminium installed over the wood for fire protection. Bunker [redacted] experienced an average water ingress of 558 L per year from 2009 to 2015. Grading was done for ILW Bunker [redacted] in 2001 along with the installation of an impermeable geotextile membrane just below grade.

In 1997, the ground was graded away from the roof of ILW Bunker [redacted] In 2002, ILW Bunker [redacted] had water pumped from the sump (205 L). After that time, the pump out lines were damaged and were not used. Repairs done in 2014 found that water was present to the top of the repaired sample lines. It is assumed from this observation that ILW Bunker [redacted] is also flooded. It was not pumped out to avoid disturbing the state of the material in the bunker and the groundwater.

Large amounts of pumping will disturb the groundwater movement and could mobilize contamination from other waste structures. For these reasons, it was decided not to pump out ILW Bunkers [redacted] and [redacted] until it

REDACTED

was time to decommission them.

Significant water amounts have been pumped from ILW Bunker [redacted] (the records for 1997-2004 show a range from 880 L to 6969 L per year). In 1997, the soil was graded to direct surface water runoff away from the structure. Repairs and modifications in 2001 saw the addition of foil tape across the gaps between the bunker shielding plugs, caulking in the joints between the access shielding plug and the curbs. Additional caulking and installation of a geotextile just below grade were done to enhance water shedding. Rain gutters were also installed at that time. While this reduced inflow, subsequent years saw increased inflow, suggesting that an alternate pathway for inflow exists.

In 2015, in order to support the decision to defer water removal from the flooded bunkers and demonstrate that the ILW Bunkers were fit for service by effectively containing contamination, shallow wells were installed adjacent to ILW Bunkers [redacted] to [redacted] [redacted]. These wells were drilled to a depth just below the base of each bunker. The water chemistry from inside each bunker was compared to the adjacent wells.

Water stains were noticed on the outside of the ILW Bunker [redacted] below the lower air vent inlet line [2-10]. These were observed following a heavy rain. Investigation indicated water had infiltrated the temporary weather shield tarping covering the top of the bunker at that time and penetrated into some of the six inner storage sites in the bunker. Radiation surveys found up to 3000 cpm beta/gamma on swipe on the exterior of the bunker and up to 25,000 cpm beta/gamma fixed on the exterior of the bunker and small amounts of contamination in the soil directly below some of the bunker vent lines. Further surveys after decontamination of the bunker exterior found no detectable loose activity.

In addition to the above, and the events listed in Section 2.2.3.5.1 (Active Area Soil Contamination), Table 2-3 lists any other unusual occurrences that occurred at WL since 2002.

Table 2-3 Unusual Occurrences Since 2002

Date	Event	Description	Remediation/Impact
2006 Sept 21	WMA tanker pump-out spill at Addition Station on north side of [redacted]	Approximately 4 L of ILLW spilled from the drip tray of the WMA tanker during transfer to receiver tank, [redacted]	Soil was excavated from the spill area and analyzed; corrective landscaping of loading area was done and guiding markers added. An air vent was installed on the tanker and the pump-priming procedure was updated. No subsurface migration of radionuclides is expected.
2009 Dec 15	Release of friable asbestos	Asbestos was released and spread when workers were moving, rigging and lowering pipe in [redacted]	Access to [redacted] was limited and a thorough clean-up of the room was completed, as confirmed with air monitoring.

REDACTED

2.4 References

The following references were current at the time of development of this DDP. Where a reference is to be complied with, ensure the latest revision is used.

[2-1] WLDP-03702-041-000-0008, *Whiteshell Laboratories Decommissioning Project Comprehensive Study Report, Volume 1: Main Report*.

[2-2] WLDP-03702-041-000-0009, *Whiteshell Laboratories Decommissioning Project Comprehensive Study Report, Volume 2: Appendices*.

[2-3] WLDP-03702-041-000-0010, *Whiteshell Laboratories Decommissioning Project Comprehensive Study Report, Volume 3: Addendum*.

[2-4] WLDP-26000-ENA-001, *Environmental Impact Statement – In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site, Pinawa, Manitoba*.

[2-5] NRTEDL-W5-8.00/2024, *Nuclear Research and Test Establishment Decommissioning Licence for Whiteshell Laboratories*.

[2-6] 900-508740-PRD-001, *Radiation Protection*.

[2-7] WLDP-03705-REPT-001, *Fitness-For-Service Report for Whiteshell Laboratories Waste Management Area Bunkers*.

[2-8] WL-00583-ASR-2011, *WL Annual Safety Review for 2011*.

[2-9] WL-00583-ASR-2015, *WL Annual Safety Review for 2015*.

[2-10] WL-00583-ASR-2009, *WL Annual Safety Review for 2009*.

REDACTED

3. APPLICABLE PROGRAMS, CODES AND STANDARDS

Compliance programs, codes and standards applicable to the WL Decommissioning Project are described in this section.

3.1 CNL Management System and Health, Safety, Security, Environment and Quality

The CNL Management System [3-1] is the platform to enable the continuance of safe operational practices. The Management System ensures safe, effective and efficient conduct of work, delivering against commitments within appropriate accountabilities and controls.

The Management System is comprised of an integrated set of documented policies, expectations, standards, procedures, and responsibilities through which CNL is governed and managed, from the high level setting of direction through to day to day operations, all within a coherent control and accountability framework. The system applies to all CNL locations including WL.

Canadian Nuclear Laboratories corporate policies continue to provide direction and expectations to management and employees for all business activities performed at WL, and all other site locations. As itemized below, CNL operates under eleven corporate policies. All policies have been authorized by the CNL Board of Directors and approved by the CNL President and Chief Executive Officer.

- Nuclear Safety
- Safety and Health
- Environment
- Code of Conduct
- Quality
- People
- Security
- Property (Asset) Management
- Supply Chain
- Intellectual Property
- Ethics & Business Conduct

A core prerequisite for CNL's success in consistently bringing high value to its customers and stakeholders is the effective and efficient governance and management of the company. Canadian Nuclear Laboratories is committed to excellence in management, thereby providing the foundation on which the company and our employees can thrive.

The Management System applies to all CNL management and execution activities. Management activities include setting expectations, enabling, planning and budgeting, and assessing all aspects of business, thereby ensuring delivery against commitments within appropriate accountabilities and controls. Execution activities include the safe, effective and efficient conduct of work across all CNL lines of business, performed by CNL employees, as well as third parties engaged through external partnerships, collaboration and CNL's Supply Chain.

The CNL Management System [3-1] aligns with Canadian Standards Association (CSA) N286-12 [3-2]. The QA program for decommissioning at WL is based on CSA N286.6 [3-3].

REDACTED

3.1.1 Occupational Safety and Health

The CNL Occupational Safety and Health (OSH) program [3-4] [3-5] applies to all work performed at WL by CNL employees and other personnel (attached staff, visitors, contractors and students, etc.). The program ensures compliance with all applicable policies and regulations. The program also ensures that conventional hazards from routine activities and decommissioning projects are identified, assessed and managed adequately to protect the environment and the health and safety of workers and the public.

3.1.2 Radiation Protection

The CNL Radiation Protection program [3-6] [3-7] is designed to protect workers and members of the public from harmful effects of radiation exposure arising from CNL activities and to ensure that CNL complies with, or exceeds, the level of radiation safety that is required by the Nuclear Safety and Control Act [3-8] and the CNSC Regulations [3-9] [3-10] [3-11] [3-12].

The Program [3-6] [3-7] applies to the monitoring, surveillance, maintenance, and decommissioning activities that affect the safety of staff and equipment in terms of ionizing radiation at all CNL sites, and applies to all employees and other personnel (attached staff, contractors, visitors, students, etc.) conducting work at all CNL sites including the WL site. The Program provides the overall framework including the requirements and responsibilities, processes and procedures, and other related activities as it relates to radiation protection for CNL's activities.

Dosimetry is a necessary component of the program, providing a quantitative measure of the effectiveness of the radiation protection program as it applies to both the individual worker and the collective workforce. Dosimetry is a fundamental requirement for the demonstration of compliance with regulatory obligations mandated by the site licence.

3.1.2.1 As Low As Reasonably Achievable Approach

The As Low As Reasonably Achievable (ALARA) approach is intended "to keep the amount of exposure to radon progeny and the effective dose and equivalent dose received by and committed to persons as low as reasonably achievable, social and economic factors being taken into account" [3-13]. The ALARA work control process provides a systematic, practical and duplicable approach to the planning and control of radiological work that will provide optimized radiation protection and assurance that:

- Doses are kept below applicable regulatory limits [3-7] and WL's Action Levels (ALs) [3-14].
- Exposures and doses are kept ALARA, social and economic factors taken into account.
- The occurrence of unplanned events exceeding a radiation deterministic effective dose threshold are prevented.
- The probability of the occurrence of unplanned events exceeding a regulatory dose limit or an action level is kept ALARA, social and economic factors being taken into account.

At WL and other CNL sites, it is achieved through the implementation of:

- Management control over work practices.
- Personnel qualification and training.
- Control of occupational and public exposure to radiation.
- Planning for unusual situations/emergencies.

REDACTED

Applying the above measures, while complying with the CNL Radiation Protection program requirements and federal Radiation Protection regulations, will keep doses received by workers and members of the public from exposure to sources of radiation ALARA.

3.1.2.2 Dose Estimates and Monitoring

Dose to workers shall be justified, maintained below regulatory dose limits [3-6] and kept ALARA, social and economic factors taken into account. At WL, this is accomplished by the control of radiation work and the application of individual and source related dose constraints, including Dose Control Points and radiological Control Hold Points. The dose limitations apply to all doses received as a consequence of the worker's occupation from all sources of ionizing radiation. They do not apply to doses received from non-occupational radiation sources, such as medical diagnostics or therapy, natural background, doses from air travel and other regulatory exempt sources of exposure.

3.1.3 Environmental Protection and Monitoring

Canadian Nuclear Laboratories Environmental Protection program [3-15] [3-16] is designed to ensure protection of the environment and the public with respect to its activities, products, or services. The Environmental Protection program requirements apply to all CNL employees for the CNL operated sites including the WL site. Whiteshell Laboratories is ISO 14001:2015 compliant and is governed by Federal regulations and legislation and, where applicable, Provincial and municipal regulations and legislation. The program [3-15] [3-16] describes the organization, responsibilities, processes, controls and requirements that are applicable to the projects and other activities of CNL including:

- Identification and assessment of significant environmental aspects related to CNL operations.
- Management and monitoring of emissions.
- Environmental monitoring.
- Management of land and habitat.
- Environmental incident reporting and investigation.

Canadian Nuclear Laboratories is legally obligated under the Canadian Environmental Assessment Act 2012 (CEAA, 2012) [3-17] to ensure that projects are considered in a careful and precautionary manner to avoid significant adverse environmental effects.

3.1.4 Emergency Preparedness

Canadian Nuclear Laboratories Emergency Preparedness (EmP) program [3-18] [3-19] focuses on the prevention and mitigation of, preparedness for, and recovery from abnormal or emergent events. The Program applies to design, operations and other activities including decommissioning work that may affect EmP at CNL sites, including the WL site. A graded approach to EmP requirements [3-19] is applied based upon an assessment of the most credible events that could occur at any given location such as the one at the WL site.

Emergency Preparedness provides the oversight to ensure personnel, equipment, and response facilities are maintained in a state of readiness to assure both response and site licensing requirements are met. To this end, the Program interfaces with internal and external stakeholders to ensure effective plans, training,

REDACTED

equipment, and resources are in place to prevent emergencies and to respond in an integrated and timely manner in the unlikely event that an emergency occurs.

Employees are responsible to be familiar with their work area and building emergency procedures, and promptly respond to emergencies as trained or as requested. They shall conduct their work and use equipment, devices, and facilities in accordance with Program requirements [3-19] and related procedures and practices specific to their facility or activity.

3.1.5 Fire Protection

Canadian Nuclear Laboratories has a comprehensive Fire Protection program, which identifies the requirements, processes and responsibilities to fulfill health and safety, security, environmental and regulatory obligations pertaining to fire protection at CNL, including the WL site. The Program Description Document [3-20] supplements the Program Requirements Document [3-21], both of which apply to all CNL employees and to other personnel (contractors, consultants, etc.) conducting work at all CNL sites, including routine monitoring and maintenance work and non-routine decommissioning activities. The Fire Protection program applies a risk graded approach in conjunction with the defence in depth principles to its operations and activities insofar as they may affect fire protection.

Whiteshell Laboratories decommissioning work is subject to a fire protection screening process by Fire Protection staff to ensure fire protection is maintained throughout the decommissioning process.

3.1.6 Security

Canadian Nuclear Laboratories Security program [3-22] [3-23] applies to the operation and activities that may affect security, and to all employees and other personnel (visitors, contract staff, etc.) conducting work at CNL sites. Adhering to the Security program requirements [3-23] ensures protection of CNL employees, facilities, and nuclear materials, and meets the objectives of the CNL Security Policy [3-24]. By implementing a strong Security program, CNL also supports Canada's interest in ensuring the protection of assets, information, safeguarding of the public and personnel, and resumption of business.

Routine work and non-routine decommissioning activities at WL are subject to CNL's Security program, where applicable. All Contractors must be security cleared through CNL Security before working at WL and must comply with the Facility's access control requirements. Canadian Nuclear Laboratories periodically performs site security and threat risk assessments for WL, and acts on the findings as required. The routine inspections, testing and maintenance of Security systems at WL are performed by WL personnel.

3.1.7 Nuclear Materials and Safeguards Management

Canadian Nuclear Laboratories Nuclear Materials and Safeguards Management (NM&SM) program [3-25] [3-26] applies to all nuclear material and safeguards management activities performed at CNL facilities, including WL. It covers procurement, receipt, disposition, transfer, accounting, safeguards management, storage, and inventory management of nuclear material. The primary focus of the NM&SM program is on facilities that contain fissionable material, and are therefore subject to regulatory safeguards measures and reporting requirements.

REDACTED

All routine and non-routine work, including decommissioning activities at WL, meet the program requirements. The Facility is also subject to periodic Compliance and Safeguards inspections and verifications by the regulatory bodies.

3.1.8 Transportation of Dangerous Goods

Canadian Nuclear Laboratories Transportation of Dangerous Goods Program [3-27] [3-28] provides an operational framework for the safe transport of dangerous goods by conforming to all applicable laws and regulations [3-12] [3-29] [3-30], and company policies and procedures. It enables an effective, consistent and comprehensive application of International standards. The Program applies to off-site shipping of dangerous goods by all modes of transport, and to anyone who performs an activity associated with the transport of such materials. Transport activities include all operations associated with the movement of dangerous goods such as classification, documentation, packaging, safety marks, security, emergency response, training, and regulatory permits and licences.

All off-site transport of dangerous goods, including radioactive materials/waste at the WL site, follows the Program requirements [3-28], which provide compliance with the decommissioning licence conditions [3-14] [3-31].

3.1.9 Waste Management

Canadian Nuclear Laboratories Waste Management Program [3-32] [3-33] applies to all operations and activities that result in the generation, transportation, treatment, storage and/or disposal of wastes (i.e., the lifecycle of waste) generated by CNL or received by CNL from an external organization. The Program applies to all CNL employees, including other personnel (contractors, attached staff, consultants, etc.) for waste management activities conducted on behalf of CNL.

The Program addresses Federal and Provincial regulatory obligations applicable to CNL sites and the CNSC requirements for waste management at all CNL operated sites, including WL. The Program provides advice to CNL waste generators to ensure that activities involving the waste management lifecycle are performed in a manner that protects the workers, the public, and the environment. The Program is driven by a series of requirements and supported through a series of procedures for the application of work processes, practices and activities.

All waste generated during the decommissioning and demolition phase at WL will be monitored, segregated, packaged or contained, shipped for processing/storage or disposal in accordance with the project specific Waste Management Plans, which will be prepared as part of the DDP. The Waste Management Plans will ensure that:

- All waste material will be adequately characterized, in order to meet CNL Waste Management program requirements [3-33], including waste acceptance criteria for clean waste and solid radioactive waste [3-34].
- Waste materials are properly packaged for transportation and storage, or disposal [3-32].

All waste generated from the operational phase of WL or from the decommissioning of the WL site will be packaged and readied for transportation to approved off-site facilities (primarily CRL for radioactive wastes).

REDACTED

3.1.10 Quality Assurance

Quality Assurance activities are integrated into work procedures to provide confidence that products and services will meet specifications and perform as expected. At CNL, this is mostly achieved by aligning its Management System Manual [3-1] with applicable standards such as CSA N286-12 [3-2], CSA N285.0 [3-35], CAN/CSA ISO 14001:2015 [3-36], and CSA N286.6-98 [3-37]. The result is the QA program description and requirements documents [3-38] and [3-39], which describe CNL's quality program and processes, and applicable QA requirements. The program description document [3-38], together with the Management System Manual, provides the framework that all employees shall use in their work to support the delivery of high value, quality products and services. Implementation of the QA Program helps to assure adequate protection of workers, the public, and the environment from adverse consequences as a result of CNL's operations, including decommissioning. Where appropriate, the degree and level of rigor applied to program elements, items, or activities are based on a graded approach that takes into account the complexity of work to be performed and the magnitude of the hazards to maintain an acceptable level of risk. Decommissioning activities at WL are further governed by the WL Quality Assurance Plan (QAP) [3-40], which is based on CSA N286.6 [3-3] and aligned to CSA N286-12 [3-2].

Effectiveness of the decommissioning activities for the facility in complying with various programs and documented procedures is evaluated through internal audits, assessments and reviews.

3.1.11 Human Performance Management and Operating Experience

Canadian Nuclear Laboratories Performance Assurance program [3-41] [3-42] provides the Organization with necessary tools, methods, training, and expertise to ensure safety of its employees and the public and protect the environment from any potential hazards associated with operating its sites and facilities. The Program also focuses on achieving continual improvement in efficiency and effectiveness without compromising safety or quality. Elements of the Performance Assurance program include Human Performance, Operating Experience and Corrective Action Program, Assessment, Continual Improvement, and Performance Measures and Analyses.

The Program elements are implemented across the Organization, and are applicable to all CNL sites including the WL site, with the objectives to (1) identify and address program and performance deficiencies and opportunities for improvement, (2) provide the means and requirements to consistently assess and report deficiencies, (3) establish and effectively implement corrective and preventive actions, and (4) share lessons to be learned across all aspects of operations.

3.1.12 Staffing, Personnel Qualifications and Testing

Staff hiring at CNL is effected through a well-defined hiring process, which is consistent with applicable Federal laws, regulations, CNL policies, and collective agreements. The hiring procedure [3-43] is designed to support a fair and transparent application of processes in order to attract and hire the best qualified candidates. The recruitment process ensures the selection of an applicant(s) who has the most desired qualifications, knowledge, skills, and experience to fill job vacancies against defined position descriptions and specifications.

Canadian Nuclear Laboratories Training and Development program [3-44] [3-45] provides employees with the knowledge, skills and competencies required to safely and successfully perform the work for which they are responsible. The Program scope also includes building and sustaining employees' skill sets in order to

REDACTED

maintain and achieve CNL's corporate objectives, and creating and maintaining an efficient and effective investment in training on a company wide basis that is planned and budgeted. The Program supports career and individual development through experience, mentoring, and training.

In the event that the decommissioning work is undertaken by Contractors, the Contractors shall provide adequately trained and licensed resources capable of performing the work in accordance with best industry practices and in compliance with codes and standards noted in Section 3.2. The Contractor's Supervisor shall provide basic instructions and training to their staff who are on site regarding work procedures, rules and requirements, and ensure contract personnel have all required training, including training on safe and proper use of vehicles and equipment required for their work. Where required, Contractor employees selected to work at the WL site will attend a general safety orientation training session. This training is site specific and will be held at the WL site. If Contractors will be performing radiological work, there will be additional radiation protection training that will be provided to the Contractor. The Project Supervisor will ensure that contract staff members receive the site specific training, plus any other additional project specific training as determined by the Project.

3.1.13 Human Factors

The human factors approach for the WL project focuses on protection of environment, health and safety associated with the critical safety tasks in the final phases of decommissioning. Canadian Nuclear Laboratories has used the Energy Institute document, Guidance on Managing Human and Organizational Factors in Decommissioning [3-46] to identify the elements that will be important to the project during execution of decommissioning. In addition, human factors elements that apply to all phases of decommissioning are assessed for the WL decommissioning project.

Human factors are embedded in many of CNL's existing processes and procedures, such as OPEX review, organizational management, task analysis (work instruction process), qualification of staff and contractors, physical work environment, and human performance:

- Staffing assessments, which include analyzing the work to be performed and assessing the time required to perform are completed for the project.
- Training needs and competency are identified and reviewed annually for individuals involved in all work positions. Records of qualifications are maintained. The OSH Program applies this requirement to Contractor staff through a systematic check of special skills for the work and retention of worker records as proof of training.
- Safety culture for all CNL staff and Contractors is well inculcated in the organization. Focus on "*Safety First*" and "*Safety Begins With Me*" maintains a culture of safety before production. In addition, programs for monitoring safety statistics, near miss reporting and continued dialogue on safety are practiced throughout the organization and with Contractors. The OSH Program includes minimum training requirements for all employees and standards to be met by Contractors.
- Task hazard analysis is performed during the writing of work instruction packages, and CNL provides rigorous oversight of Contractors including the review of their hazard analysis and work instructions.
- Organizational change is managed through a documented change management process. Canadian Nuclear Laboratories has a well-developed project organization as site closure has been in progress for over 10 years.

REDACTED

Those human factors identified that are not part of existing management programs will be assessed using the Energy Institute guidelines [3-46].

All work plans and job steps in work instruction packages will incorporate a Human Factors assessment to identify any issues requiring particular attention. An example would be the use of communication protocols such as hand signals and radios, particularly when CNL staff will integrate with Contractors.

3.1.14 Nuclear Criticality Safety

Nuclear criticality safety is aimed at preventing criticality accidents. The CNL Nuclear Criticality Safety program [3-47] [3-48] complies with the CNSC Regulatory document, REGDOC-2.4.3 [3-49], which provides the requirements for the prevention of criticality accidents in the handling, storage, processing, and transportation of fissionable materials, and the long-term management of nuclear waste.

3.1.15 Pressure Boundary

The purpose of the Pressure Boundary program [3-50] [3-51] is to ensure that pressure retaining systems and components are designed, constructed and operated in full compliance with statutory and legislative requirements, while promoting and supporting performance excellence with a strong safety culture. The ultimate objective of the Pressure Boundary program is to have "no pressure boundary failures" [3-35] [3-52].

3.2 Acts, Laws and Regulations and Codes, Guides and Standards

Decommissioning work shall comply with the requirements of several Codes, Guides and Standards including Provincial and Federal Acts, Laws, and Regulations, as applicable. All applicable Federal requirements (which are incorporated in the Management System documents noted in Section 3.1 and its sub-sections), shall be adhered to, and if Contractors are involved, they shall additionally work to all applicable Manitoba codes and standards. The Licence Conditions Handbook (LCH) [3-14], associated with the decommissioning licence [3-31], specifies relevant Acts, Laws and Regulations, Codes, Guides, and Standards with their use being either mandatory and complied with or recommended and used as guidance in the conduct of licensed activities at WL.

3.2.1 Acts, Laws and Regulations

- Nuclear Safety and Control Act.
- Canadian Environmental Protection Act.
- Transportation of Dangerous Goods Act.
- Access to Information Act.
- Canadian Environmental Assessment Act.
- Nuclear Liability Act.
- Radiation Emitting Devices Act.
- Canada/IAEA Safeguards Agreements.
- General Nuclear Safety and Control Regulations.
- Class I Nuclear Facilities Regulations.
- Radiation Protection Regulations.
- Nuclear Security Regulations.
- Nuclear Non Proliferation Import and Export Control Regulations.

REDACTED

- Packaging and Transport of Nuclear Substances Regulations.
- Transportation of Dangerous Goods Regulations.

3.2.2 Codes, Guides and Standards

The Codes, Guides, and Standards are specified in the WL LCH [3-14]. This list is not an exhaustive list of all applicable codes and standards; there could be other standards with which compliance might be required as per the CNL Management System Manual [3-1] and its sub tier documents.

3.3 References

The following references were current at the time of development of this DDP. Where a reference is to be complied with, ensure the latest revision is used.

[3-1] 900-514100-MAN-001, *CNL's Management System (Manual)*.

[3-2] CSA Standard, N286-12, *Management System Requirements for Nuclear Facilities*.

[3-3] CSA Standard, N286.6, *Decommissioning Quality Assurance for Nuclear Power Plants*.

[3-4] 900-510400-PDD-001, *Occupational Safety and Health*.

[3-5] 900-510400-PRD-001, *Occupational Safety and Health*.

[3-6] 900-508740-PRD-001, *Radiation Protection*.

[3-7] 900-508740-PDD-001, *Radiation Protection*.

[3-8] *Nuclear Safety & Control Act*, Government of Canada, S.C. 1997.

[3-9] SOR/2000-202, *General Nuclear Safety and Control Regulations*, Government of Canada.

[3-10] SOR/2000-203, *Radiation Protection Regulations*, Government of Canada.

[3-11] SOR/2000-207, *Nuclear Substances and Radiation Devices Regulations*, Government of Canada.

[3-12] SOR/2015-145, *Packaging and Transport of Nuclear Substances Regulations*, Government of Canada.

[3-13] CNSC Regulatory Guide, G-129, *Keeping Radiation Exposures and Doses "As Low as Reasonably Achievable (ALARA)"*.

[3-14] WLD-508760-HBK-002, *Licence Conditions Handbook for Whiteshell Laboratories*.

[3-15] 900-509200-PDD-001, *Environmental Protection*.

[3-16] 900-509200-PRD-001*, Environmental Protection*.

[3-17] CEAA 2012, *Canadian Environmental Assessment Act 2012*.

[3-18] 900-508730-PDD-001, *Emergency Preparedness*.

[3-19] 900-508730-PRD-001, *Emergency Preparedness*.

[3-20] 900-508720-PDD-001, *Fire Protection*.

[3-21] 900-508720-PRD-001, *Fire Protection*.

[3-22] 900-508710-PDD-001, *Security*.

[3-23] 900-508710-PRD-001, *Security*.

[3-24] 900-508710-POL-001, *Security*.

[3-25] 900-508510-PDD-001, *Nuclear Materials and Safeguards Management*.

REDACTED

[3-26] 900-508510-PRD-001, *Nuclear Materials and Safeguards Management*.

[3-27] 900-508520-PDD-001, *Transportation of Dangerous Goods*.

[3-28] 900-508520-PRD-001, *Transportation of Dangerous Goods*.

[3-29] SOR/2001-286, *Transportation of Dangerous Goods Regulations*, and SOR/2017-253*, Amendment*.

[3-30] IAEA Safety Standards SSR-6, *Regulations for the Safe Transport of Radioactive Material*, 2012 Edition.

[3-31] NRTEDL-W5-8.00/2024, *Nuclear Research and Test Establishment Decommissioning Licence for Whiteshell Laboratories*.

[3-32] 900-508600-PDD-001, *Waste Management*.

[3-33] 900-508600-PRD-001, *Waste Management*.

[3-34] 900-508600-MCP-004, *Management of Waste*.

[3-35] CSA Standard, N285.0, *General Requirements for Pressure-Retaining Systems and Components in CANDU Nuclear Power Plants*.

[3-36] CAN/CSA ISO 14001:2015, *Environmental Management System – Requirements with Guidance for Use*.

[3-37] CSA Standard, N286.6-98, *Decommissioning Quality Assurance for Nuclear Power Plants: General Instruction No 1*.

[3-38] 900-514200-PDD-001, *Quality*.

[3-39] 900-514200-PRD-001, *Quality Assurance*.

[3-40] WLD-508300-QAP-001, Revision 2, *Whiteshell Decommissioning Quality Assurance Plan*.

[3-41] 900-514000-PDD-001, *Performance Assurance*.

[3-42] 900-514000-PRD-001, *Performance Assurance*.

[3-43] 900-510000-MCP-012, *CNL Staff Hiring*.

[3-44] 900-510200-PDD-001, *Training*.

[3-45] 900-510200-PRD-001, *Training and Development*.

[3-46] Energy Institute, *Guidance on Managing Human and Organizational Factors in Decommissioning*, 2010 March.

[3-47] 900-508550-PDD-001, *Nuclear Criticality Safety*.

[3-48] 900-508550-PRD-001, *Nuclear Criticality Safety*.

[3-49] CNSC Regulatory Document, REGDOC-2.4.3, *Nuclear Criticality Safety*.

[3-50] 900-508140-PDD-001, *Pressure Boundary*.

[3-51] 900-508140-PRD-001, *Pressure Boundary*.

[3-52] CSA Standard, B51, *Boiler, Pressure Vessel and Pressure Piping Code*.

REDACTED

4. HAZARDS ASSESSMENT

4.1 Facility Current Hazards

Currently, the WL site is comprised of nuclear and non-nuclear facilities either operating, undergoing decommissioning and/or under M&S. The hazards that may invariably exist at WL site under its current state include:

- Radiological Hazards
- Chemical Hazards
- Industrial Hazards
- Biological Hazards
- Environmental Hazards

A brief description of the above listed hazards is outlined in the following subsections.

The Annual Compliance Monitoring Report (ACMR) for WL (e.g., [4-1]), has demonstrated that risks from normal anticipated operations, unplanned events, or accidents that may occur during its current operational phase are low, controlled and ALARA.

4.1.1 Radiological Hazards

The radiological safety of the workers and visitors at the WL site is ensured through the implementation of CNL's Radiation Protection Program (see Section 3.1.2).

4.1.1.1 Radiological Area and Zoning

The WL site has been segregated into radiological areas and those areas further divided in radiological safety zones to organize nuclear facilities and decommissioning activities in an effective way and to optimize the provision of radiation protection measures and controls.

The radiological area designation indicates whether activities, operations, or facilities posing a radiological hazard are permitted and details the required radiation protection practices and procedures. The system for classifying site areas is based on the International Commission on Radiation Protection (ICRP) and International Atomic Energy Agency (IAEA) recommended work place designations of Controlled, Supervised, or Uncontrolled Areas. The radiological area designation reflects the potential for allowed work activities to result in exposure to radiation and contamination hazards and the need to follow well-established radiation protection procedures and practices. The following radiological areas designations are used to segregate the WL site:

- Controlled Area 2 (CA-2): Activities and facilities that pose a radiation and/or contamination exposure hazard are permitted.
- Controlled Area 1 (CA-1): Activities and facilities that pose predominantly an external radiation hazard are permitted and activities posing a low potential for contamination may be allowed on a case-by-case basis.

REDACTED

- Supervised Area: Storage, possession and handling of radioactive material within a Supervised Area is not permitted, except for the transfer of packaged radioactive material or waste being transferred between Controlled Areas or moved off-site. Exceptions require approval by the WL Radiation Protection Program Manager.
- Uncontrolled Area: Treated as a public access areas with no radiation protection oversight or controls. The only permitted radioactive material in Uncontrolled Areas is that packaged and being transported in accordance with the applicable transport regulations at WL.

Radiological safety zoning is used to communicate the type and level of radiological hazards in rooms and work areas within a radiological area and the degree of radiation protection measures required to control contamination and radiation exposure. The CNL zoning system categorizes work areas into 1 (none) to 5 (very high) radiological safety zones that reflect the external radiation and contamination exposure hazards in a work area. The greater the level of the zone, greater the potential hazard and greater the operational measures needed to control radiation exposures and contaminations. Appendix A provides a general description of each of the zone levels.

The radiological areas and zoning at the WL site are ever evolving as decommissioning work progresses. Table 4-1 summarizes the site radiological area designations, main facilities within the area and the radiological safety zone classifications.

REDACTED

Table 4-1 WL Site Radiological Areas and Facility Radiological Safety Zone Summary

Radiological Area	Facility	Contamination Zone	Radiation Zone
Controlled Area 2	Shielded Facilities – Hot Cells Facilities	2-5	2-5
	Shielded Facilities – Immobilized Fuel Test Facility (repurposed areas and labs)	2-3	2-3
	Low Level Liquid Waste Treatment Systems ([redacted])	2	2
	Shutdown Radioisotope Laboratories with M&S [redacted]	2	1
	Whiteshell Reactor-1 ([redacted])	2-4	2-3
	Active Liquid Waste Treatment Centre ([redacted])*	2-4	2-3
	Concrete Canister Storage Facility**	1	2
	Waste Management Area**	1-3	1-3
Controlled Area 1	Shielded Facilities – Radioactive Waste Trailers and Contaminated Tooling Storage Area	1	1-2
	Research and Development Facilities Complex ([redacted]) – Inactive laundry facility, shutdown and decommissioned areas with M&S	1	1
	Containment Test Facility ([redacted])	1	1
	Waste Clearance Facility ([redacted])	1	1
	Health and Safety Facilities ([redacted]) – Environmental Monitoring Laboratory Complex	1-2	1-2
	Radiation Device Storage Room ([redacted])	1	2-3
	Crawlspace ([redacted])	1-2	1
	Former [redacted] site and surrounding area	1	1-2
	WR-1 Organic Trap Building and Pit ([redacted])	1-2	1
Supervised Areas	WL Site North and South Side Remaining Buildings	1	1
	[redacted] Remaining Areas		
	WL Outer Area – Buildings and Grounds		
Uncontrolled Areas	Plant Road	n/a	n/a
	Employee Parking Lot		
	Non-Affected Lands		

* Shutdown and undergoing decommissioning.

** Zoning classifications relate to the levels accessible to personnel. In some areas, higher levels exist in systems or areas sealed from access such as the standpipes in the WMA.

REDACTED

4.1.1.2 Radiation Dose Rates

External radiation doses to all CNL staff (WL staff and CNL staff from other sites working at WL), non-CNL employees (contractors) and visitors, received in either Controlled or Supervised Areas at WL, are individually monitored using TLDs. Additional dosimeters for neutron exposures are issued to individuals who may be exposed to neutrons in excess of 1 mSv in a year or where accidental neutron exposures are possible. Extremity dosimeters are worn for a defined job by a person who is likely to receive an extremity dose exceeding 1 mSv and significantly greater than a surface dose as monitored by their TLD, or if there is a reasonable probability that an extremity will be exposed to a beta and/or photon dose rate greater than 10 mSv/h.

WL employees and contractors who have a reasonable potential of internal radiation doses exceeding 1 mSv participate in an internal dose monitoring program. WL employs an internal dose monitoring program consisting of internal dosimetry field monitoring, routine bioassay monitoring of individuals and follow-up bioassay monitoring. The purpose of the monitoring program is to confirm workers are not receiving intakes of radioactivity resulting in a committed effective dose exceeding 1 mSv. When intakes, or potential intakes, have been identified, follow-up bioassay monitoring is perform to determine the level of intake and the evaluation and assignment of Committed Effective Dose (CED).

Annual Compliance Monitoring Reports present the data of radiation doses received by employees and contractors working at the WL site, including doses for CNL employees from other sites working at WL. According to WL ACMR 2018, during 2013 to 2018 [4-1] the doses received by workers remained consistently well below the regulatory allowable dose limits. This dose measure data during the period 2013 to 2018 is considered representative of the dose rates that will be received by employees at WL during future decommissioning work. Canadian Nuclear Laboratories will continue to implement the RP programs to ensure doses from future decommissioning activities are low, controlled and ALARA. Below is a brief summary of the doses measured during 2013 to 2018:

- There were no tritium exposures.
- There were no neutron exposures.
- There were no skin doses resulting from skin contamination.
- There were no internal exposures resulting in a CED exceeding 1 mSv.
- External whole body photon dose collective dose decreased from 80 to 40 person-mSv during the period 2013 to 2018.
- Average external whole body gamma dose per person ranged from 0.02-0.07 mSv with a maximum dose of 1.65 mSv (3.3% of the allowable regulatory limit).
- Average external surface photon plus beta (γ + β) doses ranged from 0.02-0.12 mSv with a maximum dose of 3.72 mSv (0.74% of the allowable regulatory limit).
- Average extremity dose per person ranged from 0.05-5.02 mSv with a maximum dose of 36.71 mSv (7.3% of the allowable regulatory limit).
- There was only one occasion where there was an identified internal intake to a worker which required follow-up dosimetry monitoring and evaluation of a CED. The evaluated internal dose was less than a CED of 1 mSv.

Dose estimates will be prepared and documented in facility-specific DDPs.

REDACTED

4.1.2 Facility Radiological Hazards

A large range of radiological activities were conducted at WL in support of the research and development programs. The most significant activities that contributed to the current residual hazards were the operation of WR-1, and the testing and post-irradiation examination of a wide variety of experimental fuels. These activities impacted the source term of all of the listed facilities. They also contributed to the source term of [redacted]/SF, the former Decontamination Centre (now decommissioned), the ALWTC, the buried active drainage piping, and to the residual contamination in the Affected Area from unplanned events.

The WR-1 reactor was shut down in 1985, terminating post-irradiation examination work for WR-1 fuel. The SF continued to examine irradiated fuel from offsite facilities until 1997. The last irradiation date from this fuel was in 1996. Therefore, short-lived radionuclides from the fuel cycle have decreased significantly or decayed completely. In addition, the easily mobilized hazards in [redacted] were addressed during the operational shutdown activities and the WR-1 mobile hazards were addressed during the first phase of decommissioning (completed in 1995).

The sources of radiological hazards associated with the routine operations and M&S activities at the WL site are:

- Solid low level, intermediate and high level radioactive waste.
- Low level and intermediate level liquid waste.
- Contaminated facility rooms, system components, and materials and equipment.
- Contaminated crawlspaces, lands and buried piping.
- Radioactive and contaminated samples.

The radiological hazards remaining in each WL facility and area are assessed in detail in the individual facility DDPs. A general description of the type and extent of hazards is provided below.

4.1.2.1 Shielded Facilities

The SF is one of the most significant radiological areas on the WL site and is operated in accordance with SF Facility Authorization [4-2] and Safety Analysis Report [4-3]. The radiological hazards associated with the current operation of the SF are summarized in the SF Safety Analysis Report [4-3] and WL ACMR 2018 [4-1]. Based on the radiological safety zone classification, the SF is CA-2 with Contamination Zone 2-5 and Radiation Zone 2-5 [4-4].

The most significant historical activities that contributed to the current radiological hazards in the SF included:

- Post-irradiation examinations of a wide variety of experimental fuels.
- Fuel channel sectioning and testing.
- Inspection and storage of fuel elements.
- Fuel reprocessing experiments and treatment and storage of the resulting liquid waste.
- Cementation of active liquid waste that resulted from the fuel reprocessing experiments.

These activities impacted the hot cells, warm cells (decommissioned), storage blocks (decommissioned), HCF decontamination vestibule and room, manipulator decontamination and repair facility, sampling stations, LLLW and ILLW drainage and collection systems, high level liquid waste drainage and collection systems (decommissioned), active ventilation system, and some areas of the crawlspaces.

REDACTED

Recent activities that also contributed to the current radiological hazards in the SF include:

- Handling and compaction of decommissioning waste.
- Decontamination of items, tools, boots/shoe covers, and respirators.
- Operation of WL Environmental Management laboratories.

The radiological hazards in the SF include potential exposure to alpha, beta and gamma emitting radionuclides typically associated with irradiated fuels and activated reactor components.

Sources of potential exposure include external gamma radiation from facility systems and storage areas, and both loose and fixed radioactive contamination during decontamination and dismantling activities. Contaminated soils also exist in the crawlspaces as a result of leakages from the active drainage systems.

4.1.2.2 Active Liquid Waste Treatment Centre

The ALWTC is a shutdown nuclear facility currently being decommissioned. The radiological hazards associated with the current operation of ALWTC are summarized in the WL ACMR 2018 [4-1]. Based on the radiation and contamination zone classification, the ALWTC is CA-2 with Contamination Zone 2-4 and Radiation Zone 2-3 [4-5].

The most significant radiological hazards associated with the ALWTC are the result of processing ILLW. Processing included collection, storage, concentration, and solidification of liquid effluent from the SF hot cells, warm cells, and manipulator wash-down facility, and water pumped out from ILW Bunkers [redacted] and [redacted] in the WMA. Other residual hazards are contained in the active ventilation and drainage systems for the LLLW and ILLW systems, their associated glove sampling boxes, and the LLLW system tanks. The building crawlspace also includes soil contaminated by leakage from the LLLW and ILLW process piping and systems.

The radiological hazards in the ALWTC include potential exposure to alpha, beta, and gamma emitting radionuclides typically associated with irradiated CANDU nuclear reactor fuels and activated reactor components. Any evaporated liquid waste residues that may be within, or on the surface of contaminated structures in the ILLW solidification room, are concentrated sources of radioactive material that originated from the WL HCF and pumped out water ingress from the WMA ILW bunkers.

Currently, the predominant contaminants are Cs-137 and Sr-90, which represent between 85% and 95% of the total activity of most WL waste streams. The Cs-137 is the primary external gamma radiation hazard. The predominant alpha emitter is Am-241 and, when present, the typical activity concentration is approximately 5% (LLLW) to 15% (ILLW) of the Cs-137 concentration.

4.1.2.3 Whiteshell Reactor-1

Whiteshell Reactor-1 is an organic-cooled, heavy water moderated (99.78% isotropic purity), vertical pressure tube, thermal neutron research reactor with an output rating of 60 MW (thermal). It was in operation from 1965 November until 1985 May when it was permanently shut down and defueled. Fuel used in WR-1 was enriched to 1-5% U-235 by weight. First phase of decommissioning started in 1989 and was completed in 1995 placing the reactor in a storage with surveillance operational state.

Following the completion of Phase 1 decommissioning, WR-1 was divided into two general access areas:

- WR-1 unrestricted access
- WR-1 restricted access

REDACTED

The WR-1 unrestricted access area consists of rooms that underwent decommissioning and decontamination under the Phase 1 decommissioning activities and had radiological hazards reduced to background or minimal levels (i.e., CA-2 with Contamination Zone 2-4 and Radiation Zone 2-3). This includes the majority of rooms on the 600 and 500 levels.

The WR-1 restricted access area is comprised of rooms that have not undergone any decommissioning activities or had remaining elevated radiological hazards following the completion of Phase 1 decommissioning. This includes rooms and areas on the 100 to 400 levels, and some rooms on the 500 to 600 levels. The restricted access areas of [redacted] are classified as Supervised Area with Contamination Zone 1 and Radiation Zone 1.

The main sources and mechanisms of radiological contamination and hazards expected to be present following the shut down and defueling of WR-1 are:

- Fuel failures resulting in the release of fission products and actinides to the Primary Heat Transport (PHT) system and/or experimental loops.
- Contaminated components due to contact with radioactivity transported through the PHT and heavy water moderator systems.
- Reactor rooms and materials that became contaminated as a result of spills or system leaks.
- Fuel handling and storage systems that became contaminated.

Activation products make up the vast majority of radioactivity remaining in WR-1, which are located within the reactor core, fuel channels, calandria and biological shield. Activation products of concern include C-14, Cl-36, Fe-55, Ni-63, Ni-59, Co-60, and Nb-94.

Mixed fission products (Cs-137 and Sr-90) and actinides (Am-241 and Pu) are the primary radionuclides of concern in the PHT system piping, tanks and rooms.

Tritium and C-14 are the primary radionuclides of concern in the heavy water moderator system.

REDACTED

4.1.2.4 Concrete Canister Storage Facility

The CCSF is a nuclear facility and operated in accordance with the requirements of the CCSF Facility Authorization [4-6] and Safety Analysis Report [4-7]. The radiological hazards associated with the current operation of CCSF are summarized in the CCSF Safety Analysis Report [4-7] and WL ACMR 2018 [4-1]. The CCSF is designated as a Radiological CA-2 for radiation protection.

The main radiological hazard present in the CCSF is external radiation levels due to the irradiated fuel bundles stored in concrete canisters. The fuel was sealed in baskets prior to emplacement in the canisters. The fuel baskets were sealed in the WL hot cells and then loaded remotely using a transfer flask. During fuel transfers some loose contamination remained on the exterior of the fuel baskets. These baskets are stored within the inner liner of the concrete canisters and the canisters are sealed from the environment.

4.1.2.5 Waste Management Area

The WMA is designed to provide safe storage for radioactive, hazardous, and mixed wastes originating from the operation of nuclear facilities and laboratories, and from decommissioning activities at the WL site.

The WMA is operated in accordance with requirements of the WMA Facility Authorization [4-8] and the WMA Safety Analysis Report [4-9]. The radiological hazards associated with the current operation of WMA are

summarized in the WMA Safety Analysis Report [4-9] and WL ACMR 2018 [4-1]. The WL WMA is CA-2 with Contamination Zone 1-3 and Radiation Zone 1-3.

The hazards present in the WMA cover the entire range of radiation hazards from the nuclear fuel cycle, since all wastes produced from site research and support activities are stored in the facility. Key hazards are:

- Irradiated fuel stored in standpipes.
- Active liquid waste stored in underground storage tanks.
- LLW/ILW stored throughout the area.

4.1.2.5.1 Standpipes Area

The Standpipes Area is designated as a Radiological Safety Zone 2 (Radiation Zone 2 and Contamination Zone 2) [4-10]. The Standpipes Area "Protected Area" was expanded and now encompasses both the standpipes and the ILW bunkers. Average accessible whole-body dose rates within the area are in the range of <0.1 to 0.2 mrem/h with elevated radiation fields existing at two standpipe locations. Accessible areas are generally free of removable surface contamination, but there is some potential for encountering contaminated soil within the Standpipes Area.

Based on the presence or absence of fissionable materials, the standpipes are of two types, Fissionable Materials Bearing Standpipes (FMBS) and Non Fissionable Materials Bearing Standpipes (NFMBS). The primary radionuclides of concern in the FMBS are mixed fission products (Cs-137, Sr-90 as beta-gamma contamination) and actinides (Am-241, Pu as alpha contamination hazards). In the case of NFMBS, Cs-137 is the single most dominant radionuclide contributor to the external dose.

4.1.2.5.2 Intermediate Level Waste Bunkers, [redacted] and Amine Tanks

The most significant radiological hazards associated with the ILW bunkers are the emplaced wastes, which primarily originated from the SF hot cells, WR-1, ALWTC, [redacted] high hazard laboratories, and some external sources [4-11]. The ILW Bunkers [redacted] to [redacted] are unlined and were not designed to be sealed water tight so the internal surfaces will also contain significant contamination from the emplaced wastes. Four of these bunkers are known to be fully saturated with water. These wastes contain radionuclide inventories consisting primarily of mixed fission products (Cs-137, Sr-90) and actinides (Am-241, Pu). Cs-137 is the primary source of external gamma radiation hazard. Intermediate Level Waste Bunker [redacted] currently contains cemented Thorium Fuel Reprocessing Experiments (TFRE) and Amine waste in specially designed 110 L drums.

For [redacted] Amine tanks, and vaults, only tank [redacted] presents a significant hazard as it is expected to contain a relatively small volume of diluted High Level Liquid Waste (HLLW), and, possibly, precipitate.

4.1.2.5.3 Low Level Waste Liabilities

Table 4-2 lists the sources of LLW along with a brief description of radiological hazards present within the WL WMA [4-12].

REDACTED

Table 4-2 Low Level Waste Liabilities

Building/Structure	Radiological Hazard Description
Main Entrance ([redacted])	Minimal amounts of radiological contaminants in the structure and grounds.
LLW Processing Building ([redacted])	Above-ground metal structure has minimal amounts of radiological contamination. It also contains mixed fission products and actinides surface contamination.
LLW Storage Bunkers (LLW-[redacted] to LLW-[redacted])	The bunkers contain radioactive bagged waste, radioactive bulk materials, radioactive scrap metal waste, contaminated ground materials, and radioactive concrete waste.
LLW Storage Quonsets ([redacted])	These buildings contain various waste materials for short to longer term interim storage. This may include sources slated for disposal, ILLW totes, contaminated ground materials, radioactive scrap metal, radioactive bulk materials and surplus sealed radiation sources.
Storage Building ([redacted])	The building housed a baling machine that was used to reduce the volume of LLW bags into compacted bales that were then placed in the LLW storage bunkers. Therefore, it may have become contaminated.
LLW Trenches ([redacted])	These contain LLW and are located to a depth of 4 m below ground-surface and 1 to 2 m below the water table. The dominant radionuclides of concern include mixed fission products (Sr-90, Cs-137) and actinides (Am-241, Pu), activated WR-1 fuel channels (Co-60, Nb-94 gamma emitters) and Tc-99 waste.
SMAGS ([redacted])/Cask Loading Facility	This was a storage building for prepackaged and sealed waste. It is in the process of being emptied of waste and will be converted to a Cask Loading Facility needed for decommissioning.

REDACTED

4.1.2.6 Research and Development Facilities Complex ([redacted])

The facilities and laboratories within [redacted] provided space for a wide range of radiological and non-radiological work including experiments, post-irradiation examinations, radiotracer studies, chemical analysis, and storage of radioactive sources and materials [4-13]. This work was done in support of the NFWMP, Reactor Development Programs, Decommissioning and Waste Management (D&WM), and WL site engineering/environmental monitoring programs and activities.

The most significant radiological hazards associated with [redacted] were the result of work performed in the radioisotope laboratories. This included experiments using short and long lived radionuclides.

[redacted] includes current and historical Radiological Safety Zone Classifications 1 through 4. Most of the radiological hazards in [redacted] have been decommissioned/remediated.

4.1.2.7 Health and Safety Facilities ([redacted] and [redacted])

[redacted] houses the Environmental Monitoring Laboratory Complex, dosimetry lab and whole-body counter, gamma calibrator room and offices for WL staff. The Environmental Monitoring Laboratory Complex is designated a CA-1 and is comprised of environmental and low level radioactivity analytical labs, with Contamination Zone 1-2 and Radiation Zone 1-2.

[redacted] is a CA-1 which houses a Cs-137 gamma source calibrator used for the calibration of radiation protection survey meters and dosimeters. The calibrator is a J.L. Shepherd & Associates Model 81 20 Ci (740 GBq) Cs-137 source gamma calibrator (activity as of 1991 March). This room was originally built as a safety storage vault. Its inner dimensions are 3 m x 3 m x 2.7 m high. The concrete walls are 30 cm thick. The calibrator is operated remotely at a control panel located outside the room near the entrance door. It is equipped with an interlock system, which will not allow the calibrator to be operated when the door is open and will cause the source to drop down into its shielding if the door is opened during operation.

The remainder of [redacted] is a Supervised Area where historical rooms and labs were re-purposed and are now being used as office space.

[redacted] housed an electron accelerator and a Co-60 gamma cell operated by Acsion Industries under a separate licence issued to Acsion by the CNSC. The accelerator was dismantled and removed in 2017 and the space turned back to CNL.

4.1.2.8 Underground Active Drain System

The expected radionuclides in the active drain lines include mixed fission products (Sr-90, Cs-137) and actinides (Am-241, Pu).

4.1.2.9 Storm Drain System

The section of the storm drain south of [redacted] that was contaminated as a result of the spill in 1980 contains low levels of mixed fission products (Sr-90, Cs-137) and actinides (Am-241, Pu). There is some sludge residue in this section of the drain that may have higher levels of contamination.

4.1.2.10 Sewage System

The sewage lagoon does have low levels of contamination in the sludge, primarily Cs-137 (<1 Bq/g), suggesting that some sludge residue in the sewage line may also have some residual radioactivity. Flushing the lines should minimize or eliminate this potential for residual radioactivity.

4.1.2.11 Affected Lands

The spill area near [redacted] and the areas around the WMA fence contain radionuclides (Cs-137 and Sr-90) at levels above the unconditional clearance levels. The area near the SF (IFTF), and other grounds areas/roadways are considered as having potential for contamination.

4.1.2.12 Sewage Lagoon

Sewage lagoon sediment has very low levels of contamination, less than 1 Bq/g for Cs-137 and trace quantities of Co-60. Samples collected from both the primary and secondary cells of the sewage lagoon showed the

REDACTED

presence of progeny of naturally occurring Th-232 (Ac-228, Bi-212, Pb-212 and Tl-208) and U-238 (Bi-214 and Pb-214).

4.1.2.13 Landfill

The landfill does not have radiological conditions above Radiation Zone 1 criteria. The radiological levels near the landfill are below the CNSC unconditional clearance limit of 0.1 Bq/g [4-14]. The water in adjacent ponds is also below the Canadian drinking water limits for Cs-137, Sr-90 and naturally occurring uranium and its progeny (0.05 Bq/L) [4-15].

4.1.2.14 Cesium Ponds

These ponds were developed to study the distribution of dose received by organisms living at the water-mud interface. 18.5 GBq of Cs-137 were injected into the pond in the 1960s. As much as 6.7 GBq of Cs-137 was distributed in the pond sediment and around the pond. This area was decommissioned as per [4-16].

4.1.3 Chemical Hazards

The chemical hazards that exist at the WL site are due to previous operations, current operations, and ongoing decommissioning activities. These chemical hazards include lead based paint surfaces, lead blocks used for shielding, friable and non-friable Asbestos Containing Materials (ACMs) (includes pipe lagging and floor tiles), mercury contained in instrumental panel switches and fluorescent tubes, and Polychlorinated Biphenyls (PCBs) in fluorescent light fixture ballasts. Due to the age of the facilities/buildings/structures, small amounts of PCBs could also be present in other building materials such as oil-based paints and joint-compounds (sealants, caulking, etc.). Some buildings/facilities also contain ozone depleting materials, pyrophoric materials, resins, organic materials such as solvents, hydrocarbons, organic coolants, Amines, etc., inorganic materials such as boron, beryllium, salts, bases, acids, sulphur compounds, cyanides, etc., and research chemical carcinogens. Table 4-3 provides a brief summary of chemical hazards along with their locations which are currently or were present in the WL site.

REDACTED

Table 4-3 Chemical Hazards at the Whiteshell Laboratories Site

Facility/Building/Structure	Chemical Hazards
Shielded Facilities	• ACMs • PCBs in paint and fluorescent light ballasts • Metals: mercury, lead (paint and solid form)
Active Liquid Waste Treatment Centre: [redacted]	• ACMs, • Metals: mercury • Compressed gases • Research chemical carcinogens • Organic materials such oils, glycols, solvents • Fluorescent tubes

Facility/Building/Structure	Chemical Hazards
Whiteshell Reactor-1: [redacted]	• ACMs • PCBs in paint and fluorescent light ballasts • Metals: mercury, lead (paint and solid form), palladium, platinum • Organic materials such as hydrogenated terphenyl, xylene • Inorganic materials: MgO, KOH, boron, gadolinium nitrate • Ozone depleting substances
Concrete Canister Storage Facility	• None
Waste Management Area: Standpipes Area	• Inorganic materials: nitric acid, sulfur compounds, cyanide, cesium-chloride compounds • Organic Materials: 2-ethyl-1-hexanol
Waste Management Area: ILW Bunkers, [redacted] and Amine Tanks	• PCBs in paint and fluorescent light ballasts • Inorganic materials: beryllium, cyanide, arsenic chemicals, acidic and neutralized solutions • Metals: mercury, lead • Organic materials: amine solutions, solvents • Pyrophoric material
Waste Management Area: LLW Liabilities	• ACMs • Metals: mercury, lead • Organic materials: reactor coolant, (HB-40), solvents and other hydrocarbons • Inorganic materials: DDT, arsenic, beryllium
[redacted]	• ACMs • PCBs • Metals: mercury, lead (paint and solid) • Inorganic materials: beryllium • Research chemical carcinogens
[redacted] and [redacted]	• ACMs • PCBs • Metals: mercury, lead (paint)

REDACTED

Facility/Building/Structure	Chemical Hazards
WL Licensed Site Supporting and General Infrastructure: North-Side Buildings	• ACMs • PCBs • Metals: mercury, lead • Organic materials: hydrocarbons • Ozone Depleting Substances (ODSs)
WL Licensed Site Supporting and General Infrastructure: South-Side Buildings	• ACMs • PCBs • Metals: mercury, lead (paint)
WL Licensed Site Supporting and General Infrastructure : Outer Area Buildings and Facilities	• ACMs • PCBs in ballasts • Metals: mercury, lead (paint and solid form), copper (wiring and piping), galvanized steel, zinc coated fencing
WL Licensed Site Supporting and General Infrastructure : Site Services	• ACMs • PCBs • Metals: mercury, lead • Organic materials: glycol and other fluid additives
WL Licensed Site Supporting and General Infrastructure : Site Affected Lands and Contaminated Structures	• ACMs • PCBs • Metals: mercury, lead

REDACTED

4.1.4 Industrial Hazards

The WL site has both operational and non-operational facilities. The non-operational facilities are under a M&S phase. Furthermore, the WL site has ongoing decommissioning activities. Industrial hazards are associated with operations, M&S and decommissioning activities. To ensure the safety of the workers during all these activities, all relevant industrial hazards are identified, evaluated, and mitigation measures proposed and implemented through work plans and lower level planning documents. Section 4.2.3 lists the industrial safety hazards that are associated with routine and non-routine operations as well as decommissioning activities.

4.1.5 Biological Hazards

Currently, there are no biological hazards present at the WL site, however, sewage in the sewage system could potentially contain biological hazards. Therefore, whenever work is performed on the sewage system, precautionary and safety measures will be implemented to prevent release of these sewage based biological hazards to the environment and exposure of workers. As a part of routine operations and M&S, CNL will

continue to perform proper housekeeping, planning, and preparation so that the growth of biological hazards should be prevented. On discovery of any biological hazard, CNL will act promptly and safely to remove it.

4.1.6 Environmental Hazards

A complete list of the environmental hazards is provided in Table 5-5 (Radiological Hazards) and Table 5-6 (Non-radiological Hazards) of the WL Environmental Monitoring Plan [4-17]. Some of them are:

- Tritium
- Carbon-14
- Gross Alpha (Am-241, Pu-238, Pu-239, and Pu-240)
- Gross Beta (Sr-90 and Cs-137)
- Halocarbon
- Greenhouse Gas Emissions

4.1.6.1 Environmental Emissions

The WL monitoring program will meet the standards set out in CSA N288.4-10 (by 2020 January) [4-18]. The WL ACMR 2018 provides the details of the current environmental emissions at the WL site [4-1].

The primary source of liquid radioactive effluents is the process water outflow (Outfall), which discharges continuously to the Winnipeg River. The discharge from the Outfall is composed of storm water runoff from paved roadways or around buildings, cooling water used in process facilities, and holding tank discharges including those from the new active liquid waste treatment system tanks based in [redacted] and [redacted] The average emissions for the past six years (2013-2018) for the WL site continue to be very small, below 0.0003% of the Derived Release Limit (DRL) for air emissions and 1.0% of the DRL for liquids.

The non-radiological effluent monitoring program established by CNL continues to supply valuable information about the potential impacts of operations on the Winnipeg River, and thus the local environment. The results of the monitoring program demonstrate that controls for the release of potentially hazardous substances currently in place at WL continue to provide substantial protection of the environment.

4.1.6.2 Wastewater

The WL monitoring program also meets the regulations set out in the Federal Wastewater Systems Effluent Regulations [4-19].

According to WL ACMR 2018 [4-1], the results of federally regulated parameters for the wastewater discharge were below the regulatory limits. The results are given below:

- Carbonaceous Biochemical Oxygen Demand - annual volume weighted average was 17.7 mg/L (Regulatory limit = 25 mg/L limit).
- Total Suspended Solids - annual volume weighted average was 3.8 mg/L (Regulatory limit = 25 mg/L limit).
- Un-ionized Ammonia - the maximum concentration was 0.0097 mg/L (Regulatory limit = 1.25 mg/L limit).
- Total Residual Chlorine - annual volume weighted average was 0.018 mg/L (Regulatory limit = 0.020 mg/L limit. This limit is not in force until 2021).

REDACTED

The site's chlorination practices have been adjusted over the last few years, with the result that the 2018 effluent from the lagoon (0.018 mg/L) was below the proposed limit (0.020 mg/L).

The Lagoon collects sanitary and wastewater from most buildings on the site, as well as from the laundry facility. Lagoon water residence time is more than three months, to allow for biodegradation and settling. Prior to each planned discharge, the secondary cell is isolated, and tested for a series of non-radiological parameters which include Carbonaceous Biochemical Oxygen Demand, fecal and total coliform bacteria, and acute lethality (a biological assessment on the survivability of trout in the proposed effluent). If these are acceptable, the accumulated contents of the secondary cell only are released to the Winnipeg River via a small drainage ditch leaving the Lagoon's north side.

4.2 Facility Future Hazards due to Decommissioning

The future hazards are those that are anticipated during decommissioning activities and include:

- Radiological hazards
- Non-radiological hazards (chemical, industrial, biological and environmental hazards)

In order to prevent, control and/or mitigate the potential risks anticipated from both radiological and non-radiological hazards, CNL will take appropriate actions during the execution of the decommissioning activities, which include decontamination, dismantlement, demolition, and remediation. These actions will be documented in the DDPs and associated work plans.

To reduce the future hazards, prior to the commencement of demolition activities:

- All stored radiological and hazardous wastes will be removed from each facility where practicable.
- Buildings, structures, systems, and components will be decontaminated to the extent feasible to remove both loose and fixed radiological and/or hazardous contaminations.
- All service supplies such as air, water and electricity will be disconnected.

Comprehensive and systematic survey results of radiological and other potentially hazardous conditions, including identification and description of the remaining significant gaps or uncertainties in the measurement or prediction of such conditions, will be provided in the individual facility DDPs. During the development of individual facility DDPs, using a graded approach, safety assessments will also be performed to identify potential hazards to workers and the public from both routine decommissioning activities and credible accidents during decommissioning. The assessments will identify the methods for mitigating the risks associated with the potential hazards. The assessments will also address the residual risks to the public, if any, after decommissioning is completed.

4.2.1 Radiological Hazards

Currently, the radiological hazards at the WL site are located in the nuclear buildings (SF, ALWTC, WR-1, CCSF and WMA), auxiliary operating facilities ([redacted] and [redacted]), and some of the areas of the Whiteshell Licensed Site Supporting and General Infrastructure (drain systems, sewage lagoon, landfill, and affected lands). The details are provided in Section 4.1.2 of this document.

As a part of the decommissioning planning and execution for nuclear buildings, all stored waste will be removed, active systems and components removed, and building surfaces decontaminated to allow full or

REDACTED

partial radiological release of the building for demolition or to safe levels for open air building demolition. The following internal and external radiological hazards may be present during decommissioning activities.

- Gamma and beta radiation dose rates from:
  - Radioactive and contaminated systems, components and surfaces in building rooms;
  - Radiation sources and devices; and
  - LLW and ILW waste packages and containers.
- Loose surface contamination on:
  - Room floors, walls and material and equipment;
  - Internal contamination within closed systems; and
  - Tools and equipment used for system removal, dismantling and decontamination during the decommissioning work.
- Airborne and loose contamination generated during the:
  - Removal, volume reduction, and waste packaging of active systems and components (e.g., piping, tanks, fume hoods, ventilation ducting);
  - Decontamination of building surfaces;
  - Demolition of buildings and waste packaging; and
  - Remediation of contaminated lands, underground piping, structures and waste trenches.

Radiological hazard mitigating measures are listed in Table 4-4.

REDACTED

Table 4-4 Radiological Hazards and Mitigation Measures

Hazard	Mitigation Measures
Radiation	• Radiation source term reduction • Radiation surveys and monitoring • Time, distance and shielding • Dose and dose rate constraints – alert and back-out points • Dose tracking using personal alarming dosimeters and finger dosimeters
Contamination	• Decontamination – High Efficiency Particulate Air (HEPA) vacuum, mopping, decontamination gel, concrete scabbling and shaving equipment • Fixatives or immobilization agents • Water misting • Portable HEPA filtered ventilation units • Ventilated enclosures and containment • Glove bags • Personal Protective Equipment and Clothing (PPE&C): full body suits, gloves, shoe covers and respirators • Airborne contamination monitoring • Contamination monitoring of workplaces, tools and equipment, and workers • Internal dosimetry bioassay monitoring of workers

REDACTED

4.2.2 Chemical Hazards

Currently, the chemical hazards present at the WL site include asbestos, PCBs, metals such mercury and lead, organic and inorganic materials, resins, and ozone depleting substances (see Section 4.1.3 for details). Although most of these chemical hazards will be removed as a part of the hazard reduction campaign and decontamination activities, some hazardous waste will remain and become part of the decommissioning waste. Therefore, based on the level of hazards, decommissioning workers will handle the hazardous waste in accordance with the relevant Provincial codes and standards.

Most likely the following chemical hazards are expected during decommissioning activities:

- Cleaning agents used for decontamination work.
- Concrete dust generated due to dismantling work.
- Silica dust from vehicle traffic on gravel roads.
- Airborne asbestos due to dismantling work.
- Airborne lead due to grinding of material covered with lead based paints.

The mitigation measures for these chemical hazards will be put in place to ensure that the workers, the public and the environment are fully protected during decommissioning activities.

4.2.3 Industrial Hazards

Industrial hazards at WL will be typical of a decommissioning and demolition project. Examples of such hazards that may occur while decommissioning and demolition of the buildings, structures, systems, and components at the WL site are listed along with their mitigation measures in Table 4-5. Mitigation measures are outlined in OSH program documentation [4-20] [4-21]. Many of these industrial hazards are also relevant to routine and non-routine operations and M&S phase of the WL site.

Table 4-5 Industrial Hazards and Mitigation Measures

Hazard	Mitigation Measures
Sharp Objects Cuts, Puncture and Abrasions Cutting: Dust	• Specify the Cut/Puncture Protection Level of glove or sleeve required based on the anticipated degree of cut/puncture hazard. • Plan and control work using work plans and other lower level planning document. • Workers to wear protective clothing, including appropriate gloves during material handling as per requirements identified. • Wetting or misting techniques.
Fire	• Comply with CNL Fire Protection Screening and Fire Safety Clearance requirements, if applicable.
Slip, Trip and Fall	• Maintain proper housekeeping throughout work phases to minimize slip/trip and fall hazards. • Route any temporary electrical or pneumatic cords to minimize slip/trip and fall hazards. • Follow working at heights procedures. • Follow designated walking routes. • Plan and control work using work plans and other lower level planning document.
Ergonomics (Sprains, Strains and Pinch Points)	• Walk down task to consider ergonomics prior to start of work. • Use mechanical means to move material whenever feasible. • Wear appropriate gloves during material handling. • Keep hands clear of potential pinch points. • Use proper lifting techniques. • Beware of uneven walking surfaces. • The maximum recommended weight limit to be lifted per person is 22 kg.

REDACTED

Hazard	Mitigation Measures
Excavation (Cave-ins, Underground Services and Overhead Power Lines, etc.)	• Maintain Limits of Approach. • Follow excavation procedures. • Plan and control work using work plans and other lower level planning document.
Confined Space Entry	• Assess, plan, and control of work in accordance with confined space procedures. • Identify and address any unique aspects of confined space in the applicable characterization work plans.
Heavy Equipment (Backhoe or Excavator)	• Assign/use trained spotters to guide heavy equipment and vehicles reversing. • Establish a traffic control plan to allow a drive through vehicle flow wherever possible. • Establish safe work areas to limit and control access. • Plan and control work using work plans and other lower level planning documents. • Move heavy items using pallet trucks, forklifts, hoist and cranes. • Assign only qualified personnel to complete all hoisting and rigging activities.
Hazardous Energy (Electrical, Pneumatic, Steam, etc.)	• Isolate equipment, if required. • Plan and conduct work in accordance with Digging, Drilling, Cutting and Coring procedures. • Control electrical work according to hazardous energy procedures.
Environmental Conditions (e.g., Wind, Rain, Snow, Extreme Temperatures, Poor Lighting, etc.)	• Schedule/reschedule work to avoid periods of extreme weather conditions.
Power Tool Injuries	• Use power tools in accordance with procedures.
Motor Vehicle Accidents	• Establish/use a traffic control plan to allow a safe drive through vehicle flow wherever possible and to delineate a construction zone. • Establish safe work areas to control access.

REDACTED

4.2.4 Biological Hazards

Biological hazards during decommissioning that can be present at WL include:

- Mould.
- Sewage based biological hazards include funguses, parasites, and viruses.
- Stings and bites from insects, rodents, birds, or other animals that might live or nest inside accessible buildings.
- Toxins and antigens produced by moulds and other fungi that might grow on surfaces (particularly those made of wood or other biological materials).
- Infections or adverse reactions resulting from exposure to organisms living in decaying biological material (such as carcasses, droppings and animal feces), or their by-products.
- Poisonous plants/weeds.

The mitigation measures of these biological hazards are given in Table 4-6.

These biological hazards will not have any significant effect on the type and quantity of the waste that will be generated during decommissioning and demolition activities.

Table 4-6 Biological Hazards and Mitigation Measures

Potential Biological Hazards	Mitigation Measures
Mould	• Use PPE&C • Pack and dispose according to the hazardous cleaning agent used during mould remediation
Sewage based	• Use PPE&C
Stings and bites	• Use PPE&C • Use insect repellent, if required
Organisms living in decaying biological material or their by-products	• Use PPE&C • Ensure Housekeeping
Poisonous plants/weeds	• Use PPE&C • Ensure Housekeeping

REDACTED

4.2.5 Environmental Hazards

The potential environmental hazards during decommissioning and demolition activities will be similar to those that are currently present at the WL site (see Section 4.1.6). Additional environmental hazards that may result from the decommissioning activities are dust, airborne contamination (radiological and chemical), and noise. Note that continuous air monitoring for dust during demolition is a requirement.

To minimize the release of both radiological and chemical hazards to the environment, all stored waste will be removed and each facility, building, structure, and equipment will be decontaminated or contamination fixed in place before the onset of the demolition activities, where practicable. Furthermore, surveys will be

conducted to make sure that the residual contamination levels are not higher than the maximum values for unrestricted use, where practicable. The dust management will include use of dust suppression agents such as water, wind fences/screens, HEPA filtration and temporary ventilated enclosures. If required, best practices will be used for noise management, such as limiting hours of operation of noisy work, using best available technology to limit noise by the use of quiet equipment, setting noise levels for work and/or using noise barriers.

Residual contamination may be released to the external environment because of the decommissioning activities, and abnormal weather conditions such as high wind and heavy rains. Administrative control measures will be put in place to mitigate the risks associated with the dust, airborne contamination and noise. Furthermore, the implementation of the effluent monitoring will make sure that the air and water quality remain acceptable and meet the regulatory requirements.

4.3 Nuclear Criticality Control

Following the permanent shutdown of WR-1 in 1985, all irradiated fuel bundles were removed from the reactor and stored in Fuel Bays. In 1993, the spent fuel bundles were removed from the Fuel Bays and transferred to dry storage at the CCSF (see Section 4.1.2.4). The restrictions about the spent fuel bundles are documented in the Criticality Safety Document of CCSF. These restrictions will remain applicable until the spent fuel is removed and CCSF is fully decommissioned.

The standpipes are non-operational (Passive Storage) structures located within a criticality controlled area at the WMA. Irradiated and un-irradiated fissionable materials, after handling and/or destructive testing, were originally placed in the concrete standpipes and for criticality control the following restrictions were implemented:

a. For enrichments of 5 wt% or greater, no more than 350 g U 235 shall be placed in one standpipe.
b. For enrichments less than 5 wt%, no more than 800 g U-235 shall be placed in one standpipe.
c. No more than a combined total of 200 g of separated Pu and U-233 shall be placed in one standpipe. For criticality purposes, the Pu buildup in unprocessed, irradiated U fuel will not be included in this total.
d. No mass limit shall be applied to Th alone. Limits shall be applied to the U content of unirradiated U+Th mixtures. These limits will be:
   – For enrichments less than or equal to 5 wt% (U-235 in total U+Th), no more than 800 g U-235 shall be placed in one standpipe.
   – For enrichments greater than 5 wt% (U-235 in total U+Th), no more than 350 g U-235 shall be placed in one standpipe.
   – Irradiated U+Th mixtures shall be treated as described in Section 5 of reference [4-22].
e. If mixtures of the materials stated in a, b, c and d above are present in one standpipe, the lowest limit for those materials present will apply.
f. No mass limit shall be applied to natural U.
g. Moderators such as heavy water, beryllium, beryllium oxides or graphite (beyond strictly trace amounts) are not permitted in the standpipes. Hydrogen-bearing materials such as water, plastics, etc. are permitted.

As part of the WL decommissioning standpipe remediation planning process, detailed studies of all available records have determined that under the conservative approach of not crediting fuel burnup, eight standpipes

REDACTED

were historically loaded with amounts of fissionable materials in excess of the above limits. Safety arguments were presented in Section 4.4.1 of [4-23] to demonstrate that these standpipes are safely subcritical as loaded.

The above mentioned restrictions will remain applicable until the standpipes are fully decommissioned.

4.4 External Hazards

Severe external hazards include earthquake, tornado, flooding, forest fires, lightening, high winds, blizzards and ice storms.

The WL Emergency Preparedness Program considers radiological, non-radiological and public health emergencies, such as Severe Acute Respiratory Syndrome (SARS) and pandemics. The Program includes provisions for emergency call-out of key personnel, for an off-site Emergency Operations Centre (EOC) if the on-site EOC becomes untenable, and for the provision of longer term staff relief and provisions (food, fuel, etc.).

4.5 Unplanned Events

Unplanned events that may occur during decommissioning activities, radiological or otherwise, will be reported to line management, who will assess the events; categorize them according to their consequences; notify internal and external authorities (such as the CNSC), as required; investigate the cause; devise corrective actions; and ensure their implementation, in order to prevent recurrence.

4.6 References

The following references were current at the time of development of this DDP. Where a reference is to be complied with, ensure the latest revision is used.

[4-1] WL-00583-ACMR-2018, *Whiteshell Laboratories Annual Compliance Monitoring Report for 2018*, Revision 0, 2019 April.

[4-2] WLSF-00583-FA-001, *Facility Authorization for the Operation of the Shielded Facilities at Whiteshell Laboratories*, Revision 5, 2015 September.

[4-3] WLSF-03500-SAR-001, *Safety Analysis Report Whiteshell Laboratories Shielded Facilities*, Revision 4, 2015 September.

[4-4] WLDP-21400-DDP-001, *Whiteshell Laboratories Detailed Decommissioning Plan: Volume 2-Shielded Facilities*.

[4-5] WLDP-25400-DDP-001, *Whiteshell Laboratories Detailed Decommissioning Plan: Volume 5 – Active Liquid Waste Treatment Centre* [redacted].

[4-6] AECL-FA-22, *Facility Authorization for the Operation of the Concrete Canister Storage Facility at the Whiteshell Laboratories*, Revision 3, 1998 July.

[4-7] RC-983, *Whiteshell Laboratories Concrete Canister Storage Safety Analysis Report*, Revision 1, 2000 January.

[4-8] WLWMA-00583-FA-001, *Facility Authorization for the Operation of the Waste Management Area at the Whiteshell Laboratories*, Revision 3, 2015 December.

REDACTED

[4-9] WLWMA-508640-SAR-001, *Safety Analysis Report for the Whiteshell Laboratories Waste Management Area*, Revision 2, 2015 December.

[4-10] WLDP-36500-DDP-001, *Detailed Decommissioning Plan Volume 8-WMA Part 1: Standpipes Area*, Revision 2, 2015 December.

[4-11] WLDP-24900-DDP-001, *Detailed Decommissioning Plan Volume 8-WMA Part 2: Intermediate Level Waste Bunkers,* [redacted] *and Amine Tanks*, Revision 1, 2017 March.

[4-12] WLDP-24400-DDP-001, *Detailed Decommissioning Plan: Volume 8-WMA Part 3: Low Level Waste Liabilities*, Revision 3, 2018 March.

[4-13] WLDP-23500-DDP-001 (RC-2143-9), *Detailed Decommissioning Plan, Volume 9-*[redacted].

[4-14] NSRDR SOR/2000-207, *Nuclear Substances and Radiation Devices Regulations*.

[4-15] Health Canada, *Guidelines for Canadian Drinking Water Quality*.

[4-16] WLDP-35000-DDP-001, *Detailed Decommissioning Plan, Volume 12 – Whiteshell Laboratories Licensed Site Supporting and General Infrastructure – Part 5: Site Affected Lands and Contaminated Structures*.

[4-17] WL-509200-PLA-002, *WL Environmental Monitoring Plan*.

[4-18] CSA N288.4-10, *Environmental Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills*, Edition: 2, 2010 May 01.

[4-19] The Canada Gazette, Part I, Volume 144, No. 12, *Federal Wastewater System Effluent Regulations*, 2010 March 20.

[4-20] 900-510400-PDD-001, *Occupational Safety and Health*.

[4-21] 900-510400-PRD-001, *Occupational Safety and Health*.

[4-22] WNRE-9, *Guide for WNRE Criticality, Approvals*.

[4-23] WLWMA-123400-CSD-001, *Whiteshell Laboratories Waste Management Area (CSD-27)*, Revision 6, 2019 May.

REDACTED

5. DECOMMISSIONING APPROACH

The decommissioning approach and alternatives in this section are the ones that were presented in the original Overview DDP document [5-1], with notable changes below. The strategy and timeline for WL decommissioning changed with the restructuring of AECL, and the contract awarded to CNEA, which included the prompt decommissioning of the WL site (initially to complete decommissioning by 2024, subsequently revised to complete by 2027). This strategy and timeline (see Alternative 4 in Section 5.1.1.4 and the schedule in Section 9.2) includes the proposed ISD of the WR-1 reactor, which is currently going through the EA process, as well as shipping waste for licensed off-site storage/disposal (i.e., not waiting for a national repository for used fuel or other waste disposal). As mentioned, this section comes from [5-1], with the addition of Section 5.1.1.4 for Alternative 4, as well as Section 5.3.3.2 for the proposed ISD of WR-1.

5.1 Rationale for the WL Decommissioning Strategy

In 1997, AECL made a business decision to discontinue research programs and operations at WL. In 1998, the federal government concurred with AECL's decision to decommission WL. The shutdown and decommissioning of WL was planned to take into account a number of business objectives and operational and decommissioning constraints.

The business objectives for WL shutdown and decommissioning were to:

- ensure an orderly consolidation of all remaining CANDU programs so as not to jeopardize the CANDU business,
- continue to fulfill management responsibilities for the NFWMP until privatization or termination of the program occurs,
- minimize the operational costs for WL by aligning the WL site operational activities with the level of activity in the remaining programs, and
- fulfill the management responsibilities for the decommissioning program and provide operational support to the decommissioning program.

Following were the operational constraints:

- AECL's Reactor Safety Research program will continue to operate at WL until December 2003 which will require continued operations in three active area buildings,
- the NFWMP will continue to operate out of WL and/or the Underground Research Laboratory (URL) (subject to continued funding from Ontario Power Generation or other non-AECL sponsors) until an as yet undefined date and will require continued operations in one active area building ([redacted]),
- the WL WMA will need to continue as an operational facility for the initial decommissioning work to support the continuing AECL programs and to support the decommissioning of those buildings that are no longer required by AECL,
- AECL assets (including surplus buildings in the non-active area) not required for the continuing CANDU programs will be made available for commercialization purposes, and
- the public - particularly in Manitoba - will be given the opportunity to provide input to the Decommissioning Program. The mechanism for such input will be through the CEAA process.

Following were the decommissioning constraints:

- unavailability of waste disposal in Canada limits the decommissioning activity, when viewed from a risk/benefit perspective, to achieving and maintaining a secure M&S state for the nuclear facilities. Large scale removal of radioactive materials to an interim storage facility will result in increased operational dose due to the double handling of the waste, first to interim storage and then to final disposal; and
- the impact of interim waste management decisions on an initiative to establish a national radioactive waste management organization, with a current focus on used fuel, must also be considered in the WL decommissioning strategy. This development is in keeping with the federal radioactive waste policy framework.

While developing decommissioning strategy for WL site, it was ensured that a plan is in place for transition of the site from a nuclear operating state to a decommissioning state, and portion of the nuclear facilities and support facilities remain operational to support the decommissioning work.

The financial impacts of end state options were also factored to optimize WL Decommissioning Program. The implementation plan for the decommissioning program considered following key factors:

- identification, characterization and safety assessments for site hazards,
- development of detailed plans and procedures,

REDACTED

- waste management policy and structure which allows definition of a suitable end state, specifically, availability of waste disposal or suitable storage alternatives,
- satisfactory completion of the regulatory approvals process, including the environmental assessment process, and
- implementation and control of the decommissioning process.

These factors dictated the time frame required to achieve a final end state within which the WL Decommissioning Program.

According to CSA N294-09, a decommissioning strategy should be based on one or a combination of the following [5-2]:

- **Prompt decommissioning**, where the facility would be decontaminated and dismantled immediately after shut down.
- **Deferred decommissioning**, where the facility would be safely placed in a period of SWS to allow radiation levels to decay prior to decontamination and dismantlement.
- **In situ confinement**, where the facility would be placed in a safe and secure condition with the intention to abandon in-place.

Based on the Health, Safety, Security, Environment and Quality (HSSE&Q) considerations, AECL selected a combination of prompt decommissioning and deferred decommissioning. The CEAA process was followed and the Environment Minister made decision that the proposed Whiteshell Laboratories Decommissioning project is not likely to cause significant adverse effects, and that no further environment assessment by a review panel or mediation is warranted [5-3].

The WL Decommissioning Project encompasses five nuclear facilities, two auxiliary operating facilities and Whiteshell Licensed Site Supporting and General Infrastructure. Table 1-1 provides the information about the WL facilities, DDP volumes, End-State Reports completed by 2020 November, and the DDP or facility current status.

REDACTED

5.1.1 Decommissioning Alternatives

5.1.1.1 Alternative 1: Decommission the Site to a Final End State in a 20 Year Period (2020)

The intent of this alternative would be to decommission the site to a final end state in a period of 20 years. There would be sufficient time to meet the characterization, safety assessment and planning/approval requirements needed to implement the project work. It would allow for a complete assessment of the WL wastes, to differentiate the wastes which can be managed in situ at the site from those which will require removal to disposal or alternate storage.

However, to secure final end points, actions toward implementation of the waste policy and siting of waste disposal or alternate storage facilities would have to commence immediately. It is expected that to establish a national waste disposal policy, and to site and construct a facility fulfilling all the regulatory review requirements would take at least 10 years under the most optimistic approach. That would leave only 10 years to move wastes requiring relocation and establishing controls for those which can be safely managed in situ. If alternate storage were a component of the project implementation, transport and relocation of various waste volumes would need to be reassessed on a safety and environmental impacts basis. Although in theory, this option could be accomplished it presents substantial risks in terms of waste management

requirements which are outside the control of the WL program management. The actual timing and availability of disposal will be factored into future updates of the Decommissioning Plan, particularly in terms of any impacts on the planned schedules for decommissioning activities.

5.1.1.2 Alternative 2: Deferred Decommissioning With Completion in 100 Years (2100)

This alternative proposes decommissioning of Whiteshell Laboratories over as long a period as necessary to implement national waste disposal policies. The assumption is that the longest this process would take is 100 years. As in Alternative 1, the initial work would proceed by placing site facilities in a secure M&S state. It is likely that all waste disposal requirements can be optimized as part of the national program. Implementation would occur in three phases:

Phase 1 activities directed toward nuclear and radioisotope buildings and facilities to place them in a safe, secure, interim end state. The Van de Graaff Accelerator and the Neutron Generator will be completely decommissioned. Phase 1 would be completed in approximately 6 years.

Phase 2 regular M&S of all buildings and facilities; most project activity would be focused on WMA. Most waste management facilities will be placed in a passive operational state and interim processing, handling and storage facilities, required during M&S and decommissioning project activities, will be established. Phase 2 would be followed by a deferment period of approximately 45 years during which site M&S would be maintained.

Phase 3 activities directed to bringing the site to a final end state that will fulfill all pertinent regulatory and national policy requirements. Phase 3 would involve decommissioning to a final end-state within 100 years. The site would be decommissioned to an unrestricted release state except for some parts of the WMA which may be disposed of in situ. Infrastructure refurbishment and rebuilding would likely be required to maintain the facilities under M&S state for the 45 year deferment period and beyond, resulting in increased rubble during the final decommissioning.

The three phases of decommissioning activities will be followed by a period of institutional control where the performance of the remaining in situ disposal components are monitored and controlled. The institutional control activities are designed to demonstrate that the in situ components perform in the manner predicted in the related safety assessments and to ensure that there is no development or intrusion into affected areas until the hazards have been reduced to acceptable levels. For Whiteshell Laboratories, this period is expected to extend for approximately 200 years beyond the physical project work.

5.1.1.3 Alternative 3: Decommission the Site to a Final End State in a Phased Approach Over a Period 60 Years (2060)

This alternative has the advantage of presenting a feasible approach which is planned in accordance with project assumptions that disposal space for WL waste will be available in a disposal facility by 2025 for LLW and by 2050 for High Level Waste (HLW). This plan would meet all of the key factors required to secure a final decommissioning end state. It also achieves maximum cost efficiency since it capitalizes on existing engineered structures and building envelopes to control nuclear liabilities under M&S in the interim, and schedules final decommissioning for individual facilities based on the expected lifetime of the structures.

This is likely the optimal approach and is AECL's reference option for the WL site decommissioning program.

REDACTED

If off-site waste disposal becomes available earlier, all site facilities except those which provide radioactivity decay benefits (e.g., WR-1 and some WMA wastes) could be decommissioned earlier. On the other hand, should off-site waste disposal availability take longer than assumed, the contingency would be to revert to Alternative 2.

The work and scheduling planned for each phase under this option is described briefly below.

Phase 1 Decommissioning, will address the site Active Area research facilities and the support laboratories/facilities not required for the remaining AECL programs. The primary focus of the initial decommissioning work will be on a limited set of facilities, including Shielded Facilities (includes the Neutron Generator), Laboratories (includes the Van de Graaff Accelerator), Active Liquid Waste Treatment Center, Decontamination Center, and Active Area General - (e.g., underground services, operational impacts to the site).

The Van de Graaff accelerator and the Neutron Generator will be completely decommissioned. The other facilities will be decommissioned to a safe, secure M&S interim end state. Shutdown of the research programs will require operational processing of research materials. Examples include irradiated component samples, irradiated fuel samples and small volumes of active liquid waste currently stored within the nuclear facilities. The impacts of these shutdown operations and decommissioning activities on WM facilities will be assessed as part of Phase 1 activity. However, WM facilities will need to remain operational under the existing facility authorization structure. Completion of this phase will require about 6 years.

Phase 2 Decommissioning, will address the WM facilities with the objective of achieving a passive operational state. The Phase 2 work will also address the longer term planning for the management of the collected waste inventory including future options for consolidating wastes such as irradiated fuel at an alternate location. The research facilities will be maintained in a safe, secure M&S state throughout this phase which is expected to last about 10 years.

The incinerator facility will be decommissioned.

The retrieval, processing and relocation of HLW from standpipes would commence in approximately 2010, and bunkers and buildings will be placed in M&S.

Phase 3 The final phase will see a staged decommissioning of the site to a final end state that will fulfill all pertinent regulatory and national policy requirements. The timing and sequence of decommissioning actions on the remaining facilities will be determined largely by the actual availability of disposal facilities and by the age and condition of engineered structures and buildings.

REDACTED

Phase 3 targets for decommissioning of the significant remaining facilities/buildings are:

Active Area Infrastructure	Decommissioned to End state	2015
WMA	Bunkers and Buildings Waste Removal	2024
	Bunkers and Buildings Decommissioning	2030
	Trench Decommissioning	2025
	Implementation of Waste Trench In situ Disposal, Capping, Stabilization, Institutional Controls (waste removal/trench remediation where required)	2050
CCSF	Fuel Transferred to Disposal Facility	2050
	Decommissioning to End state	2055
ALWTC	Decommissioning to End state	2055
Decontamination Centre	Decommissioning to End state	2025
[redacted]	Decommissioning to End state	2030
Active Drainage System	Decommissioned to End state	2035
Shielded Facilities	Decommissioned to End state	2040
WR-1	Decommissioned to End state	2050

The three phases of decommissioning activities will be followed by a period of institutional control where the performance of the remaining in situ disposal components are monitored and controlled. The institutional control activities are designed to demonstrate that the in situ components perform in the manner predicted in the related safety assessments and to ensure that there is no development or intrusion into affected areas until the hazards have been reduced to acceptable levels. For WL, this period is expected to extend for approximately 200 years beyond the physical project work.

5.1.1.4 Alternative 4: Decommission the Site to a Final End-State in a Phased Approach Over a Period of ~27 Years (~2027)

This alternative is similar to Alternative 3 in Section 5.1.1.3, but without a waiting period for disposal facilities. This alternative presents a feasible approach which is planned in accordance with project assumptions that most of the waste generated by WL decommissioning project will be transferred to either the proposed Near Surface Disposal Facility (NSDF) or interim storage at CRL until disposal facilities become available.

Alternative 4 assumes that intermediate and high-level waste disposal facilities will not become available within the Alternative 3 decommissioning time frame. This creates a long term uncertainty and risk for the decommissioning project. A decision was made to commence full decommissioning of the site, including the WMA, with no deferment period. Low level, intermediate-level and high level radioactive waste will be packaged and characterized to allow for safe transport, receipt, and interim storage at CRL (or another

REDACTED

suitable licensed storage/disposal facility), and subsequent retrieval and placement into a final disposal facility.

An assessment on the potential impact of Alternative 4 compared with Alternative 3 (previously selected alternative) has been prepared to estimate the occupational dose consequences to workers [5-4]. The accelerated decommissioning dose is twice the deferred decommissioning dose as a result of not having radioactive decay from a 30 year decommissioning deferment period. The annual individual doses range from 1 to 2 mSv and up to a maximum of 3 to 5 mSv, and a total collective dose up to 400 person-mSv. Decommissioning the site under Alternative 4 will result in additional occupational dose at the CRL site from additional waste handling and storage with annual individual doses ranging from less than 0.5 mSv and not more than 3 mSv, and the total collective doses not exceeding 110 person-mSv. These doses are relatively low and are acceptable from an ALARA perspective. Annual individual doses are a low percentage (≤6% at CRL and ≤10% at WL) of the regulatory limit of 50 mSv for Nuclear Energy Workers. The estimated total collective doses (400 person-mSv) are below the CNSC ALARA assessment trigger guideline of 1,000 person-mSv [5-5].

The current detailed project schedule for the WL decommissioning activities for Alternative 4 is shown in Figure 9-1.

Safety assessments for all nuclear facilities/buildings will be performed to identify potential hazards to workers, the public and the environment from routine decommissioning activities and credible accidents during execution of their decommissioning activities and due to release of contaminants during the institutional control period, if disposed in situ. This information will also be summarized in the facility or building specific DDPs.

For the proposed in situ disposal of WR-1, an environmental assessment under CEAA 2012 shall demonstrate that the proposed decommissioning project will not likely cause significant adverse environmental effects. For the proposed in situ disposal of the LLW trenches in WMA, a safety case will be developed and submitted to the CNSC as per the Comprehensive Study Report [5-6].

Decommissioning activities will be followed by a period of institutional control where the performance of the remaining in situ disposal components (LLW trenches in WMA, proposed WR-1 Disposal Facility, and the Inactive Landfill/Asbestos Burial Pit Site) are monitored and controlled. The institutional control activities are designed to demonstrate that the in situ components perform in the manner predicted in the related safety assessments, and to ensure that there is no development or intrusion into affected areas until the hazards have been reduced to acceptable levels. The rationale for and duration of the institutional control periods will be provided in safety case or other documentation leading towards an institutional control licence, or through the Environmental Assessment for WR-1 ISD.

5.1.1.5 Preferred Decommissioning Approach

The main difference between the four alternative means of decommissioning the Whiteshell Laboratories is the time involved. The steps to completing decommissioning of the site and the proposed end-state are virtually the same for the four alternatives considered. It is understood that the public preference is for an early and complete decommissioning, that is, Alternative 1. That approach appears to have two limitations. One relates to the short period for deriving benefits from natural radioactive decay; the other to the unavailability of a site or facilities for disposal of radioactive wastes. Alternatives 2 and 3 offer longer time

REDACTED

frames to complete the project, allowing optimization of radioactivity decay (Figure 5-1 and Figure 5-2) and the avoidance of double handling by moving wastes directly to disposal facilities.

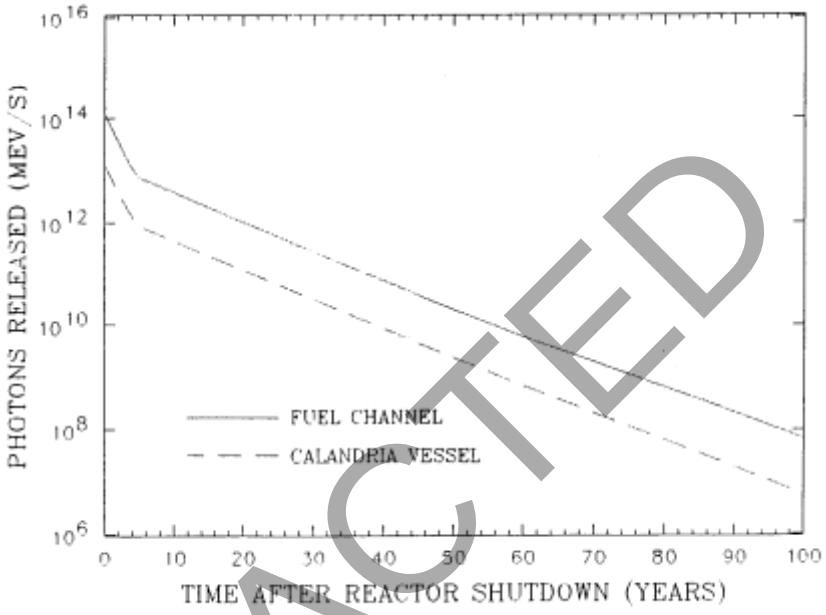


Figure 5-1 Decay Curves for the Steel Fuel Channels and the Steel Calandria Vessel (per kilogram)
(Reactor shutdown in 1985)

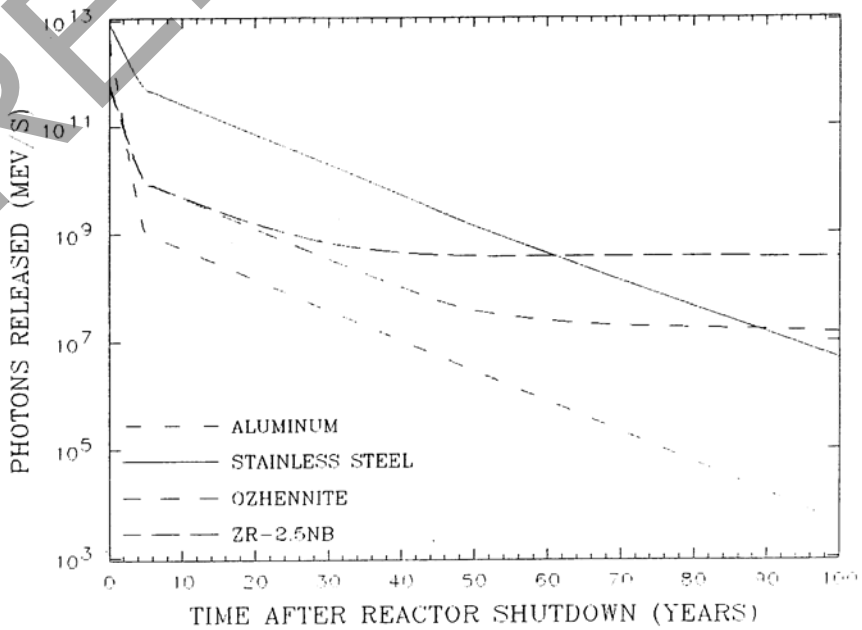


Figure 5-2 Decay Curves for the Fuel Channel and Calandria Tubes (per centimeter height)
(Reactor shutdown in 1985)

REDACTED

Handling of the highly radioactive materials places economic and safety limitations on the implementation of the decommissioning program. Although doable, removal of highly radioactive material prior to optimizing radioactive decay, dramatically increases the cost to maintain worker safety. The additional shielding and remote handling required is estimated to add between $40M and $80M to the reference project cost.

Similarly, the unavailability of disposal facilities impacts cost and worker safety. To provide interim storage space requires the construction of high integrity shielded facilities estimated to add between $20M and $40M to the reference cost of the decommissioning project. The double handling to move materials to disposal adds an additional $10M to $20M to the reference cost of the project and contributes to significant additional dose to workers.

The management of the irradiated fuel inventory currently stored in concrete canisters at Whiteshell Laboratories until disposal facilities become available also provides an economic benefit. The canister life safely extends to at least 2050. Although, handling equipment does exist to allow transfer to another location, the construction of replacement interim storage and the associated double handling would add approximately $20M to $30M to the reference project cost.

Alternative 3, (60 years) is the reference option and represents the baseline project cost.

Alternative 1 (20 years) would incur the highest overall additional cost to complete the project. Although the M&S cost (approximately $2M/a) would be lower by approximately $40M, the remote handling and interim storage costs would increase the reference project cost in the range of $90M to $170M for an overall increase of between $50M and $130M.

Alternative 2 (100 years), would incur no additional cost for interim storage or remote handling beyond those already estimated in the reference option because there is limited benefit from additional radioactivity decay. However, the M&S costs (approximately $2M/a) would be higher by approximately $80M because of the increased project time frame. As well, most buildings housing nuclear facilities on the site would have exceeded their economic and structural life span and would require extensive replacement. This would add approximately $28M to overall project cost (estimated at about $2000/$m^2$ for the basic building footprint space of 14,000 m^2 occupied by nuclear facilities). The rebuilding would also increase the amount of waste which ultimately requires disposal. The cost of Alternative 2 is higher than the reference alternative by at least $108M. A cost comparison for the first three alternatives is presented in Table 5-1.

The first three alternatives involve virtually identical decommissioning steps. As a result, the main differences relate to overall project cost and the greater risk to worker health and safety associated with the dismantling of WR-1 before radioactivity levels have been lowered naturally over time.

REDACTED

Table 5-1 Comparison of Cost for Decommissioning Alternatives 1 to 3 [5-1]

Alternative	Time Frame (Years)	Base Cost ($M)	$M Reductions Provided by Option	$M Additional Costs of Option	$M Total Incremental Cost of Option
1	20	Reference project cost	-40	90 - 170	50 to 130
2	100	Reference project cost	0	108	108
3	60	Reference project cost	0	0	0

REDACTED

The foregoing discussion indicates that Alternative 3 provides the best worker dose optimization and is the lowest cost approach. This approach is summarized as follows:

1. The achievement of a M&S state for the site nuclear facilities within 6 years of project implementation.
2. Monitoring and surveillance of the nuclear facilities with decommissioning activities scheduled to coincide with the end of building structural life and the expected availability of national disposal facilities.
3. Movement of wastes only when off-site disposal is available or when safety in existing structures is compromised.
4. In situ management for selected LLW trenches in the WMA.

The decommissioning Alternatives 1 to 3 were evaluated in the previous overview DDP [5-1] and the Comprehensive Study Report [5-6]. These alternatives include a decommissioning deferment period with shut down, monitoring and surveillance until suitable radioactive waste disposal facilities becoming available in Canada and then site decommissioning being performed. Alternative 4 was proposed when AECL transitioned to a GoCo model with CNL established and a contractor hired to operate the WL site. Alternative 4 (Decommission the Site to a Final End State in a Phased Approach Over a Period 27 Years (2027)), was evaluated in a dose impact assessment [5-4]. This assessment provides the potential impact that Alternative 4 may have on occupational dose due to reduced radioactive decay, multiple decommissioning activities being performed concurrently, and additional waste handling and storage. The dose consequences associated with Alternative 4 are described in Section 5.1.1.4. In summary, the accelerated decommissioning dose is twice the deferred decommissioning as the result of not having radioactive decay from a 30 year decommissioning deferment period. Accelerated decommissioning will also result in additional occupational dose at the CRL site from additional waste handling and storage with individual doses ranging from less than 0.3 mSv to a maximum of 3 mSv and total collective doses not exceeding 110 person-mSv. These doses for accelerated decommissioning are relatively low and acceptable from an ALARA perspective.

5.1.2 Decommissioning Strategy

CNL's decommissioning strategy is based upon two fundamental characteristics of decommissioning work. First, that the decommissioning process does not begin until there is a clear intent to permanently retire a

facility, or a defined area, from service. Second, that decommissioning work can be phased and may be defined by stages with discrete end state where each end state may be followed by a period of surveillance where no decommissioning activities would be conducted. Therefore, once all ongoing operations cease then following strategy will be followed:

1. The facility will be placed in a safe and sustainable shut-down state, e.g., inventories are reduced, short-term risks and hazards are removed, M&S systems may be augmented. These actions will be taken under the provisions of the Facility Authorization by the Facility Authority responsible for operations.
2. The end state condition of the facility, the facility boundaries and monitoring/surveillance requirements will be documented in a facility turnover document which is submitted by the Facility Authority to the Facility Decommissioning Manager. Following acceptance of the turnover document by the Decommissioning Manager, the facility ownership will be transferred from the Facility Authority (Operator) to the Decommissioning Manager.
3. The facility will be maintained and monitored in its shutdown state either under the provisions of an approved M&S Plan or under the licence conditions for the decommissioning facility as listed in either. The licence conditions specify the responsibilities and requirements for the storage with surveillance stage. This stage will be maintained until such time as a decision is made to proceed to the next stage of decommissioning.
4. Completion of the decommissioning process to an agreed, defined end state will proceed through a series of staged actions, appropriate to each specific facility, that are designed to achieve a decreasing level of worker and public risk. Each stage will be approved by CNL through a detailed decommissioning plan. Each stage may be followed by a surveillance period and where a surveillance period is applied, appropriate end state documentation is prepared. Decisions on the scope and timing of each stage will be based upon an analysis of the relevant costs, benefits, risks and priorities.
5. The sequence of decommissioning actions or stages is defined in the conceptual decommissioning plan which is updated, as required, to keep it current throughout the life cycle of the decommissioning process.

The application of this strategy will be determined for each specific facility and documented in the facility's detailed decommissioning plan.

5.1.3 Implementation of the Preferred Decommissioning Approach

The proposed Whiteshell Laboratories Decommissioning Project (WLDP) was to be implemented through a phased approach preceded by operational shut down work, as per the original Overview DDP [5-1] (schedule is provided in Table 5-2). The activities planned in each phase were:

Phase 1 (approximately 5 years) – activities directed toward nuclear and radioisotope buildings and facilities to place them in a safe, secure, interim end state. The Van de Graaff Accelerator and the Neutron Generator will be completely decommissioned.

Phase 2 (approximately 10 years) – regular M&S of all buildings and facilities. Most project activity will be focussed on the WMA. Most waste management facilities will be placed in a passive operational state and interim processing, handling and storage facilities, required during M&S and decommissioning project activities, will be established.

REDACTED

Phase 3 (approximately 45 years) – activities directed to bringing the site to a final end state that will fulfil all pertinent regulatory and national policy requirements. The timing and sequence of decommissioning activities will be determined largely by the availability of disposal facilities and by the age and condition of engineered structures and buildings.

Following the completion of Phase 3, part of the site, namely, the WMA, will remain under institutional control for an additional 200 year period.

Preparatory work for the initial phase of decommissioning will be completed in parallel with the shutdown operations work as follows:

- preparation and submission of DDPs and Shutdown and Decontamination Plans for approval,
- preparation and submission of EA documentation including documentation of the results of the public consultation process,
- acceptance of the findings of the EA,
- on approval of DDP's transfer the listed facilities addressed in Phase 1 to the decommissioning section of the Site Decommissioning Licence structure,
- establish the licensing structures for the WM facilities (CCSF, WMA) which will remain in operation, and
- establish the licensing process for turning over general site buildings for commercialization.

At the time the implementation of Alternative 4 began in 2015 (at the time of transition to the GoCo model), the decommissioning project was part-way through these three phases, and proceeding through these distinct phases was abandoned, in essence moving straight in to Phase 3, on a different timescale.

REDACTED

Table 5-2 Whiteshell Laboratories Decommissioning Schedule (as per original Overview DDP [5-1])

Facility	Decommissioning Activity/State	Phase
Shielded Facilities	Operational - processing of high level liquid waste	Phase 1
	Decontamination	Phase 1
	Monitoring and surveillance	Phases 2 and 3
	Final Decommissioning	Phase 3
Active Liquid Waste Treatment Center	Part of facility remains operational through to Phase 3	Phase 1, 2 and 3
	Decommissioning of unused portion	Phase 1
	Monitoring and Surveillance	Phase 2
	Final Decommissioning	Phase 3
Concrete Canister Storage Facility	Operational	Phase 1
	Placed in a Passive Operational State	Phase 2
	Monitoring and Surveillance	Phase 2 and 3
	Final Decommissioning	Phase 3
Waste Management Area	Operational	Phase 1
	Define and operate remaining facility	Phase 2 and 3
	Storage of Monitoring and Surveillance wastes	Phase 2 and 3

Facility	Decommissioning Activity/State	Phase
	Recover and process stored waste from facilities requiring upgrading	Phase 2
	Placing retrieved waste into new upgraded facilities	Phase 2
	Transfer WMA storage facilities not required for Phase 2 activities to a passive operational state	Phase 2
	Monitoring and Surveillance in the Passive Operational State until wastes are removed to disposal facilities	Phase 3
	Maintain institutional controls until in situ waste is acceptable for unconditional release	Institutional control period
	Preparation and transfer of waste to disposal facilities	Phase 3
[redacted]	Decontamination and/or Fixation of Contamination	Phase 1
	Monitoring and Surveillance	Phase 2 and 3
	Final Decommissioning to an unrestricted release state	Phase 3
[redacted]	Operational throughout Phase 1 Decommissioning. Approach is dependent on the extent of continued commercial use of [redacted] beyond Phase 1	Phase 1
	Final decommissioning as early as the first part of Phase 2 (if commercialization is discontinued)	Phase 2
Non-Nuclear Buildings	An assessment will be made of the decommissioning of the general site service facilities by the end of Phase 1	Phase 1
	Final decommissioning	Phase 2 and 3
Inactive Landfill	Operational throughout Phases 1 and 2	Phase 1 and 2
	Development of a remediation plan	Phase 2
	Final Decommissioning	Towards the end of Phase 3
Sewage Lagoon	Operational throughout Phase 1 and 2	Phase 1 and 2
	Development of a remediation plan	Phase 2
	Final Decommissioning	Phase 3
Buried Services	Operational	First part of Phase 1
	Drains will be assessed, remediated and capped	Phase 1

REDACTED

Facility	Decommissioning Activity/State	Phase
	Monitoring and Surveillance	Phase 2
	Most systems, other than parts of the active drainage, will remain functional during Phase 2 Remediation of buried services and soil contamination associated with the active drainage system	Phase 2 and 3
Affected Lands	Surveying, assessing and developing remediation plans	Phase 1
	Monitoring and surveillance	Phase 2 and 3
	Remediation to levels acceptable for unrestricted release	Phase 3
River Sediments	Monitoring and surveillance	Phase 1, 2 and 3
	Re-evaluation to confirm final in situ end state	Phase 3
North Ditch	Identification of contamination above levels acceptable for unconditional release	Phase 1
	Preparation of a remediation plan	Phase 1
	Remediation if necessary	Early in Phase 2

REDACTED

5.1.4 Monitoring and Surveillance Approach

The primary objective of the Phase 1 work was to place the site in a M&S state. Radioactive contamination and sources were planned for removal or fixation to deliver a building/facility interim end state where any changes in condition would take place over an extended period and allow for detection through remote monitoring coupled with routine inspections. A central monitoring station was proposed for [redacted] to serve as the base of M&S and project operations. Key parameters such as building temperature, ventilation, leak detection, sump levels were identified as part of Phase 1 work to establish the monitoring functions. Periodic walk-throughs were scheduled for buildings/facilities in accordance with level of hazard remaining. The minimum inspection schedule for any building is semi-annually.

5.1.5 Building/Facility End-State Approach

Clearance levels for materials and equipment are established based on either surface contamination (e.g., Bq/cm^2) or volumetric contamination (e.g., Bq/g or Bq/kg). The clearance levels to be applied for materials and equipment that will be removed during the WL decommissioning activities are listed in Contamination Clearance Levels Used for WL Decommissioning [5-7]. The maximum allowable surface contamination levels for unrestricted use of materials, equipment and clothing are listed in Table A-3.

The decommissioning plan includes demolition of building structure to achieve a final end state. The rationale for the end state is based on survey and removal of radiological and non-radiological hazards to meet release criteria after which the building will be rubblized and removed. The foundation and building footprint will be

characterized to ensure that radiological and non-radiological hazards have been removed and subsequently the building footprint will be backfilled, leveled and seeded leaving the underground footings etc. in situ.

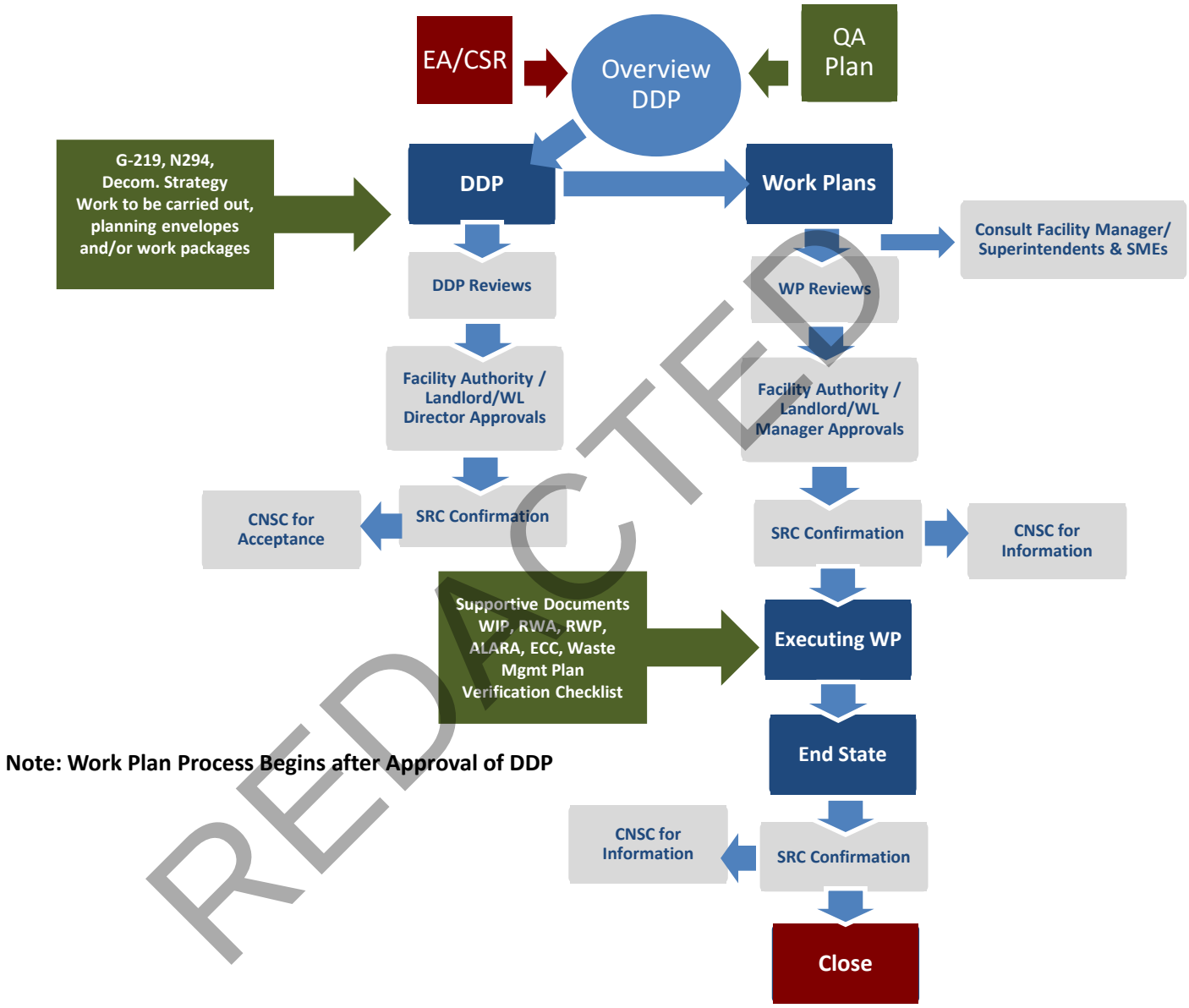
5.2 Whiteshell's Decommissioning Planning Process

The planning process used at WL for decommissioning projects is a rolling wave process whereby the detail of the work and tasks is refined from stage to stage. The work planning methodology describes the requirements and processes for assessment and planning of decommissioning work at WL. It provides a process to effectively manage health, safety, and security of persons and protect the environment risks and to ensure the work planning requirements of the WL Decommissioning QAP [5-8] are met prior to executing decommissioning work. It is to be used by WL staff and others who may be charged with planning and execution of decommissioning activities. As well, requirements are set out in the WL Site Licence [5-9] and the Licence Conditions Handbook (LCH) for WL [5-10] reference documents pertaining to decommissioning at WL, including compliance programs and QA requirements.

Each DDP Volume is a bounding scope document that describes the work to be done for a specific facility, lays out the high level work breakdown structure and provides a high-level hazard assessment.

The next stage in the planning process is the development of more detailed Work Plans. The Work Plans have the detailed work breakdown structure, schedule and resource requirements. The Work Plans are supported by rigorous hazard and risk assessments and work execution planning. Figure 5-3 summarizes the relationship between DDPs and Work Plans. To support the execution of the Work Plans, work tasks are planned with supporting work planning tools (e.g., Job Scope Analysis, Hazard and Risk Screening Assessments, Work Instruction Packages, Radiological Work Assessments, Safe Job Instructions, and Temporary Operating Instructions).

REDACTED



REDACTED

Figure 5-3 Whiteshell's Decommissioning Process

5.3 Decommissioning of Nuclear Facilities

5.3.1 Shielded Facilities

Operational cleanup of cells and work areas to remove research program equipment, materials and wastes is in progress as part of operational shut down. Processing of two active liquid waste volumes stored at the site, 270 L of Thorium Reprocessing Experiment (TFRE) waste, stored in a tank in the HCF, and 180 L of Amine Experiment waste (Amine), stored at the WMA will be processed to a solid waste form for interim storage at Whiteshell Laboratories under the SF operational licence. This work will emphasize identification, design, construction and operation of a processing facility in the HCF to solidify these wastes in an acceptable form for interim storage. The work includes the transfer of the amine wastes to the HCF. All facility safety systems will remain in operation until Amine/TFRE waste processing and decontamination operations are complete.

A summary of the decommissioning phases of SF and activities that were to be performed in each decommissioning phase as per the original Overview DDP [5-1] are given in Table 5-3.

Table 5-3 Shielded Facilities Decommissioning Phases and Activities

Phase	Activities
Operational Shutdown Period	• Disposition research samples and equipment. • Repackage Douglas Point fuel from Canister [redacted] and transfer to the production canister site. • Process SF and WMA stored active liquid waste to a solid form. • Prepare the facility DDP. • Confirm facility operational shutdown complete and document turnover condition.
Phase 1	• Decontaminate all HCF/IFTF shielded cells to remove major mobile contamination and/or fix loose contamination in situ. Survey and document cell end state. • Isolate cells from ventilation systems and seal all cell openings, ports, etc. • Decontaminate and/or fix loose contamination in situ for IFTF canisters and seal with the existing plugs. Survey and document. • Decontaminate operating halls and service areas to remove major loose contamination or fix contamination in situ. Survey and document. • Specify and implement minimum building ventilation, heating, and maintenance plan to protect integrity of the building envelope. • Lock/secure building access. • Complete and document facility hazards characterization. • Document interim end state. • Document and implement the M&S Plan. The Phase 1 end state achieves a secure M&S state for the Shielded Facilities.
Phase 2	• Maintain the M&S Plan. • Maintain integrity of the building envelope. • Address any problems identified by periodic inspection. • Maintain the facility DDP current. • Maintain annual reporting. The Phase 2 end state is a continued M&S state.
Phase 3	• Final decommissioning phase targeted for 2040. • Decontaminate and/or remove radioactively contaminated material to meet release criteria. Transfer to alternate storage or disposal facilities. • Final survey. • Secure regulatory approval for uncontrolled site release. The Phase 3 end state is complete decommissioning of the facility for release from regulatory control.

REDACTED

The schedule of completing decommissioning activities under the new Alternative 4 is provided in Figure 9-1.

5.3.2 Active Liquid Waste Treatment Centre

As per the original Overview DDP [5-1], for the first part of Phase 1, the ALWTC will remain fully operational. By about 2004, most of the facility will be decommissioned to an interim end state. The process systems required for managing the reduced amount of aqueous LLW from building sumps and small amounts of aqueous MLW generated from M&S and site decommissioning operations will be retained in an operational state beyond Phase 1 as follows:

- seven existing waste collection tanks will be consolidated to collect building sump wastes for M&S into two tanks; and
- a replacement waste concentration system will be designed and constructed to process Medium Level aqueous waste arising from WMA waste processing operations (e.g., standpipe waste retrieval). The existing method of treatment using an evaporator is worker radiation dose intensive and was eliminated as an option.

The active drainage lines are out of service and capped. These active drainage lines were used to transfer surface drainage sump-water from nuclear facilities buildings ([redacted]) to the ALWTC.

Phase 1 decommissioning of the unused portion of the ALWTC will include sealing active systems and active drainage. For example, drainage and ventilation systems will be removed or modified. Any systems remaining in place, which are not being used, will be capped off. Rooms will be decontaminated, hazards assessed and remediation applied where needed. In some areas contamination may be sealed/fixed in place until the final decommissioning in Phase 3. Radiological surveying will be carried out to document the facility condition for the interim end state.

In Phase 2, the unused portion of the ALWTC will remain in a M&S state. Liquid waste processing operations will be continued in a portion of the building. The design and operation of the remaining facility will be controlled to ensure the impact of operation is well within regulatory requirements.

The ALWTC will be decommissioned to an unrestricted use level in Phase 3 (2021).

A summary of the decommissioning phases of ALWTC and activities that were to be performed in each decommissioning phase as per the original Overview DDP [5-1] are given in Table 5-4.

REDACTED

Table 5-4 Active Liquid Waste Treatment Center Decommissioning Phases and Activities

Phase	Activities
Operational Shutdown Period	• Process waste arising from shutdown operations. • Identify any continuing WL site requirements for central collection of sump drainage, etc. • Prepare the facility PDP. • Identify the formal shutdown date. • Drain collection tanks and process all waste. • Document safe shutdown state/turnover condition.

Phase	Activities
Phase 1	• Develop the PDP to a DDP in year 3. • Process waste arising from SF/[redacted] decommissioning. • Confirm waste transfer from site facilities is complete. • Identify and establish the process for continued aqueous sump waste collection. • Flush all waste transfer system lines to the ALWTC collection tanks. • Flush all collection tanks to remove gross contamination and process flushing waste as appropriate. • Isolate collection lines from tanks and cap. • Cap all redundant collection lines at the source location (WR-1, [redacted] and Decontamination Centre). • Decontaminate and survey tanks, characterize tank condition. • Isolate tanks from ventilation, exit piping and seal openings. • Decontaminate tank rooms/operating halls to remove loose contamination, fix minor contamination in situ, survey and document. • Specify and implement minimum building ventilation, heating and maintenance plan to protect integrity of the building envelope. • Lock/secure building access. • Complete and document facility hazards characterization. • Document the interim end state. • Document and implement the M&S Plan. The Phase 1 end state will place most of the facility in a secure M&S state with the remaining operational component identified.
Phase 2	• Maintain the M&S Plan. • Maintain integrity of the building envelope. • Address any problems identified by periodic inspection. • Maintain the facility DDP current. • Maintain annual reporting. The Phase 2 end state is a continued M&S state.
Phase 3	• Final decommissioning phase targeted for 2040. • Decontaminate and/or remove radioactively contaminated material to meet release criteria. Transfer to alternate storage or disposal facilities. • Final survey. • Secure regulatory approval for uncontrolled site release. The Phase 3 end state is complete decommissioning of the facility for release from regulatory control.

REDACTED

The schedule of completing decommissioning activities under the new Alternative 4 is provided in Figure 9-1.

5.3.3 Whiteshell Reactor-1

5.3.3.1 Complete Removal Approach (as per the original Overview DDP [5-1])

The Complete Removal Approach for WR-1 Reactor has gone through the EA process as a part of the WL Decommissioning project and a decision has been made that Whiteshell Laboratories Decommissioning project is not likely to cause significant adverse effects, and that no further environment assessment by a review panel or mediation is warranted [5-3].

The Phase 1 decommissioning commenced in 1989 and was completed in 1995. This work addressed the removal of easily mobilized radioactivity (fuel, fluids, etc.) from the facility and decontamination of the main floor (600 level) and first sub-level (500 level) space with potential for reuse by Whiteshell Laboratories. Phase 1 work substantially decreased potential hazards from the facility and reduced the M&S requirements for the deferment period. The Phase 1 end state prepared WR-1 for a deferment period during which significant radioactivity decay will reduce the postulated dose commitment associated with future decommissioning work.

The WR-1 will remain under M&S throughout Phases 1 and 2.

RC-1290-R1 [5-11] and RC-1291-R1 [5-12] document the facility description and the M&S Plan at the end of the first phase of decommissioning for the facility which is already complete. These documents represent the Decommissioning Plan for the facility and will be included as DDP Volume 6 of the WL Decommissioning Plan [5-13].

The approach for WR-1 is to fully remove and package all activated and contaminated components for disposal in offsite facilities, to decontaminate the facility structure and then to demolish the building to achieve unrestricted release criteria.

Table 5-5 describes briefly the activities that will be performed in each decommissioning phase of WR-1 Reactor involving complete removal.

Table 5-5 WR-1 Reactor Decommissioning Phases and Activities for Complete Removal

Phase	Activities
Operational Shutdown Period	• Maintain M&S Plan.
Phase 1	• Maintain M&S Plan as documented in RC-1291-R1 [5-12].
Phase 2	• Maintain M&S Plan as documented in RC-1291-R1 [5-12].
Phase 3	The dismantling and remediation activities include: • Removal of reactor vault components, • Removal of process piping and equipment, • Transfer of radioactive waste to off-site facilities, • Decontamination of building structure, • Demolition of the building structure, • Remediation of the site to a “natural” state, and • Secure regulatory approval for final end state. The Phase 3 end state is complete decommissioning of the facility and release from regulatory control.

REDACTED

5.3.3.2 In Situ Decommissioning Approach (as per Alternative 4)

In keeping with the evolution of international best practices, CNL's decommissioning strategy has been moving towards reduced deferment periods. The resulting plan, to decommission WR-1 'in situ', incorporates these international standards and current best practices of decommissioning, reflecting a strong commitment to protect workers, the public and the environment in accordance with CNL's Health and Safety Policy [5-14], and Environmental Policy [5-15] and to recognize the government's liability for legacy nuclear wastes at all CNL sites.

The selected ISD option for WR-1 and [redacted] is also based on an evaluation of the short and long term risks associated with ISD of WR-1 [5-16] in accordance with CNSC G-320 [5-17]. Currently, this proposed ISD of WR-1 is going through the EA review process.

In situ decommissioning is a combination of permanent, passive disposal of the WR-1 below grade reactor area, and demolition and complete removal of the other building areas, including removal of above-grade building and infrastructure. It reduces the short term risk to workers, both of exposure to radiation, and other industrial hazards, and reduces the risk of releases to the public and the environment during decommissioning by minimizing the handling, and transporting of radioactive materials. The source term, including both non-radiological and radiological hazards, will be grouted in place to isolate the hazards from people and the environment. The nuclear source term will decay through time. Institutional controls will be incorporated for a duration of 300 years, or any other period that the CNSC prescribes[11]. A defined portion of land will remain under Government of Canada control and monitoring.

The building is divided into two parts; the ISD envelope and the balance of the building. The ISD envelope defines the boundaries of WR-1 systems and equipment that are to be disposed of in situ, and the balance of [redacted] (including the remaining Slowpoke Demonstration Reactor components) is decontaminated, demolished, and disposed of or recycled at an approved off-site facility.

The ISD envelope will contain the overwhelming majority of radioactive/contaminated equipment and materials. The ISD envelope is to be filled with a grout that will encase the contaminated equipment and materials, and provide containment and a barrier to the local environment. The grout material will be selected to ensure that an adequate level of protection is provided to ensure the safety of workers, the public and the environment.

The ISD envelope includes the core areas of the WR-1 below grade structure. These core areas house all of the most contaminated WR-1 systems and equipment, including the reactor vessel, the heavy water moderator system, portions of the primary heat transport system, and various support systems. Non-radiological hazardous materials that are in the ISD envelope will be removed where it is practical to do so, considering the hazard to the workers, and the long term safety as assessed in the EIS [5-16] and Decommissioning Safety Assessment (DSA) [5-18].

In some cases, there will be areas outside of the ISD envelope, such as the Primary Heat Transport Pump Room ([redacted]) that contain equipment that will be relocated below grade into the ISD envelope for in situ disposal.

REDACTED

[11] The proposal for WR-1 institutional control is 100 years of active institutional control followed by 200 years of passive institutional control.

The balance of [redacted] is expected to contain little to no radiological contamination. All equipment will be removed, segregated and disposed of. The below grade structure of the balance of [redacted] will be left in place and backfilled with grout to minimize groundwater movement that could potentially facilitate transport of contamination. The composition of grout will be selected to provide the appropriate low permeability conditions. The above grade building will be decontaminated to the extent practical, and receive radiological clearance surveys, to allow the bulk of the construction material to be reused, recycled, or rubblized and transferred to an inactive landfill. Demolition may produce contaminated concrete rubble and other building components, which will be safely managed according to the CNL Waste Management Program [5-19].

The final End-State for WR-1 will be a multilayered ISD system that applies a Defense in Depth strategy. The primary pathway for release of contamination from the system is by groundwater that has infiltrated into the sub-surface structure, picked up contamination, and then carried it out of the sub-surface structure to the groundwater. Each layer of the ISD provides an additional measure to prevent and mitigate the release of contaminants to protect the Public and the Environment. The layers of defence against contaminant release include reactor system components, grout, internal walls, outer foundation walls, the local geosphere, an engineered cover, and active environmental monitoring. Combined, they form a rigorous system of barriers to provide long term safety to the Public and the Environment.

Table 5-6 describes briefly the activities that will be performed in each decommissioning phase of WR-1 Reactor involving ISD.

Table 5-6 WR-1 Reactor Decommissioning Phases and Activities for In Situ Decommissioning

Phase	Activities
Operational Shutdown Period	• Maintain M&S Plan.
Phase 1	• Maintain M&S Plan as documented in RC-1291-R1 [5-12].
Phase 2	• Maintain M&S Plan as documented in RC-1291-R1 [5-12].
Phase 3	The ISD activities include: • Isolation of building from site infrastructure, • Remove above ground structures, • Preparation of reactor systems and materials to permit encapsulation with grout, • Encapsulation of reactor systems and below grade structure with grout, • Demolition of non-reactor systems and structures, installation of an engineered cap, and site restoration, and • Institution of ongoing environmental monitoring program and return to AECL control. The Phase 3 end state is a multilayered ISD system that applies a Defense in Depth strategy.

The schedule of completing decommissioning activities under the new Alternative 4 is provided in Figure 9-1.

REDACTED

5.3.4 Concrete Canister Storage Facility

The CCSF remained in operation throughout Phase 1 under the current facility authorization. In Phase 2 the continuing operational requirements was to be assessed and the CCSF will be placed in a passive operational state.

Monitoring and surveillance was to be carried out during most of Phase 3. The fuel was to be transferred to CRL WMA G for interim storage (planned for 2050). All canisters then would be decontaminated and demolished. The canister rubble would be disposed of or recycled and the CCSF sites will be rehabilitated to unrestricted release.

A summary of the decommissioning phases of CCSF and activities that were to be performed in each decommissioning phase as per the original Overview DDP [5-1] are given in Table 5-7.

Table 5-7 Concrete Canister Storage Facility Decommissioning Phases and Activities

Phase	Activities
Operational Shutdown Period	• Store obsolete research fuel in canisters. • Consolidate site storage canisters ([redacted]) into main CCSF. • Prepare the facility PDP/DDP.
Phase 1	• CCSF remains in operation. • Identify and store other site wastes requiring canister storage. • Develop the PDP into a DDP. The facility remains in operation at the end of Phase 1.
Phase 2	• Prepare and document the facility hazards assessment, • Place the facility in a passive operational state, • Prepare, implement and maintain an M&S plan for the facility in the passive operational state. The facility will be placed in a passive operational state at the end of Phase 2.
Phase 3	• Transfer irradiated fuel inventory to disposal facilities, 2050. • Assess radiological condition of canister liner. • Demolish canisters, confirm and remove concrete as clean waste, decontaminate liners based on economics or store as radioactive waste targeted for 2055. • Survey site for final release. • Remove fencing and security systems. • Document final end state and secure regulatory approval for end state as controlled release within the WL site. The Phase 3 end state is a completely decommissioned facility released from regulatory control.

The schedule of completing decommissioning activities under the new Alternative 4 is provided in Figure 9-1.

REDACTED

5.3.5 Waste Management Area

The WMA remained fully operational during Phase 1.

The buildings, structures and grounds within the WMA will be deactivated, demolished, and remediated to end-state release criteria, with the exception of 21 of the 25 LLW trenches, which are proposed for in situ disposal without any remediation work, and are out-of-scope for this DDP. The case for in situ disposal is presented in [5-6].

Phase 1 work included the design and implementation of an enhanced hydrogeological and environmental monitoring program to collect additional site data to support a final decision on in situ disposal. The wastes have continued to be managed under CNSC licensing conditions which provide an audit and review mechanism to ensure that any additional monitoring or EA required to support a final decision is conducted.

A summary of the decommissioning phases of WMA and activities that were to be performed in each decommissioning phase as per the original Overview DDP [5-1] are given in Table 5-8.

Table 5-8 Waste Management Area Decommissioning Phases and Activities

Phase	Activities
Operational Shutdown Period	Not Applicable
Phase 1	• Acceptance of low-, medium- and high-level radioactive waste generated from decontamination of the site research facilities (e.g., Shielded facility, [redacted]). Waste includes: - Solidified TFRE/Amine active liquid waste, - Decontamination waste, - Contaminated laboratory equipment, and - Contaminated building service system components. • Construction of additional bunker storage space to meet capacity requirements for Phase 1 decommissioning waste. • Maintenance of the WMA facilities and grounds. • Design and implementation of an enhanced monitoring system for the LLW trenches to collect data in support of the final in situ disposal decision.
Phase 2	In Phase 2, waste-processing operations will be implemented to address wastes which cannot remain in existing storage structures until waste disposal becomes available. This work will specifically address irradiated fuel waste in standpipes, waste in trenches [redacted] and [redacted] and some industrial/chemical waste in trenches [redacted] and [redacted] The key activities to be carried out are: • Establishing the remaining operating area required to process, package and provide interim storage throughout Phases 2 and 3. New facilities will be constructed to meet regulatory requirements and will include retrieval, processing, segregation and interim storage for waste which cannot be managed in existing facilities until waste disposal facilities become available.

REDACTED

Phase	Activities
	• Placing the WMA facilities, no longer receiving or processing waste, into a passive operational state. This may include modification to facilities and some relocation of waste within facilities. • Recovering and processing the fuel waste from the standpipes and the irradiated reactor components from Trenches [redacted] and [redacted][12]. • Recover industrial chemical wastes from Trenches [redacted] and [redacted] • Constructing facilities in the remaining operating area to meet Whiteshell Laboratories' requirements for managing waste from decommissioning activities. • Carrying out enhanced monitoring in support of trench in situ disposal. Several new facilities will be designed and constructed in the newly defined operating area located within the existing WMA boundary. New facilities comprise: • Interim storage bunker for solidified TFRE/Amine active liquid waste. • Interim bunker storage for routine M&S waste. • Interim storage for processed waste arising from WMA retrieval operations and from any site decommissioning work required prior to the availability of off-site disposal. • A de minimis segregated facility to process waste into appropriate handling categories for off-site disposal. • Transport equipment (shielded tanker) to accommodate transfer of aqueous waste to the ALWTC. WMA storage facilities which are not required for Phase 2 activities will be transitioned to a passive operational state.
Phase 3	• Preparation and packaging of waste for immediate transfer to disposal facilities, since the major site decommissioning activities are planned in accordance with assumptions on waste disposal facility availability. • Monitoring and surveillance in the passive operational area until the wastes are removed to disposal facilities or in situ management controls are in place. • Preparation of final safety case for in situ disposal of LLW Trenches to support the final decision on in situ disposal. Optimization of the disposal plan will consider: - Removal/remediation of trench waste unsuitable for in situ disposal,

[12] Trench [redacted] was deemed marginally high due to the levels of Tc-99. With an updated understanding of Tc-99 contents of Trench [redacted] (completed in 2019), it is likely that inaccurate and overly conservative conclusions in the evaluations and assessments resulted in a conclusion that Trench [redacted] required partial remediation, when in fact the trench likely does not require any remediation to remove the Tc-99 for safe in situ disposal. The errors in the original assessments likely placed an unnecessary commitment on CNL.

REDACTED

Phase	Activities
	- Engineered barriers, - Surface drainage patterns, - Additional monitoring locations, and - Additional controls following Phase 3 • Processing final decommissioning project wastes as required to accommodate transport to disposal facilities (e.g., segregation of contaminated waste from clean waste, packaging, loading shipping containers). • Retrieving and transfer all WMA waste that cannot be managed in situ at the site to final disposal, • Stabilizing/capping/securing the low level trench area to manage waste in situ and establish institutional controls, and • Remediating the balance of the WMA to a more "natural" condition. The Phase 3 end state is full of removal of all wastes except for 21 LLW trenches which will remain under institutional control for a period of approximately 200 years.

The schedule of completing decommissioning activities under the new Alternative 4 is provided in Figure 9-1.

5.4 Decommissioning of Radioisotopes Facilities/Auxiliary Facilities

5.4.1 Research and Development Facilities Complex ([redacted])

The Phase 1 work for [redacted] included decontamination and/or fixation of contamination throughout the facility. Fume hoods were isolated from the exhaust ventilation system and active drainage lines were drained and capped. Active drainage system connections to the ALWTC were maintained to manage building sump wastewater. Minimum heating and ventilation was established.

A summary of the decommissioning phases of Research and Development Facilities Complex and activities that were to be performed in each decommissioning phase as per the original Overview DDP [5-1] are given in Table 5-9.

Table 5-9 Research and Development Facilities Complex Decommissioning Phases and Activities

Phase	Activities
Operational Shutdown Period	• Disposition research materials/equipment.
Phase 1	• Confirm operational shutdown activity is complete for the building envelope (Reactor Safety Research Program Operation until 2003 December. North Extension operations are dependent on program decisions and may result in continued operation separate from balance of facility).

REDACTED

Phase	Activities
	• Assess radioactive service systems, laboratories ventilation and active drains. Seal in place or package as waste for storage at the WMA. • Decontaminate building interior to remove loose contamination or fix in situ. • Specify and implement minimum ventilation, heating and the maintenance plan to ensure integrity of the building envelope, • Lock/secure building access. • Complete and document facility hazards characterization. • Document end state. • Document and implement the M&S Plan. The Phase 1 end state achieves a secure M&S state for [redacted]
Phase 2	• Maintain the M&S Plan. • Address any problems identified by periodic inspection. • Maintain annual reporting. The Phase 2 end state is a continued M&S state.
Phase 3	• Final decommissioning, completion target 2030. • Decontaminate and/or remove radioactively contaminated material to meet release criteria. • Transfer radioactively contaminated material to alternate storage or disposal facilities. • Demolish the building. • Final survey. • Secure regulatory approval for uncontrolled site release. The Phase 3 end state is complete decommissioning of the facility and release from regulatory control.

REDACTED

The schedule of completing decommissioning activities under the new Alternative 4 is provided in Figure 9-1.

5.4.2 Health and Safety Facilities [redacted] and [redacted])

[redacted] was operated throughout Phase 1 to provide dosimetry services to AECL and to accommodate commercialization activities such as ACSION.

The decommissioning approach for the building includes:

- Characterization and decontamination activity similar to the Decontamination Center to prepare the building for decommissioning to an unrestricted release level.

The schedule of completing decommissioning activities under the new Alternative 4 is provided in Figure 9-1.

5.5 Decommissioning of Whiteshell Licensed Site Supporting and General Site Infrastructure

5.5.1 Non-Nuclear Buildings

During the operational shut down period, non-nuclear buildings were prepared for demolition or for transfer to other (commercial) owners.

The general site buildings were maintained in an operational state to support continuing research programs (e.g., [redacted]), the decommissioning program, commercialization opportunities (e.g., [redacted]) or to support the site operation generally (e.g., Powerhouse [redacted] Pump house [redacted]).

A summary of the decommissioning phases of Non-Nuclear Buildings and activities that were to be performed in each decommissioning phase as per the original Overview DDP [5-1] are given in Table 5-10.

Table 5-10 Non-Nuclear Buildings Decommissioning Phases and Activities

Phase	Activities
Operational Shutdown Period	• Maintain non-nuclear buildings in operational state to support commercialization activities, research programs, decommissioning. • Develop licensing strategy/process for turnover of non-nuclear buildings to private tenants. • Support commercialization for targeted buildings by surveying to release state. • Turnover buildings to private use in accordance with strategy.
Phase 1	• Continue support to remaining research programs, commercialization effort. • Turnover buildings to private use in accordance with licensing strategy. • Complete differentiation between M&S facilities/infrastructure and commercialized buildings/infrastructure. The Phase 1 end state places all buildings no longer required for commercialization or to support the decommissioning activities in a secure M&S state.
Phase 2	• Remove redundant buildings/infrastructure. • Maintain M&S state for remaining infrastructure. The Phase 2 end state is continued M&S for remaining buildings and infrastructure.
Phase 3	• Final decommissioning work. • Decontaminate/remove radioactive waste (if any) to meet release criteria. • Demolish/remove any remaining non-nuclear buildings/infrastructures. • Finalize overall site end state and any survey required. • Secure regulatory approval for uncontrolled release of non-nuclear buildings/infrastructure. The Phase 3 end state achieves full decommissioning of all non-nuclear buildings and full release from regulatory control.

The schedule of completing decommissioning activities under the new Alternative 4 is provided in Figure 9-1.

REDACTED

5.5.2 Inactive Landfill

The inactive landfill remained fully operational for Phases 1 and 2. Waste processing operations and maintenance was consistent with that done prior to decommissioning. A plan for remediation of the landfill will be developed. Environmental, radiological and geotechnical evaluations will be carried out to provide inputs to the plan.

The landfill will be decommissioned to a final end state. The landfill will be capped and the surface restored to a more "natural" condition. Subsequent to closure, monitoring will be carried out to confirm that the landfill is fully stabilized.

The operation and decommissioning of the inactive landfill falls under federal jurisdiction. Manitoba Environment Act Regulation 150/91 on closure of landfills will be considered in developing the remediation plan for this facility.

The schedule of completing decommissioning activities under the new Alternative 4 is provided in Figure 9-1.

5.5.3 Sewage Lagoon

The sewage lagoons remained fully operational for Phases 1 and 2. Waste processing operations and maintenance were consistent with that done prior to decommissioning. A plan for remediation of the lagoon system will be developed.

Environmental, radiological and geotechnical evaluations will be carried out to provide inputs to the plan.

Decommissioning of the lagoon system to a final end state will be accomplished by backfilling and restoring to a more "natural" condition. Subsequent to closure, monitoring will be carried out to confirm the lagoon is fully stabilized. Interim domestic sewage facilities (e.g., septic tanks) will be required to meet operational needs.

The operation and decommissioning of the lagoon falls under federal jurisdiction. Manitoba Environment Act, Regulation 163/88 will be taken into consideration in developing remediation plans for this facility.

The schedule of completing decommissioning activities under the new Alternative 4 is provided in Figure 9-1.

5.5.4 Buried Services

The timing for reducing or terminating buried services is co-ordinated with the discontinued need for a service and/or with the demolition of individual buildings. For electrical, district heat, firewater and domestic water, the site service is maintained until all facilities are demolished/removed. As individual facilities are removed the service supply is terminated/ capped at the building footprint perimeter. Decommissioning of in ground services is planned as part of final site remediation. Much of the non-radioactive infrastructure will be disconnected/capped and abandoned in situ.

5.5.5 Affected Lands

The approach to decommissioning will be the same generally for each of the known specifically affected areas.

Any identified need for early remediation or stabilization will be completed. Since stabilization/remediation for these areas was incorporated as the first step in addressing the incident immediately after occurrence, only limited work is expected for these areas until final remediation.

REDACTED

Remediation will be completed to a level where any remaining contamination is within acceptable levels for unrestricted release. In some areas, institutional controls may be required after remediation has been completed.

5.5.6 River Sediments

Based on the evaluation in Appendix B.1 of [5-6], the decommissioning approach is to abandon the contaminated sediments in situ.

River sediment monitoring will be carried out as documented in [5-20]. Results from collection and analysis of Winnipeg River bottom sediments at three Target Areas in 2006 are reported in [5-21].

5.5.7 North Ditch/Creek

A full assessment of environmental monitoring data and of the original spill documentation will be conducted to confirm that the initial remediation following the incident was satisfactory and that no additional remediation is required.

5.6 Interim and Final End-State

End-State objectives for WL decommissioning are related to the finalization of the WL Closure Project's Land Use and End State Plan. The extent of the removal and remediation of the infrastructure and surrounding soil, as well as the restoration of the worksite at WL, will be determined in accordance with the land-use category designated for the area of the WL site and defined in the end-state objectives.

5.6.1 Interim End-State Objectives

Where a facility/building is decommissioned in a phased program, an interim end state report may be prepared to document the state of decommissioning so that information is readily accessible when final decommissioning takes place.

5.6.2 Final End-State Objectives

The land clearance criteria to which the WL site will be prepared for its Final End State depends on the long term land use objectives for the site.

At WL, LLW trenches in WMA, proposed Whiteshell Reactor Disposal Facility (WRDF), and inactive landfill/asbestos burial pit site will have a period of institutional control where the performance of these remaining in situ disposal components are monitored and controlled.

Canadian Nuclear Laboratories has laid out a plan for the WL site to identify the completion of decommissioning activities and transition of the site to institutional control. During the next licence period, CNL will prepare for a transition to an institutional control state, with an appropriate licence application/applications to the CNSC. The CNL's Environmental Protection Program includes effluent, environmental and groundwater monitoring, and the program evolves over the time period of the project transitioning into and being a part of the institutional controls.

For the WL site, other than the areas where the institutional control is applied, four post closure land use categories are being contemplated as the proposed end state land use: Agricultural, Residential, Industrial and Recreational. Each land use category has associated clearance levels and cleanup criteria for radioactive and

REDACTED

non-radioactive contaminants. The land areas will be decommissioned, remediated and cleaned up to meet the cleanup criteria for the designated land-use category to achieve the applicable end states of the WL Closure Project that will be documented in the final Land-Use and End-State Plan [5-22].

To achieve the proposed end state, the following activities will have to be completed:

- All structures, systems and components including the buildings have been dismantled/demolished and removed from the site;
- All subsurface structures have been drained, de energized, and removed to a minimum depth of 1.5 m below grade (consistent with industry practices);
- All excavated areas have been backfilled with clean soil, graded with topsoil and sodded/seeded;
- Below-grade holes, voids or channels into the bedrock at a depth more than 1.5 m from the grade have been filled with grout, and the top 1.5 m layer backfilled and graded with clean soil and topsoil;
- All radioactive wastes, hazardous waste materials, and radiological and non-radiological contaminations in excess of the established clearance levels have been removed from the site;
- Environmental review to determine if in situ abandonment and/or in situ confinement and management is appropriate (i.e., supported by the WL CSR [5-6] and/or requires an additional environmental risk assessment and/or safety assessment);
- All spent fuel and the associated canister facility have been removed from the WL site; and
- WL site has been remediated/restored to conditions specified in the facility specific or building specific DDPs and is ready for alternative use.

Upon completion of the physical project work, the LLW trenches in WMA, proposed WRDF, and inactive landfill/asbestos burial pit site will remain under institutional control. During the institutional control period, administrative controls as well appropriate mitigation measures will be put in place to control and monitor these areas such as airborne, groundwater and surface water monitoring for a specified time period. The institutional control activities are designed to demonstrate that the in situ components perform in the manner predicted in the related safety assessments, and to ensure that there is no development or intrusion into affected areas until the hazards have been reduced to acceptable levels. For WL, this period is expected to extend for approximately 200-300 years beyond the physical project work.

The Final End State of the WL will be achieved when the following additional activities have been completed:

- Completion of the Final Status Survey of the site/area(s), which confirms that the concentrations of any remaining radiological or chemical contaminants in the impacted areas are below the release criteria for the proposed designation of the WL site/area(s);
- Completion of the Final End-state Report for the WL site/area(s) confirming successful completion of decommissioning; and
- Institutional controls, as applicable, are in place.

5.6.3 End-State Documentation

End-state documents will be prepared for the decommissioning work in accordance with WL Decommissioning QA Plan [5-8]. Appendix B of this document provides a Table of Contents, which will be used as guidance to document the end states for the completion of the work.

REDACTED

5.7 References

The following references were current at the time of development of this DDP. Where a reference is to be complied with, ensure the latest revision is used.

[5-1] RC-2143-1, *Whiteshell Laboratories Detailed Decommissioning Plan - Volume 1 – Program Overview*, Revision 4, 2002 January.

[5-2] CSA N294-09 (reaffirmed 2014), *Decommissioning of facilities containing nuclear substances*, 2014.

[5-3] https://ceaa-acee.gc.ca/default.asp?lang=En&xml=7CE78B85-3486-4BE8-957A-DE3054DC531B.

[5-4] WLD-508740-041-000, *Dose Impact Assessment for WL Accelerated Decommissioning Alternative Schedule*, Revision 0, 2020 July 30.

[5-5] Regulatory Guide, *Keeping Radiation Exposures and Doses "As Low As Reasonably Achievable (ALARA)"*, G-129, Revision 1, 2004 October.

[5-6] WLDP-03702-041-000-0008, *Whiteshell Laboratories Decommissioning Project Comprehensive Study Report Volume 1: Main Report*, Revision 2, 2001 March.

[5-7] WLD-508740-REPT-001, *Contamination Clearance Levels Used for WL Decommissioning*.

[5-8] WLD-508300-QAP-001, *Quality Assurance Plan Whiteshell Laboratories Decommissioning*.

[5-9] NRTEDL-W5-8.00/2024, *Nuclear Research and Test Establishment Decommissioning Licence Whiteshell Laboratories*.

[5-10] WLDP-508760-HBK-002, *Licence Conditions Handbook for Whiteshell Laboratories*.

[5-11] RC-1290-R1, *The WR-1 Reactor Phase I Decommissioning Interim End-State Report-Facility Description*, 1996 March.

[5-12] RC-1291-R1, *The Monitoring and Surveillance Plan for the WR-1 Deferment Period*, 1996.

[5-13] WLDP-26400-DDP-001, *Whiteshell Laboratories Detailed Decommissioning Plan: Volume 6 – Whiteshell Reactor # 1:* [redacted] Revision 3, 2015 February.

[5-14] 900-510400-PDD-001, *Occupational Safety and Health*.

[5-15] 900-509200-PDD-001, *Environmental Protection*.

[5-16] WLDP-26000-ENA-001, *Environmental Impact Statement: In Situ Decommissioning of Whiteshell Reactor # 1*, Revision 1, 2017 September.

[5-17] G-320, *CNSC Regulatory Guide – Assessing the Long Term Safety of Radioactive Waste Management*, 2006.

[5-18] WLDP-26000-SAR-001, *In situ Decommissioning of Whiteshell Reactor 1 Project – Decommissioning Safety Assessment Report*, Revision 2, 2017 September.

[5-19] 900-508600-PDD-001, *Waste Management*.

[5-20] WLDP-03704-ENA-002, *Whiteshell Laboratories EA Follow-Up Program Work Package #8, River Sediments, Enhanced Monitoring-Identification of Target Sampling Sites*, Revision 3, 2006 September.

[5-21] WLDP-03704-REPT-007, *Sampling and Analysis of Winnipeg River Bottom Sediments at Three Target Areas: Current Baseline Conditions*, Revision 0, 2008 April.

[5-22] WL-508350-PLA-001, *Whiteshell Laboratories Closure Land-Use and End-State Plan*, 2020 April (draft).

REDACTED

6. WASTE MANAGEMENT PLAN

6.1 Waste Management Practices

In essence, the decommissioning program is a process of managing the WL site waste streams to secure an end state where all wastes are dispositioned to offsite storage/disposal facilities or to in situ management. The decommissioning of the WL site will be performed in accordance with the requirements of the CNL's WM Program to ensure that all waste generated is dispositioned in a safe, environmentally-responsible, cost-effective and regulatory compliant manner [6-1] [6-2] [6-3]. The CNL's WM Program provides the WL specific processes and requirements for managing all classes of wastes that has been generated due to the past operations (i.e., stored waste) and will be generated due to current operation and ongoing decommissioning activities (i.e., operational waste and decommissioning waste respectively) of the WL site.

The CNL's WM Program facilitates and oversees all aspects of the waste management process which includes:

- Characterization;
- Segregation;
- Volume reduction;
- Packaging;
- Tracking;
- Transportation;
- Interim storage in the WL WMA of radioactive wastes;
- Disposal of non-radioactive waste (including hazardous) that meets CNL's unconditional clearance criteria; and
- Documentation all of the waste management activities.

The waste materials i.e., stored/operational/decommissioning wastes will be managed as follows:

- All waste will be managed in a safe and environmentally responsible manner that meets or exceeds applicable regulations and standards, and minimizes current and future environmental impacts and liabilities.
- All documentation referenced in the site licence, and any other licences granted by the CNSC (or other regulatory authorities, such as environment ministries) for the management of waste materials or radioactive nuclear substances will be complied with.
- All waste materials will be classified in accordance with the CNL's WM Program [6-1] [6-2].
- Waste for which there is no identified and approved treatment or storage/disposal facility will not be knowingly produced. Should waste be inadvertently generated for which there is no identified and approved treatment or storage/disposal, this shall be treated as a non-conformance and a plan will be developed and implemented to treat and/or safely store the waste, as per the WM Program.
- Decommissioning activities will be planned, developed and operated or conducted in a manner that minimizes both the volume and the level of hazard of all waste materials that are generated, to the extent practical.
- The quantity and hazard of waste materials generated at WL will be minimized, following the principles, in decreasing priority, of Prevent, Reduce, Reuse and Recycle, to the extent practical.

REDACTED

- Waste materials will be segregated into groups with common characteristics (i.e., physical, radiological and hazardous) and the same disposition pathway (i.e., reuse, recycle, disposal in a licensed provincial landfill, management as hazardous waste or management as radioactive waste).
- The radiological clearance of waste materials including buildings, lands and equipment shall be performed in accordance with CNL requirements.

6.2 Classification of Waste

According to CNL's WM Program [6-1], the waste can be broadly classified into two main categories i.e., non-radioactive waste and radioactive waste. The non-radioactive waste could be clean waste or hazardous waste while the radioactive waste has three classes i.e., HLW, ILW, and LLW. The mixed waste class arises from the hazardous waste. When hazardous waste contains radioactive contaminations then it is referred as a mixed waste. Table 6-1 provides the definitions of different classes of wastes that are adopted from CNL's WM Program.

Table 6-1 Classification of Waste

Waste Types	Description
Non-Radioactive Waste	**Clean Waste** - Non-hazardous material that is declared to be non-radioactive by its history, location and use; or non-hazardous material that has been determined to meet regulatory requirements for unconditional clearance by means of suitable radiological monitoring. **Hazardous Waste** - Solid, liquid or gaseous waste material, other than a radioactive material, that may pose a potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed, and as specified in applicable regulations.
Radioactive Waste	Any material (liquid, gaseous or solid) that contains radioactive "nuclear substances", as defined in Section 2 of the Nuclear Safety and Control Act [6-4] and which the Waste Generator has declared to be waste. The waste classification system is generally organized according to the degree of containment and isolation required to ensure safety in the short and long term. It also considers the hazard potential of the different types of radioactive waste. The three main categories are: **High Level Waste (HLW)** - Used (i.e., irradiated) nuclear fuel that has been declared as radioactive waste and/or is waste that generates significant heat (typically more than 2 kW/m^3) via radioactive decay. **Intermediate Level Waste (ILW)** - Waste which exhibits levels of penetrating radiation sufficient to require shielding but needs little or no provision for heat dissipation during its handling and transportation. ILW generally contains long-lived radionuclides in concentrations that require isolation and containment for periods greater than several hundred years (i.e., more than 300 to 500 years).

REDACTED

Waste Types	Description
	Low Level Waste (LLW) - Waste with radionuclide content above established clearance levels and exemption quantities, but that generally has limited amounts of long-lived activity. LLW requires isolation and containment for periods of up to a few hundred years. LLW does not require significant shielding during handling and transportation.
Mixed Waste	Radioactive waste that would also be classified as "Hazardous Waste" on the basis of its non-radiological characteristics.

6.3 Inventory of Stored Wastes

Radioactive laboratories and waste storage occupy approximately 1% of the site land (approximately 40 ha). The active area totals approximately 4 ha (0.1% of the site).

Radioactive wastes are stored in waste management facilities and are categorised into three levels.

- Low level waste (LLW), which includes used lab-ware, rubber gloves, shoe covers, wipe paper, and mops. The total accumulation of LLW is approximately 34,000 m^3 and is located in trenches, bunkers and storage buildings.
- Intermediate level waste (ILW), also referred as Medium Level Waste, is typically composed of scrap metal materials from experiments, filters, and radioactive liquid waste that has been solidified. This waste is stored in the standpipes and bunkers in the WMA. The total accumulation of ILW in the WMA is approximately 1,200 m^3; and
- High level waste (HLW), comprises irradiated reactor fuel and metals from nuclear reactor core components. The Concrete Canister Storage Facility (CCSF) provides storage for 29 metric tonnes of irradiated reactor fuel. Some fuel wastes (approximately 3 metric tonnes) from operations prior to 1975 are stored in standpipes in the WMA.

Two other categories of stored waste are:

- 450 L of Amine/TFRE active liquid waste processed to a solid form as part of shutdown operations, and
- a small volume of PCBs (16.6 L) is stored in [redacted] located at the main laboratory site. As storage of PCB waste is only permitted for one year, therefore depending on the number of buildings/areas decommissioned and demolished, the volume of PCBs fluctuates. The [redacted] also contains various classes of hazardous waste, excluding PCBs.

6.4 Inventory of Decommissioning Wastes

While performing decommissioning activities at WL site, all waste will be handled and processed in accordance with CNL's established policies and procedures [6-1] [6-2] [6-3]. At the WL site, waste generated from the decommissioning activities will be identified and accounted for under the following five categories:

- Intermediate Level Waste (ILW)
- Low Level Waste (LLW)
- Mixed Waste
- Hazardous Waste
- Clean Waste

REDACTED

Table 6-2 provides a high level summary of the waste streams along with their quantities for the WL Decommissioning Project. The WL Decommissioning Project will produce a total of approximately 134,000 m^3 of the decommissioning waste. The decommissioning waste will comprise of approximately 1.0%, 24.3%, 0.4%, 8.3%, and 66.0% of ILW, LLW, mixed waste, hazardous waste, and clean waste respectively.

Nuclear facilities and radioisotope facilities will produce the largest component of radioactively contaminated waste estimated at approximately 1,068 m^3 of ILW and approximately 24,037 m^3 of LLW. In addition to this approximately 588 m^3 of mixed waste, approximately 5,846 m^3 of hazardous waste, and approximately 51,907 m^3 of clean waste will also be generated as a result of decommissioning nuclear and radioisotopes facilities.

The decommissioning of Whiteshell Licensed Site Supporting and General Infrastructure will produce approximately 2 m^3 of ILW, approximately 8,475 m^3 of LLW, approximately 5,238 m^3 hazardous waste, and approximately 36,817 m^3 of clean waste.

Contaminated soil waste will be produced from remediation of individual building sites and from remediation of affected lands (spill incident areas, active drain lines etc.). This category cannot be estimated until additional assessments are carried out during Phase 1 to delineate the extent of contamination.

The hazardous waste and mixed waste due to decommissioning is estimated to be approximately 11,084 m^3 (8 % of the total waste) and approximately 588 m^3 (0.4 % of the total waste) respectively. It is expected that the nuclear facilities will produce approximately 2,089 m^3, radioisotope facilities will produce approximately 3,757 m^3 and Whiteshell Licensed Site Supporting and General Site Infrastructure will produce approximately 5,238 m^3 of hazardous waste. The hazardous waste will include PCB-filled electrical components, ACMs, lead, etc. (see Section 4.2.2). The mixed waste will be produced by only nuclear facilities, which include WR-1 and [redacted] (approximately 285 m^3), ALWTC (approximately 20 m^3), and WMA (approximately 283 m^3).

REDACTED

Table 6-2 Summary of WL Site Decommissioning Waste Estimate

Facilities	Nuclear Facilities						Radioisotope Facilities			Whiteshell Licensed Site Supporting and General Site Infrastructure	Total Waste
Waste Stream (m^3)	**Whiteshell Reactor-1 and [redacted]**	**Shielded Facilities**	**Concrete Canister Storage Facility**	**ALWTC [redacted]**	**WMA**	**Total**	**R&D Facilities Complex [redacted]**	**Health and Safety Facilities**	**Total**	**North Side Buildings South Side Buildings Site Services Affected Lands and Contaminated Structures**	
Intermediate Level Waste	0	273	0	45	748	**1066**	0	2	**2**	2	**1070**
Low Level Waste	2490	6488	48	869	13521	**23416**	497	124	**621**	8475	**32512**
Mixed Waste	285	0	0	20	283	**588**	0	0	**0**	0	**588**
Hazardous Waste	2069	0	0	0	20	**2089**	2744	1013	**3757**	5238	**11084**
Clean Waste	13310	2385	900	532	3750	**20877**	26490	4540	**31030**	36817	**88724**
Total Waste	**18154**	**9146**	**948**	**1466**	**18322**	**48036**	**29731**	**5679**	**35410**	**50532**	**133978**

REDACTED

6.5 Operational Waste

In addition to stored waste and decommissioning waste, the routine operational (including decommissioning waste collection, processing, packaging and disposition) and maintenance activities also produced some waste which is called operational waste. The operational waste comprised of three main streams i.e., LLW, ILW, and Hazardous waste. It is estimated that operational and maintenance activities will generate about 129 m^3 of ILW, 244 m^3 of LLW, and 25 m^3 of Hazardous Waste.

6.6 Waste Streams

At WL site, all waste materials i.e., stored wastes/decommissioning wastes /operational wastes will be categorised into following classes of waste:

- Clean Waste
- Clearable Waste
- Hazardous Waste
  - Clearable Hazardous Waste
- Radioactive Solid Waste
  - LLW
  - ILW
  - HLW
- Radioactive Liquid Waste
  - LLLW
  - ILLW
- Mixed Waste

6.7 Radiological Characterization and Clearance Surveys

6.7.1 General

Radiological characterization and clearance surveys are required to assure the proper disposition of waste materials generated as a result of decommissioning of the buildings and lands, and prior to the final remediation and disposition of buildings and all lands that have the potential to be impacted by site nuclear operations [6-5].

The objectives of characterization and clearance surveys are to:

a. provide assurance that radioactive materials are identified and appropriately managed as radioactive waste, and
b. demonstrate that material declared as clean or non-radioactive:
   i. do not have surface contamination levels exceeding the maximum allowable values provided in CNL's RP Program Requirements [6-6],
   ii. do not have volumetric contamination levels exceeding the CNSC approved clearance levels [6-7], and
   iii. confirm that any residual levels of contamination are ALARA, economic and social factors taken into account.

REDACTED

Radiological characterization and clearance surveys will be designed and conducted in accordance with the WL Radiological Clearance Surveys of Materials procedure [6-8] and WL Radiological Disposition and Clearance of Buildings, Lands and Materials procedure [6-5] and by means consistent with the recommendations contained in US-NUREG-1575 (MARSSIM) [6-9] and US-NUREG-1575, Supp 1 (MARSAME) [6-10].

6.7.2 Clearance Criteria

Canadian Nuclear Laboratories policy on the release criteria of materials from the WL site is described in CNL's Radiation Protection Program Requirements [6-6] and program standard on contamination levels [6-11]. Reference [6-6] defines the surface contamination release limits for the maximum values for unrestricted use and reference [6-11] defines administrative release levels. These are shown in Table A-3.

The RP Program release limits represent the maximum values that can be allowed to be released for unrestricted use and the administrative release levels represent the level of residual contamination considered ALARA and acceptable to release without further justification. Every reasonable effort should be taken to meet the target clearance levels when it is technically practical, economically feasible and is considered safe and sound to do so. Surface contamination that exceeds the administrative release level but are less than the release limits will be evaluated on a case by case basis. Material or surfaces that cannot be decontaminated to below the administrative release levels and are below the release limits may still be released if decontamination is not feasible or the cost of and effort of decontamination will not result in a significant reduction in contamination levels. A Group 1 qualified Health Physicist will verify the evaluation of contamination levels, and approval will be obtained from the WL RP Program Manager. Materials that cannot be decontaminated to the levels below the release limits will not be released for unrestricted use.

Canadian Nuclear Safety Commission's unconditional clearance levels for bulk material [6-7] and the WL screening soil cleanup criteria [6-12] will be to the clearance of ground material in crawlspaces and exterior grounds of buildings.

REDACTED

6.8 Waste Processing Facilities

The anticipated interim processing facilities required are described briefly below.

6.8.1 Active Liquid Waste Treatment

The [redacted] and [redacted] LLLW treatment systems will continue to operate until no longer required. An ILLW treatment system is being designed and constructed in the WMA for use during the decommissioning of the WMA facilities.

6.8.2 WMA Retrieval, Reprocessing and Repackaging Facility

A retrieval, reprocessing and repackaging facility is being designed and constructed to remediate the standpipes and ILW bunkers.

6.9 Final Waste Disposition

6.9.1 Waste Disposition Paths

There are five main disposition paths for the site decommissioning waste. These are described briefly in the following subsections.

6.9.1.1 In Situ Disposal

The current plan is to complete decommissioning of the WL site by 2027 with the following areas expected to be managed in situ (subject to regulatory approval).

- WR-1 Reactor;
- 21 or 22 of the 25 LLW Trenches;
- Inactive (non-radioactive) Landfill; and
- Contaminated Outfall River Sediments.

Following ISD, institutional controls and surveillance activities will be required to monitor environmental performance at the WL site. The WL WR-1 EIS provides further details for proposed institutional controls for WR-1 ISD [6-13].

6.9.1.2 Engineered Off-Site Facilities

The engineered off-site facilities that are available in Canada will be engaged for disposal or safe storage of hazardous chemical wastes.

6.9.1.3 Off-Site Landfill

These are engineered sanitary landfills expected to be available within the Regional Study Area. It would likely be an off-site facility capable of handling building rubble.

6.9.1.4 River

Liquids are batch processed at the LLLW treatment systems to remove contamination and only released to the Winnipeg River if they meet release criteria. All releases to the environment will be controlled within administrative levels set well below the site DRLs.

6.9.1.5 CRL and Other Licensed Facilities

Currently, the most viable option for WL radioactive waste disposition is the CRL site, in alignment with CNL's Integrated Waste Strategy (IWS) [6-3] as shown in Table 6-3. Repetitive handling is minimized through sufficient characterization and appropriate packaging/waste form to facilitate transfer from CNL's Waste Management Areas to an eventual disposal facility. This ensures that managing radioactive waste is in line with nuclear safety principles, such as ALARA. These considerations are incorporated as part of the specific Waste Management Plans, which in turn meet the Waste Management suite of Management System documents. HLW, ILW, and LLW will be transferred to CRL for storage. The mixed waste will be transported either to CRL for treatment and long-term management or to an off-site mixed waste processing for treatment and conditioning, dependant on the hazardous constituent present in the waste.

REDACTED

Table 6-3 Key IWS Activities Relevant to WL Decommissioning

Major IWS activities from CNL's IWS relevant to WL	Method of addressing key IWS activities
Continuing to update and refine waste inventory and forecasting.	The waste inventory data and waste forecasting for WL decommissioning work packages will be prepared. The Phase 2 work will address the planning for the management of the collected waste inventory.
Continuing to develop characterization program and technical improvements.	To improve the inventory data, all waste material generated by WL decommissioning activities will be adequately characterized.
Continuing to Identify and improve transport capabilities across CNL.	All off-site transport of radioactive waste material generated by WL decommissioning activities will follow the CNL's Transportation of Dangerous Goods program requirements, which also provide compliance with the WL decommissioning licence conditions.
Ensuring sufficient LLW storage capability is maintained at CRL prior to proposed NSDF availability.	The storage capacity continues to be reviewed on an ongoing basis until the availability of NSDF. These activities are documented in the CRL ACMR. These mitigating actions and continual review ensure that sufficient storage space is available for CNL's decommissioning strategy and schedule, while also allowing for continuing operations at the CRL site.
Expanding HLW dry storage capability at CRL in a phased manner.	HLW dry storage capacity has been expanded to accept irradiated fuel from WL.

REDACTED

6.9.2 Waste Disposition Plan

The waste materials will be dispositioned in the following manner:

- Non-hazardous, non-radioactive waste will be reused, recycled or disposed of in a licensed provincial landfill.
- Hazardous non-radioactive wastes will be sent to a suitable off-site waste management facility for processing and disposal.
- Mixed wastes will be characterized and packaged into suitable containers and either transported to CRL for treatment and long-term management or to an off-site mixed waste processing facility for treatment and conditioning.
- Radioactive liquid wastes will be processed on-site through the WL LLLW processing system, or treated in the ILLW Treatment System to be installed in the WMA, solidified and stabilized for future management. If any liquid wastes cannot be treated on site, they will be shipped to an off-site licensed facility (e.g., CRL).

- Solid LLW will be characterized, processed and packaged into standardized containers and transported to an approved off-site facility for storage/disposal.
- Solid ILW will be characterized, processed and packaging into approved, licensed containers (which will, in some cases, include shielding) and transported to CRL for long-term storage and/or disposal.
- Solid HLW including spent fuel bundles will be transported to CRL for the interim storage.
- Interim on-site storage facilities (e.g., SMAGS) may be utilized to stage radioactive waste prior to shipment from WL to CRL.
- Options for off-site decontamination, volume reduction, recycling and/or disposal of contaminated materials (e.g., metals) will be evaluated on a case-by-case basis and may be utilized if the service is cost effective and practical.
- Inactive dismantling/demolition debris (e.g., concrete canisters) will be reused/recycled and/or dispositioned into inactive landfill facilities in accordance with CNL's procedures and applicable federal and provincial legislation.

6.10 References

The following references were current at the time of development of this DDP. Where a reference is to be complied with, ensure the latest revision is used.

[6-1] 900-508600-PDD-001, *Waste Management*.

[6-2] 900-508600-PRD-001, *Waste Management*.

[6-3] CW-508600-PLA-002, *Canadian Nuclear Laboratories Integrated Waste Strategy*.

[6-4] S.C. 1997, c.9, *Nuclear Safety Control Act*.

[6-5] WLD-508740-PRO-001, *Radiological Disposition and Clearance of Buildings, Lands and Materials*.

[6-6] 900-508740-PRD-001, *CNL Radiation Protection Program Requirements*.

[6-7] SOR/2000-207, Canadian Nuclear Safety Commission, *Nuclear Substance and Radiation Devices Regulation*.

[6-8] 191-508740-610-000-0002, *Radiological Clearance Surveys of Materials and Equipment from Buildings*.

[6-9] US NUREG-1575, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*, Revision 1.

[6-10] US NUREG-1575, *Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual (MARSAME)*, Supplement 1.

[6-11] 900-508740-STD-012, *Contamination Levels*.

[6-12] WL-509420-REPT-001, *WL Screening Soil Cleanup Criteria*.

[6-13] WLDP-2600-ENA-001, *Environmental Impact Statement: In Situ Decommissioning of Whiteshell Reactor # 1*, Revision 1, 2017 September.

REDACTED

7. REGULATORY AND ENVIRONMENTAL ASSESSMENT CONSIDERATIONS

Decommissioning of the WL nuclear facilities will be conducted in accordance with the requirements of the licence [7-1], applicable laws and regulations that are set out in a number of federal statutes and agreements, including the following:

- Nuclear Safety and Control Act
- General Nuclear Safety and Control Regulations
- Radiation Protection Regulations
- Class I Nuclear Facilities Regulations
- Canadian Environmental Assessment Act
- Canadian Environment Protection Act
- Nuclear Liability Act
- Transportation of Dangerous Goods Act
- Radiation Emitting Devices Act
- Access to Information Act
- Canada/IAEA Safeguards Agreements

The licensing basis contained in the licence [7-1] and in the accompanying LCH [7-2] sets the boundary conditions for acceptable performance at WL or for a regulated activity, and thus establishes the basis for the CNSC's compliance program with respect to WL or that regulated activity. Canadian Nuclear Laboratories will operate WL in accordance with the licensing basis. If any changes to the documents included or referenced in the licence [7-1] are required, CNL will assess them for impact on the licensing basis as related to the provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

The work described in individual DDPs will comply with all applicable provincial and federal regulations, and align with current standards and best practices. The federal and provincial agencies involved in the WL decommissioning project include:

- AECL - oversight
- CNSC
- Natural Resources Canada
- Environment and Climate Change Canada
- Health Canada
- Department of Fisheries and Oceans
- Canadian Environmental Assessment Agency
- Transportation Canada
- Labour Program
- Manitoba Sustainable Development
- Manitoba Department of Transportation
- Manitoba Labour Board
- Indigenous and Northern Affairs Canada
- Canada Revenue Agency

REDACTED

Decommissioning of the WL nuclear facilities will also be conducted in accordance with the CSA Standard N288.6 [7-3], and the CNSC Regulatory Guide, G-219 [7-4], and will meet CNL requirements as specified in Decommissioning Program Description and Program Requirements Documents [7-5] [7-6], and the WL Decommissioning QAP [7-7]. Decommissioning activities will be undertaken only under approved decommissioning plans. With respect to the approved strategy for the WL site decommissioning project including WR-1 (i.e., complete removal), there is no further need for environmental assessments since the project is not likely to cause significant adverse environmental effects [7-8].

The WL Decommissioning Project addresses the entire site including all of the site facilities, buildings, infrastructure and land, and the current licence for WL [7-1] authorizes the project to carry out the decommissioning activities.

The current WL licence [7-1] would require an amendment to include the WR-1 ISD approach. This overview document is designed to serve as the licensing basis document to support decommissioning of the WL site. The Detailed Decommissioning Plans for individual facilities at WL will be prepared and submitted to the CNSC prior to undertaking decommissioning work.

To meet the requirements for an Environmental Assessment, a Comprehensive Study Report for the entire decommissioning project was prepared: Volume 1 – Main Report [7-9]; Volume 2 - Appendices [7-10]; and Volume 3 - Addendum [7-11], and was approved. This previously approved strategy was to completely remove all buildings and structures at WL, including WR-1. However, CNL recently proposed an ISD strategy for WR-1 and an EA is currently in progress to support and address this change [7-12].

7.1 References

The following references were current at the time of development of this DDP. Where a reference is to be complied with, ensure the latest revision is used.

[7-1] NRTEDL-W5-8.00/2024, *Nuclear Research and Test Establishment Decommissioning Licence for Whiteshell Laboratories*.

[7-2] WLD-508760-HBK-002, *Licence Conditions Handbook for Whiteshell Laboratories*.

[7-3] CSA Standard, N288.6-12, *Environmental Risk Assessments at Class I Nuclear Facilities and Uranium Mines*.

[7-4] Regulatory Guide, G-219, *Decommissioning Planning for Licensed Activities*.

[7-5] 900-508300-PDD-001, *Decommissioning and Demolition*.

[7-6] 900-508300-PRD-001, *Decommissioning and Demolition*.

[7-7] WLD-508300-QAP-001, *Whiteshell Decommissioning Quality Assurance Plan*, Revision 2.

[7-8] https://ceaa-acee.gc.ca/default.asp?lang=En&xml=7CE78B85-3486-4BE8-957A-DE3054DC531B

[7-9] WLDP-03702-041-0888-0008, *Whiteshell Laboratories Decommissioning Project Comprehensive Study Report, Volume 1: Main Report*, Revision 2, 2001 March.

[7-10] WLDP-03702-041-000-0009, *Whiteshell Laboratories Decommissioning Project Comprehensive Study Report, Volume 2: Appendices*, Revision 2, 2001 March.

[7-11] WLDP-03702-041-000-010, *Whiteshell Laboratories Decommissioning Project Comprehensive Study Report, Volume 3: Addendum*, Revision 0, 2001 November.

[7-12] https://ceaa-acee.gc.ca/050/evaluations/proj/80124?culture=en-CA

REDACTED

8. ENVIRONMENTAL MONITORING

Canadian Nuclear Laboratories' Environmental Policy, issued under the authority of the CNL Board of Directors, states CNL's commitment to protecting the environment and establishes the overall principles and goals for environmental responsibility and performance expected of all CNL employees. Canadian Nuclear Laboratories maintains a comprehensive Environmental Protection Program [8-1] [8-2], which is applicable to CNL operated sites including the WL site, and ensures compliance with legal and other environmental obligations. The program is designed to ensure that radiation doses, as a result of releases of radioactive material in site effluents, remain well below the annual dose limits for members of the public specified in CNSC Regulations [8-3], and ALARA, economic and social factors being taken into account. Canadian Nuclear Laboratories sets the standards and controls for monitoring radioactive and non-radioactive emissions at CNL operated sites.

Environmental performance at WL is assessed through an integrated Environmental Monitoring Program [8-4], which is comprised of three distinct programs: the Environmental Monitoring Program, the Effluent Verification Monitoring Program, and the Groundwater Monitoring Program. Together, these three Programs comprise contaminant pathway monitoring at WL, enabling the tracking of radiological and non-radiological contaminants throughout the different compartments of the geosphere, atmosphere, and biosphere. Environmental monitoring includes measurement of ambient gamma radiation, as well as sampling and analysis of drinking water, air, fish, wild game, garden produce, and river sediments. An integrated approach to environmental monitoring means that the evaluation of impacts on the environment from WL facilities and operations is carried out in a logical, comprehensive manner and is used to demonstrate compliance and protection of the environment and health and safety of the public.

8.1 Environmental Monitoring Program

Environmental Monitoring is performed to assist in determining the effect of emissions in the environment surrounding the site or facility, and consists of measuring or estimating nuclear and hazardous substances present in the environment.

The primary objectives of the WL Environmental Monitoring Program [8-4] are:

- To assess the level of risk on human health and safety, and the potential biological effects in the environment of the contaminants and physical stressors of concern arising from the facility.
- To demonstrate compliance with limits on the concentration and/or intensity of contaminants and physical stressors in the environment or their effect on the environment.
- To check, independently of effluent monitoring, on the effectiveness of containment and effluent control, and provide public assurance of the effectiveness of containment and effluent control.
- Further to the objective described above, which provides an indication on effectiveness of effluent control, where waste storage facilities and contaminated lands exist, the objective is to provide an indication of unusual or unforeseen conditions that might require corrective action or additional monitoring such as groundwater monitoring, and
- To verify the predictions made by an Environmental Risk Assessment (ERA) (or equivalent), DRL model, and/or EA, refine the models used in the ERA (or equivalent), DRL model and/or EA, or reduce the uncertainty in the predictions made by the ERA (or equivalent), DRL model and/or EA.

REDACTED

The following secondary objectives are also considered in the design of the Environmental Monitoring Program [8-4]:

- To provide data required to support site restoration programs, site operations or to plan for future stages of the facility lifecycle (e.g., decommissioning).
- To provide resources and data that can be of value during the response to an accident or upset, and in the recovery from such an event.
- To demonstrate due diligence.
- To meet a stakeholder commitment, and
- For other business purposes (e.g., monitoring emissions to support international treaties).

8.2 Effluent Verification Monitoring Program

The Effluent Verification Monitoring Program is intended primarily to verify that emissions are below regulatory limits and consists of measuring or estimating nuclear and hazardous substances being released into the environment by a site or facility.

The primary objectives of the Effluent Verification Monitoring Program [8-4] are:

- To demonstrate compliance with regulatory emission limits and any other regulatory requirements (e.g., Action Levels) concerning the emission of nuclear/hazardous substances from the source.
- To demonstrate adherence to internal levels set on emission amounts (e.g., Administrative Levels or Internal Investigation Levels), for purposes of effluent control.
- To confirm the adequacy of controls on emissions from the source.
- To provide an indication of unusual or unforeseen conditions that might require corrective action or additional monitoring.
- To provide data to assess the level of risk on human health and safety, and the potential biological effects in the environment of the nuclear/hazardous substances of concern released from the facility, and
- To confirm predictions in environmental assessments.

The following secondary objectives are also considered in the design of the Effluent Verification Monitoring Program [8-4]:

- To provide data for trend analysis.
- To provide assurance to employees and the public on the effectiveness of effluent control.
- To provide data which, when combined with the results of environmental monitoring and modelling, can be used to test or refine the models of the environment used in the ERA (or equivalent) or dose/exposure assessments.
- To provide baseline data and capability for monitoring and assessment in emergency conditions, and
- Other business purposes (e.g., demonstrating due diligence, meeting a stakeholder commitment, etc.).

Monitoring locations for airborne and liquid effluent streams are representative of the final discharge to the off-site environment, and may include the combined discharge from a number of facilities at WL. Additional monitoring points are maintained at upstream locations as an aid in identifying the specific sources of emissions. Sampling system design ensures that samples are representative of the total content of the stream at each location. The effluent monitoring locations/effluent streams at WL are shown in Figure 8-1.

REDACTED

Effluent streams at WL are monitored for all groups of radionuclides that are likely to be present. Air effluents from [redacted] and [redacted] are sampled continuously throughout the year. The primary source of liquid radioactive effluents is the process water outflow (Outfall), which discharges continuously to the Winnipeg River. The discharge from the Outfall is composed of storm water runoff from paved roadways or around buildings, cooling water used in process facilities, and holding tank discharges including those from the active liquid waste treatment system tanks based in [redacted] and [redacted] The current airborne and liquid effluent monitoring locations are shown in [8-5].

For each of the monitored streams, routine reports provide information on:

- The period monitored.
- Total weekly effluent volume (m^3) discharged.
- Total release (loading) Bq of each monitored parameter for the week.
- A summary of any failures or unavailability of measurements or equipment.

REDACTED

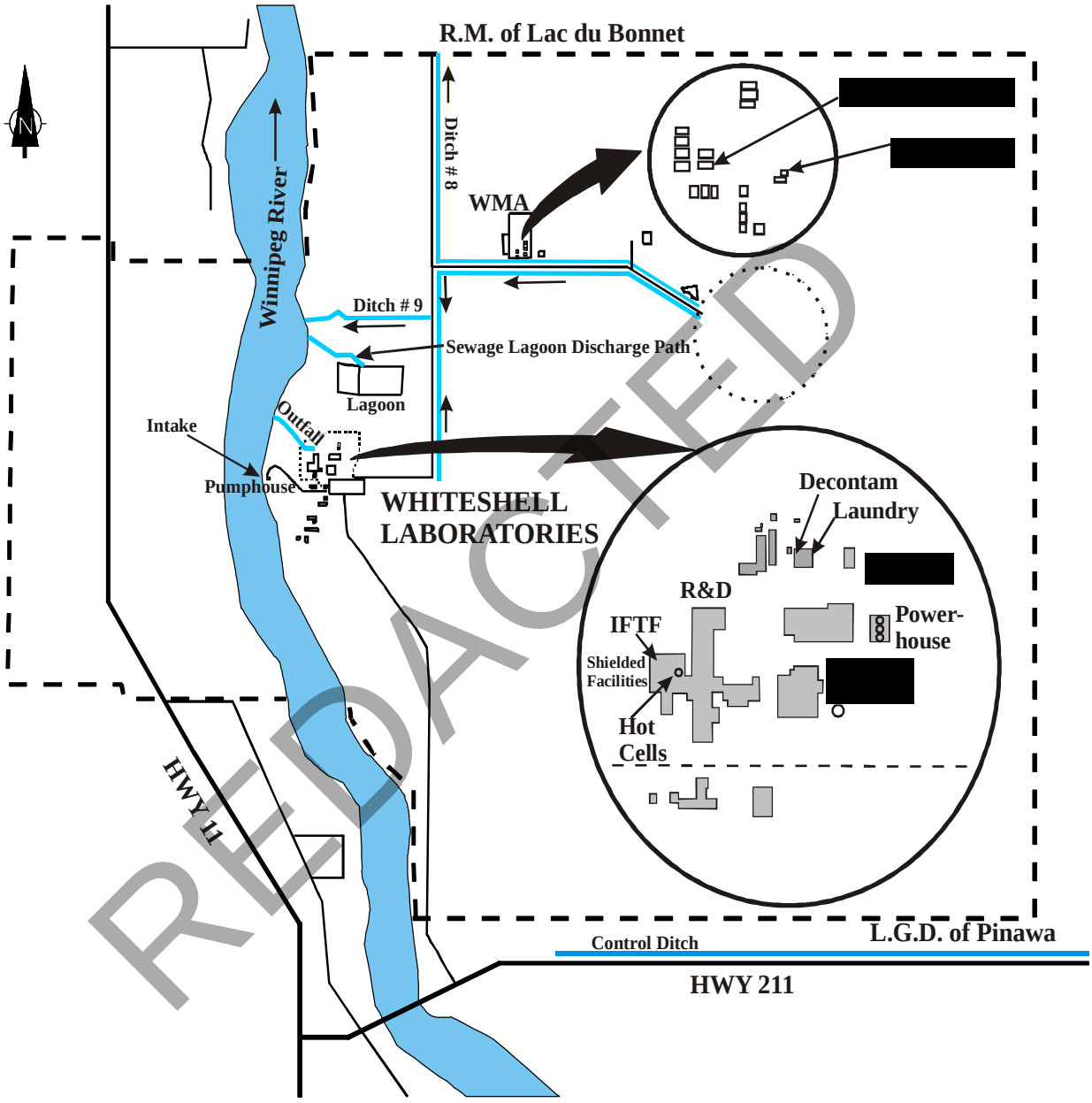


Figure 8-1 Effluent Monitoring Locations

8.3 Groundwater Monitoring Program

The groundwater monitoring plan includes a variety of activities focussed on producing a defensible program based on the hydrogeologic characteristics and an optimization strategy aimed at an efficient use of resources. The key aspects of the plan include:

- Evaluating regional influences of precipitation, Seven Sister's Dam, and Winnipeg River levels.
- Evaluating local influences, such as water withdrawals from any wells or structures within or outside the WMA.
- Documenting waste storage characteristics.

- Evaluating discharge/recharge gradients in the WMA.
- Optimizing radiological and non-radiological groundwater analysis locations.
- Program for the ongoing maintenance of the well network assets.
- Optimizing the water level program schedule and methodology, and
- Completing an annual monitoring program review.

The objective of the Groundwater Monitoring Program [8-6] is to:

- Develop a scientifically defensible monitoring plan that is linked to the hydrogeologic characteristics and regulatory requirements for the site and includes an optimization strategy for data collection, interpretation and reporting.

8.4 Monitoring and Surveillance

Environmental monitoring during the decommissioning period will be conducted in accordance with the Environmental Protection Program [8-1] [8-2].

A post-decommissioning monitoring program will be established for those areas where a potential need is identified, such as in remediated sites, or areas such as the WMA where low level radioactive materials may remain in situ. The degree of M&S established for each area will be commensurate with radiological hazards or other hazards.

While baseline information is available with respect to most of the decommissioning activities to be undertaken, in some circumstances, baseline information may need to be gathered in order to define and carry out follow-up activities. The Comprehensive Study Report [8-7] [8-8] [8-9] identifies follow-up monitoring programs requirements for the WMA, the Landfill and the Sewage Lagoons.

8.5 Factors Affecting Scope of Monitoring

Monitoring requirements will change in terms of monitoring frequency, duration, monitoring pathways, and type over the course of decommissioning and following the completion of decommissioning. Depending on the decommissioning project, monitoring requirements may also change from one decommissioning project to another in terms of contaminants of interest and decommissioning methods used. These changes will reflect not only changes in regulatory requirements and technological advancements, but also the characteristics of the effects being monitored. Air quality monitoring, for example, will have only relatively short term monitoring requirements because air quality generally is only affected during construction/demolition related activities. In addition, the type of air quality monitoring will depend on the specific activity being undertaken; remediating contaminated interior spaces requires a different type and scale of air quality monitoring than that required during demolition. The frequency and type of monitoring will continue to be evaluated over time. Monitoring will be adjusted to reflect findings from the monitoring activities. Cessation of a monitoring activity will occur once it can be shown that an effect has stabilized or has been reduced to a level where it is no longer considered significant by regulatory or other standards such as community concerns.

In the event that an unanticipated effect develops from the decommissioning activities, special surveys would be developed to assess and monitor the effect. Appropriate mitigation measures would evolve from the monitoring and surveying activities.

REDACTED

8.6 Environmental Effects

The EA requirements and the potential environmental effects of the proposed decommissioning program at WL are documented in WL Decommissioning Project Comprehensive Study Report [8-7] [8-8] [8-9]. In addition, the potential environmental effects of the proposed ISD of WR-1 is described in the Environmental Impact Statement [8-10].

All decommissioning work will be conducted in accordance with CNL's approved policies, programs and procedures to ensure the protection of the environment. Adherence to CNL's Environmental Protection Program [8-1] [8-2] will mitigate the above effects. Monitoring for dust and odour may also be carried out during the active decommissioning and remediation stages. The Environmental Assessment Follow-Up Program [8-11] includes provision for air and dust monitoring during decommissioning. Other types of monitoring (e.g., soil, surface water/vegetation and groundwater monitoring) will be routinely performed per requirements of the Comprehensive Study Report [8-7] [8-8] [8-9] and the Environmental Assessment Follow-Up Program [8-11].

The conclusion from the Comprehensive Study Report [8-7] [8-8] [8-9] is that this decommissioning project is not likely to cause significant adverse environmental effects, if all mitigation measures in the Comprehensive Study Report are implemented.

All environmental aspects of this project will be considered in the Environmental Evaluations pertaining to the decommissioning activities. Environmental Evaluations will indicate the required mitigation measures to deal with each environmental aspect or hazard.

It is an objective of CNL to have all work, including recycling work, performed in an environmentally responsible manner as per the Environmental Protection Program [8-1]. All decommissioning activities will be planned and implemented in accordance with federal and provincial regulations and guidelines.

8.7 References

The following references were current at the time of development of this DDP. Where a reference is to be complied with, ensure the latest revision is used.

[8-1] 900-509200-PDD-001, *Environmental Protection*.

[8-2] 900-509200-PRD-001, *Environmental Protection*.

[8-3] SOR/2000-202, *General Nuclear Safety and Control Regulations*.

[8-4] WL-509200-OV-001, *Whiteshell Laboratories' Integrated Monitoring Program Framework*.

[8-5] WL-00583-ACMR-2018, *Whiteshell Laboratories Annual Compliance Monitoring Report for 2018*, Revision 0, 2019 April.

[8-6] WLDP-03705-041-000-0022, *Monitoring Plan for the Ongoing Assessment of the WMA, Lagoon and Landfill Physical and Chemical Hydrogeological Conditions*.

[8-7] WLDP-03702-041-000-0008, *Whiteshell Laboratories Decommissioning Project Comprehensive Study Report, Volume 1: Main Report*.

[8-8] WLDP-03702-041-000-0009, *Whiteshell Laboratories Decommissioning Project Comprehensive Study Report, Volume 2: Appendices*.

REDACTED

[8-9] WLDP-03702-041-000-0010, *Whiteshell Laboratories Decommissioning Project Comprehensive Study Report, Volume 3: Addendum*.

[8-10] WLDP-26000-ENA-001, *Environmental Impact Statement – In Situ Decommissioning of WR-1 at the Whiteshell Laboratories Site, Pinawa, Manitoba*.

[8-11] 03704-001, *Environmental Assessment Follow-Up Program for Whiteshell Laboratories*, Revision 1, 2002 June.

9. PROGRAM MANAGEMENT

9.1 Organization

Canadian Nuclear Laboratories' organizational structure is established by the Canadian National Energy Alliance (CNEA) Board of Directors on recommendation of CNL's President and Chief Executive Officer (CEO). Responsibility for the management and operations of each element of its structure is assigned to Executives and senior management reporting to the President and CEO. CNL's current organizational structure is provided in CNL's Annual Compliance Monitoring Report (e.g., Reference [9-1]).

Projects within the WL Decommissioning Project will be executed under the responsibility of the WL Closure Project within CNL's Environmental Remediation Management Organization.

The overall organizational structure is described in the CNL Management System Manual [9-2] and the Whiteshell Laboratories Organization [9-3]. A depiction of the current WL project management structure is presented in [9-3].

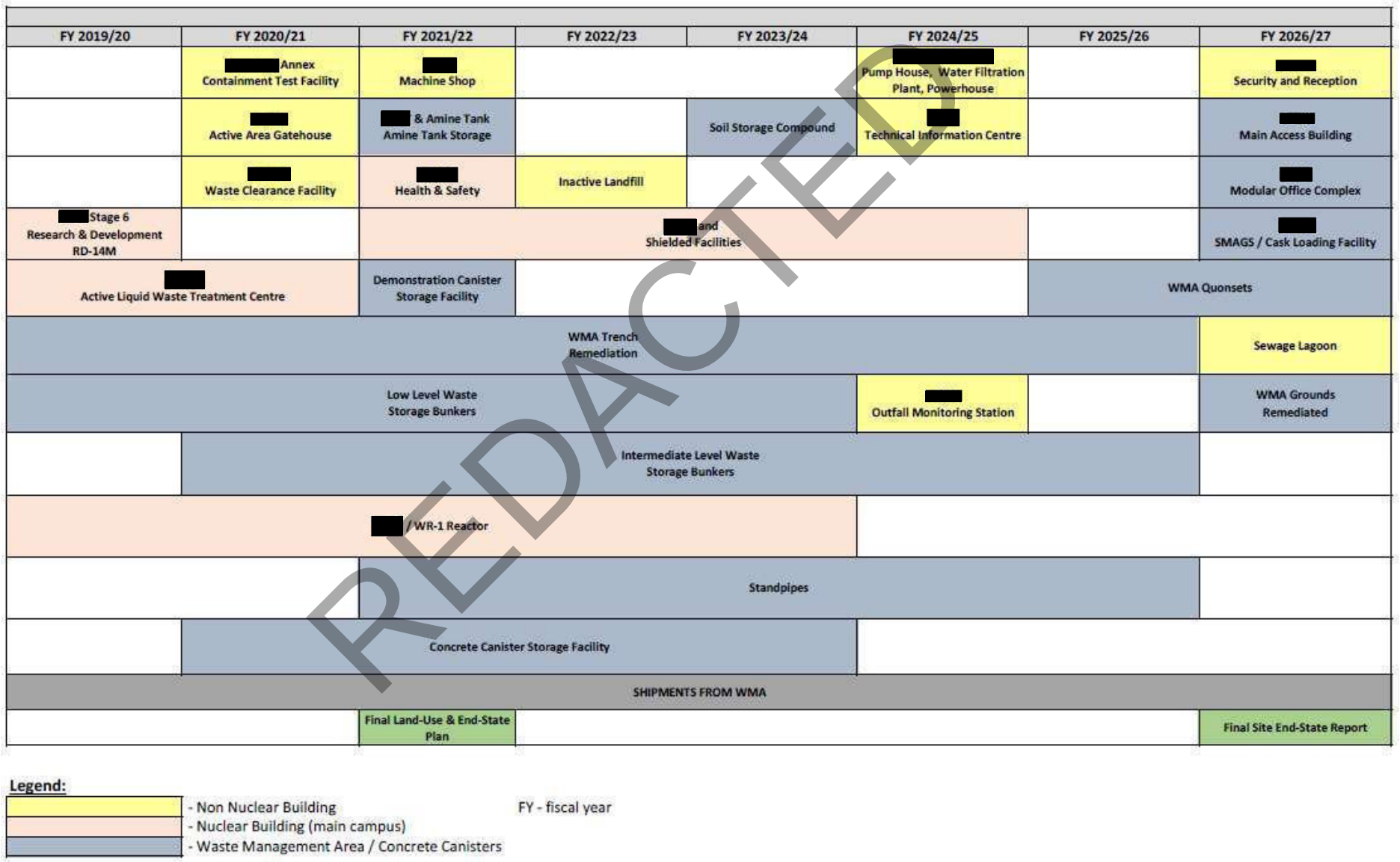
The WL Site Head & General Manager is the Site Licence Holder for the WL site. The responsibilities of the Site Licence Holder are described in the CNL Management System Manual [9-2].

The current list of individuals with responsibility for nuclear and non-nuclear facilities and buildings at WL is maintained in Responsibility for Facilities and the Safety of Operations at the Whiteshell Laboratories [9-4].

REDACTED

9.2 Schedule

A preliminary project schedule for the WL decommissioning activities is presented in Figure 9-1. More detailed schedule of decommissioning activities will be provided in the subsequent volumes of DDPs.



REDACTED

Figure 9-1 Preliminary Whiteshell Project Schedule

9.3 Funding, Cost Estimate and Financial Guarantee

The Whiteshell Laboratories Closure Project is funded by the Government of Canada through AECL. A private consortium, Canadian National Energy Alliance, was awarded a contract in 2015 to complete the project. A baseline cost estimate was prepared for the project and documented in the Performance Baseline Plan.

Cost estimates for this and other decommissioning work at WL is provided in Reference [9-5].

Pursuant to Licence Condition 1.5 of the Whiteshell Nuclear Research and Test Establishment Decommissioning Licence, NRTEDL-W5-8.00/2024 [9-6], CNSC was previously sent a letter from the Honorable G. Rickford [9-7], advising that as an agent of Her Majesty in Right of Canada, AECL's liabilities associated with the decommissioning of WL are ultimately liabilities of Her Majesty in Right of Canada (note: AECL retains ownership of the lands, assets and liabilities associated with CNL's licences).

9.4 References

The following references were current at the time of development of this DDP. Where a reference is to be complied with, ensure the latest revision is used.

[9-1] 145-00583-ACMR-2019, *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories for 2019*.

[9-2] 900-514100-MAN-001, *CNL Management System Manual*.

[9-3] WL-514100-ORG-002, *Whiteshell Laboratories Organization*.

[9-4] WL-508200-PRO-212, *Responsibility for Facilities and the Safety of Operations at the Whiteshell Laboratories*.

[9-5] WL-508760-PLA-002, *Whiteshell Laboratories Cost Estimate Submission to Support Licence Conditions Related to Financial Guarantee*.

[9-6] NRTEDL-W5-8.00/2024, *Whiteshell Nuclear Research and Test Establishment Decommissioning Licence*.

[9-7] Honorable G. Rickford, P.C., M.P., Minister of Natural Resources Canada, Letter to M. Binder, President and Chief Executive Officer, Canadian Nuclear Safety Commission, 2015 July 31.

10. PUBLIC INFORMATION

10.1 Public and Indigenous Communication

Canadian Nuclear Laboratories is committed to organizational transparency, ensuring that Indigenous communities, the general public, local communities, elected and appointed government officials and other industry stakeholders are properly informed about activities carried out at all CNL's sites including Whiteshell Laboratories. This commitment is met through CNL's Public Information Program (PIP) [10-1]. CNL's PIP fulfils the requirements of the CNSC's Regulatory Document REGDOC-3.2.1, Public Information and Disclosure [10-2]. CNL's PIP includes specific communications to stakeholders and public access to information related to routine activities, radiological and non-radiological emissions, non-routine items or events and environmental and performance reporting.

REDACTED

The WL site maintains the public information program to ensure that the general public and Indigenous communities have access to information on the proposed decommissioning program. The WL specifically communicates with:

- WL based CNL Employee Unions;
- Emergency Measures Manitoba Organization;
- Sagkeeng First Nation;
- Brokenhead Ojibway Nation;
- Black River First Nation;
- Hollow Water First Nation;
- Wabaseemoong Independent Nations;
- Grand Council of Treaty 3;
- The Public Liaison Committee;
- Manitoba Metis Federation (MMF);
- Local business partners (e.g., Pinawa Chamber of Commerce and Lac du Bonnet and district Chamber of Commerce);
- Local government officials/committees:
  - Local Government District (LGD) of Pinawa
  - Town of Lac du Bonnet
  - Rural Municipality (RM) of Lac du Bonnet
  - Community of Whitemouth
  - Town of Beausejour
  - Town of Powerview Pine Falls
  - RM of Alexander
  - Government of Canada – Minister and Department of Natural Resources, local Members of Parliament, Provincial; and
- Environmental Groups & Organizations (ENGOs) and citizens groups (Concerned Citizens of Manitoba, Whiteshell Cottagers Association, Manitoba Cottagers Association, Eastman Tourism, and the Whiteshell Laboratories Community Economic Regeneration Partnership).

REDACTED

10.2 Communication Modes

Canadian Nuclear Laboratories uses various communication modes to reach specific audiences (e.g., neighbouring communities, industry, customers, employment prospects, etc.). All communication products are maintained and kept up to date, this includes the dedicated corporate website (www.cnl.ca), posters, advertisements, recruitment materials, and related products. These communication products also serve to record comments and feedback received, and any actions taken to address them. Additionally, WL prepares engagement reports and share them with neighbouring Indigenous communities and the regulators.

10.3 Whiteshell Public Liaison Committee

The Public Liaison Committee (PLC) of WL is an independently facilitated council and comprised of regional representatives, members designated by local councils, and representatives from CNL. The PLC provides opportunities to key stakeholder for dialogue and feedback. The council openly discusses a broad range of matters of mutual interest to both CNL and the community and provides ongoing and consistent two-way

interactions with community stakeholders on the decommissioning activities of the WL. The PLC meets two times a year. The information about routine activities, radiological and non-radiological emissions and non-routine items or events is shared with PLC members through email notifications, regularly scheduled meetings, and briefings, tours of the WL site, reports, news, and community meetings.

10.4 Whiteshell Closure Project

CNL has been engaging and will continue to engage Indigenous communities, the general public, local communities, elected and appointed government officials and other industry stakeholders about the Whiteshell Closure Project activities.

In April of 2000, CNL submitted a draft of the Comprehensive Study Report to the CNSC covering safety aspects of the proposed decommissioning approach of complete dismantlement and removal of all buildings, structures, systems and components including WR-1. This Comprehensive Study Report was also made available to and consultations took place with the public, Indigenous and expert federal departments. The comments received from the federal experts, Indigenous communities and the public were addressed and included in the Comprehensive Study Report. The updated Comprehensive Study Report Volume 1 was submitted to the public and Indigenous communities again [10-3]. The comments received and their dispositions were captured in Volume 2 of the Comprehensive Study Report [10-4]. An addendum to the Comprehensive Study Report (Volume 3) [10-5] was prepared and submitted to the federal Minister of the Environment for decision. On 2002 April 02, the Environment Minister made the decision that the proposed Whiteshell Laboratories Decommissioning project is not likely to cause significant adverse effects, and that no further environment assessment by a review panel or mediation is warranted [10-6].

In recent years, CNL has consulted and engaged the public and Indigenous groups on activities related to the WL Closure Project. The long-standing Public Liaison Committee mentioned above has been engaged twice yearly to provide an update on decommissioning activities at WL, and an opportunity for facilitated discussion and feedback on activities and plans for site closure.

There have been a multitude of public information sessions in the region regarding the proposed in situ disposal of the WR-1 reactor. Included in these sessions have been information poster boards on other site closure activities, and CNL had staff available to engage on this topic. At First Nations and Métis engagements, CNL provided an overview of the WL site that included information on site closure activities. CNL also fielded questions at these engagements on site closure plans and had the appropriate staff available to answer these questions.

CNL has also participated in numerous public events, such as the Lac du Bonnet trade fair where material and staff were available to engage on site closure activities.

CNL has provided numerous public, Indigenous, government and other stakeholder tours. On these tours, CNL included an introductory presentation and had the appropriate staff on hand. Environmental monitoring is a key concern expressed by Indigenous communities. CNL has invited the MMF and First Nations Peoples to directly observe components of the WL Environmental Monitoring program. CNL has also sought input on valued species.

In the summer of 2019, WL hosted a public open house with over 300 attendees. There were posters and other displays related to the decommissioning activities on site. As part of this open house, CNL provided a narrated bus tour that included the main parts of the site.

REDACTED

Throughout all these engagements, there were no concerns raised specific to the scope of this DDP, other than what is being documented as part of the Environmental Assessment for the proposed in situ disposal of the WR-1 reactor.

10.5 References

The following references were current at the time of development of this DDP. Where a reference is to be complied with, ensure the latest revision is used.

[10-1] CW-513430-REPT-001, *Public Information Program for Canadian Nuclear Laboratories (CNL)*.

[10-2] CNSC Regulatory Document, REGDOC-3.2.1, *Public Information and Disclosure, Public and Aboriginal Engagement*, 2018 May.

[10-3] WLDP-03702-041-000-0008, *Whiteshell Laboratories Decommissioning Project Comprehensive Study Report Volume 1: Main Report*, Revision 2, 2001 March.

[10-4] WLDP-03702-041-000-0009, *Whiteshell Laboratories Decommissioning Project Comprehensive Study Report Volume 2: Appendices*, Revision 2, 2001 March.

[10-5] WLDP-03702-041-000-0010, *Whiteshell Laboratories Decommissioning Project Comprehensive Study Report Volume 3: Addendum*, Revision 0, 2001 November.

[10-6] https://ceaa-acee.gc.ca/default.asp?lang=En&xml=7CE78B85-3486-4BE8-957A-DE3054DC531B.

11. RECORDS MANAGEMENT

Canadian Nuclear Laboratories maintains a Records Management System to ensure that records are categorized, registered, retrievable, and properly managed in a controlled environment. The records management process ensures that essential (permanent) and non-essential (non-permanent) records are identified, maintained, stored, retained, and routinely inspected to ensure their preservation and protection from loss, deterioration, or destruction in accordance with CNL requirements. As well, retention periods that meet regulatory requirements are assigned to each record and these determine whether a record is a permanent or non-permanent record. Records generated during the planning and execution of a project are filed in CNL's Electronic Document Records Management System (EDRMS). To ensure the traceability of requirements and documentation, EDRMS parent/child associations are used and a hierarchy of project documents and records is created.

11.1 Decommissioning Records

All project records and documentation will be prepared, issued, and archived as per the WL Decommissioning QA Plan [11-1].

11.2 References

The following references were current at the time of development of this DDP. Where a reference is to be complied with, ensure the latest revision is used.

[11-1] WLD-508300-QAP-001, *Quality Assurance Plan Whiteshell Decommissioning*.

REDACTED

APPENDIX A RADIOLOGICAL SAFETY ZONE DESCRIPTION

To allow for the effective provision of radiation protection within Controlled Areas, workplaces are organized into radiological safety zones, based on anticipated radiation dose rates and contamination levels during routine operation. The zoning level reflects the type and level of radiation and contamination hazards in a workplace and the extent that access control and radiation protection measures are required to control contamination and radiation exposure.

The CNL zoning system categorizes work areas into 1 of 5 radiological safety zones that reflect the external radiation and contamination hazards in a work area. The greater the level of the zone, the greater the potential hazard and the degree operational measures needed to control radiation exposures and contamination. The overall zoning is the highest of the radiation zoning and contamination zoning level.

Table A-1 provides a general description of each zone level and Table A-2 summarises the levels of radiation and contamination that could be encountered in each zone. Table A-3 gives the CNL RP Program maximum allowable surface contamination levels for unrestricted use of materials, equipment and clothing.

Table A-1 Radiological Safety Zone Description

Zone	Description
1	No radiological hazard work place: • Contamination and radiation hazard free zone. • Normally contains no radioactive material or sources. • Considered suitable for unrestricted and full-time occupancy for all employees. • Examples include hallways, washrooms, non-radiological labs, roadways, outside buildings.
2	Low radiological hazard workplace: • Normally free of radioactive contamination, but may contain sources of contamination exposures. May be subject to infrequent cross-contamination from work activities or higher numbered zones. Efforts are made to eliminate removable contamination upon discovery. • Low level whole-body dose rates may exist. • Considered to be suitable for full-time occupancy for Nuclear Energy Workers. • Examples includes low level radioisotope labs, nuclear facility main work areas.
3	Moderate radiological hazard workplace: • Regular entry and work restricted to nuclear energy workers with suitable RP training. • Activities may permitted that generate low level loose surface contamination in localized areas, and for short periods of time. May require the use of personal protective clothing and respirators. Areas decontaminated to the extent possible following completion of work. • Considered a zone of medium occupancy, and such occupancy is subject to continuing review by line management and Group 1 employees. • Examples include moderate and high radioisotope laboratories, decontamination areas, active liquid tank rooms, contaminated crawlspaces, reactor bays, low level solid radioactive waste storage bunkers.

REDACTED

Zone	Description
4	High radiological hazard workplace: • Entry and work only if justified and restricted to nuclear energy workers with suitable RP training. • High radiation dose rates and loose surface and airborne contamination hazards may exist. • Well established procedures and practices required to prevent workers receiving significant radiation exposures and internal contamination intakes. This includes use of personal alarming dosimeters and personal protective clothing and respirators. • Considered a zone of restricted occupancy, with access and work controls enforced. • Examples include hot cell isolation rooms, intermediate level liquid waste process rooms, intermediate level solid radioactive storage bunkers, reactor loop rooms.
5	Very High radiological hazard workplace: • Normally not an area suitable for human occupancy. • Entry is normally by exception and requires action to reduce or mitigate radiation and contamination hazards prior to entry. • All entries require radiological work planning in which the radiological assessments and radiation protection measures are approved by a Group 1 Health Physicist. In addition, all such entries shall require the constant attention and direction of a Group 1 RP Surveyor. • Examples include interior of hot cells, warm cells or Pu handling glove boxes; reactor lower access areas when operating.

REDACTED

Table A-2 Classification of Radiological Safety Zones

Zone	Radiation Hazard Description	General (Accessible) Whole Body Dose Rate Levels	General (Accessible) Removable Surface Contamination Levels*
1	Very Low	≤ 0.5 µSv/h (50 µrem/h)	< values in Table A-3**
2	Low	> 0.5 µSv/h (50 µrem/h) ≤ 10 µSv/h (1 mrem/h)	< values in Table A-3**
3	Moderate	> 10 µSv/h (1 mrem/h) ≤ 1.0 mSv/h (100 mrem/h)	≤ 10 times values in Table A-3
4	High	> 1.0 mSv/h (100 mrem/h ≤ 100 mSv/h (10 rem/h)	>10 times values in Table A-3
5	Very High	> 100 mSv/h (10 rem/h)	> 10 times values in Table A-3 and where based on a Group 1 Health Physicist judgement airborne contamination levels and/or external beta radiation fields present an acute hazard such that unplanned doses could realistically exceed regulatory limits or deterministic threshold level.

Note:

* Removable radioactive surface contamination levels higher than those specified in Table A-3 should only be allowed for zones within a Controlled Area. Exceptions shall only be short-term in nature and shall be individually justified to and authorized by the responsible RP Program Manager. Neither removable nor fixed contamination higher than the values in Table A-3 is allowed in Zone 1 areas.

** Maximum permissible Levels on any surface.

REDACTED

Table A-3 Administrative Release Levels and Maximum Release Limits for Surface Contamination

Radionuclide	Removable[1] (Bq/cm^2)	Total Surface Activity (Bq/cm^2)	
		Administrative Level[2]	Maximum Limit[3]
Alpha emitters, except U-nat, depleted U, LEU[4], Th-nat	0.01	0.2	0.4
U-nat, depleted U, LEU[4], Th-nat	0.2	1.0	4.0
Sr-90[5], radioiodines	0.05	1.0	4.0
Beta-gamma emitters[6], except pure beta emitters with E_{max}≤0.15 MeV	0.2	1.0	4.0
H-3, C-14, pure beta emitters with E_{max}≤0.15 MeV	2	10	40

[1] Removable means the surface contamination removed by and measured on a swipe. For comparison to values in this table, the removable surface contamination is determined by swiping a surface and assessing the amount of radioactive material on the swipe, divided by the area over which the swipe was taken (i.e., the total area covered by the actual physical path of the swipe, not the area bounding the extent of the area swiped).

[2] Target surface activity values apply to the average activity measured over the survey unit. Activity in any 100 cm^2 area can exceed the target values if the activity is less than 3 times the target values and the average surface activity within 1 m^2 around the area of elevated activity (including the area of elevated activity) is less than the target value. Removable surface activity measurements should be over a 100 cm^2 area.

[3] Maximum surface activity values applies to the surface activity averaged over any 300 cm^2 area over the surface unit or the entire object if the area is less than 300 cm^2. For floors, walls and large containers may be applied to the surface activity averaged over any 1,000 cm^2 area.

[4] LEU = Low-Enriched Uranium (<20% by weight of U-235).

[5] This category of radionuclides applies to Sr-90 and radioiodines that have been separated from other fission products and mixtures where the Sr-90 has been enriched. It does not include mixed fission products that have Sr-90 and radioiodines present in them.

[6] This category of radionuclides includes mixed fission products, including the Sr-90 and radioiodines which are present in them. It does not apply to Sr-90 and radioiodines which have been separated from the other fission products or mixtures where the Sr-90 has been enriched.

REDACTED

APPENDIX B TABLE OF CONTENTS FOR FINAL END-STATE REPORT

1. INTRODUCTION
2. DECOMMISSIONING SUMMARY
    2.1 Scope of Work
    2.2 Summary of Work Completed
    2.3 Deviations from Detailed Decommissioning Plan
    2.4 Deviations from Work Plan
    2.5 Hazards and Dose Summary
        2.5.1 Radiological Hazards
        2.5.2 Non-Radiological Hazards
    2.6 OPEX and Lessons Learned
        2.6.1 OPEX
        2.6.2 Lessons Learned
            2.6.2.1 Opportunities for Improvement
            2.6.2.2 Project Successes
3. END STATE
    3.1 Reference End-State
    3.2 Deviations from Detailed Decommissioning Plan End-State
    3.3 Status
    3.4 Radiological Status
    3.5 Environmental Status
4. WASTE SUMMARY
    4.1 Waste Characterization and Disposition
    4.2 Radioactive Waste
    4.3 Non-Radioactive Waste
        4.3.1 Hazardous Waste
        4.3.2 Recyclables
        4.3.3 Re-Useable
    4.4 Environmental Impact
5. FUTURE LICENCE REQUIREMENTS
6. REMAINING ENTITIES
7. RECORDS RETENTION AND PROJECT DOCUMENTATION
8. COST SUMMARY
9. REFERENCES

REDACTED

TITLE REPORT

for

Atomic Energy of Canada Ltd.
Plant Site Lands

Sections 12 & 13 Township 14 Range 10 EPM
and
Sections 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 28 & 29 Township 14 Range 11 EPM

LGD of Pinawa - Manitoba

Prepared by:

Pollock & Wright
Land Surveyors
117 Fort Street
Winnipeg, Manitoba
R3C 1C6

Phone: (204) 947-1557
Fax: (204) 943-8024

December 17, 2002

Pollock & Wright Land Surveyors
Title Report for Atomic Energy of Canada Ltd.
Plant Site Lands
Sections 12 & 13 Township 14 Range 10 EPM and
Sections 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 28 and 29 Township 14 Range 11 EPM
LGD of Pinawa - Manitoba
December 17, 2002

Table of Contents

Scope of Work 1

Ownership Report 1

Title Summary 6

Encumbrances 6

Historic Search 6

Summary 8

Appendix A - Current Titles

Appendix B - Private Owners Titles & Crown Canada Titles

Appendix C - Crown Manitoba Titles

Appendix D - Plant Site - Aerial View

Appendix E - Registered Encumbrances

Appendix F - Plan Showing Title Locations

Title Report for Atomic Energy of Canada Ltd. (AECL) – Plant Site Lands

Scope of Work

The scope of work is to provide a plan showing the locations of various lands held by AECL around the existing plant site (Title Plot), to provide a report as to the status of those lands and to determine the immediate past owners (historic search).

The area is generally contained within Sections 8, 9, 10, 11, 14, 15, 16, 17, 19, 20, 21, 22, 23, 26, 27, 28 and 29 Township 14 Range 11 EPM and the E ½'s of Sections 12 & 13 Township 14 Range 10 EPM

Ownership Report

CT # 971327 - This CT covers parts of Section 8, 9, 16 & 17-14-11 EPM. The title excepts Power Transmission Line Plan No. 3400 in Sections 9 & 16-14-11 EPM and mines and minerals. The title is subject to a caveat registered as Instrument No. 192664, (copy attached). The land contained in this title was formerly Crown Land (Manitoba). Part of the Plant is contained on this property.

CT # 971328 - This CT covers land in Section 17-14-11 EPM on the West side of the Winnipeg River. The title excepts mines and minerals and is subject to a caveat registered as Instrument No. 192664, (copy attached). The land contained in the title was formerly Crown Land (Manitoba). Based on the aerial photograph, part of the land is being used for agricultural purposes.

CT # 971329 - This CT covers all the land within Section 11-14-11 EPM. The title excepts mines and minerals and is subject to a caveat registered as Instrument No. 192664, (copy attached). The land contained in the title was formerly Crown Land (Manitoba). Based on the aerial photographs, none of the land is being used for commercial, residential or agricultural purposes.

CT # 971330 - The CT covers land in part of Section 26-14-11 EPM. The title excepts mines and minerals and is subject to a caveat registered as Instrument No. 192664, (copy attached). The land contained in the title was formerly Crown Land (Manitoba). Based on the aerial photograph none on the land is being used for commercial, residential or agricultural purposes.

CT # 971331 - The CT covers land in part of Sections 20 & 29-14-11 EPM. The title except mines and minerals and is subject to a caveat registered as Instrument No. 192664, (copy attached). The land contained in the title was formerly Crown

Land (Manitoba). Based on the aerial photograph none on the land is being used for commercial, residential or agricultural purposes.

CT # 971332 – The CT covers land in part of Section 20-14-11 EPM lying to the West of the Winnipeg River. The title except mines and minerals and is subject to a caveat registered as Instrument No. 192664, (copy attached). The land contained in the title was formerly Crown Land (Manitoba). Based on the aerial photograph the land is being used for agricultural purposes.

CT # 971333 – The CT covers most of the Government Road Allowances in the area East of the Winnipeg River with the exception of the East-West road allowances under the Power Line Plan 3400. The title excepts mines and minerals and is subject to a caveat registered as Instrument No. 192664, (copy attached). The land contained in the title was formerly Crown Land (Manitoba).

CT # 978791 – The CT covers all the land in Section 10, 14 & 15-14-11 EPM. The title excepts mines and minerals and is subject to a caveat registered as Instrument No. 192664, (copy attached). Prior to acquisition by AECL, this land was held in CT # 97103, 97106 and 97107 in the name of His Majesty The King in Right of Manitoba. Based on the aerial photographs, none of the land is being used for commercial, residential or agricultural purposes.

CT # 978792 – The CT covers lands in Section 9, 16, 17, 20 and 21. The title excepts mines and minerals and is subject to a caveat registered as Instrument No. 192664, (copy attached). Prior to acquisition by AECL, the land was held in CT # 97102, 97108, 97109, 97112 and 97113 in the name of His Majesty The King in Right of Manitoba. This land is generally adjacent to the plant site and based on the aerial photographs is generally not being used for any purposes other than the access roadway to the plant.

CT # 978793 – The CT covers land in Sections 22, 23 & 26-14-11 EPM. The title excepts mines and minerals and is subject to a caveat registered as Instrument No. 192664, (copy attached). Prior to acquisition by AECL, the land was held in CT # 97114, 97115 and 97118 in the name of His Majesty The King in Right of Manitoba. Based on the aerial photography, the land is not being used for any commercial, residential or agricultural purposes with the exception of what appears to be a test site in Section 22.

CT # 978794 – The CT covers land in Sections 27 & 28-14-11 EPM. The title excepts mines and minerals and is subject to a caveat registered as Instrument No. 192664, (copy attached). Prior to acquisition by AECL, the land was held in CT # 97119 and 97120 in the name of His Majesty The King in Right of Manitoba. Based on the aerial photography, the land is being used by AECL.

CT # A 2124 – The CT covers land within Plan No. 6014 and road allowances in and adjacent to Sections 17, 20 and 29-14-11 EPM. The title excepts mines and minerals and is subject to a caveat registered as Instrument No. 192664, (copy attached). The land contained in this title was formerly Crown Land (Manitoba). Some of the land West of the river, based on the aerial photography, is being used for agricultural purposes.

CT # B 4983 – The CT covers land in the NE ¼ Section 13-14-10 EPM. The title is subject to the Crown Lands Act. Prior to acquisition by AECL, the land was held in CT # 948969 in the name of Her Majesty The Queen in Right of Canada. Based on the aerial photography, the land is not being used for any commercial, residential or agricultural purposes.

CT # B 4984 – The CT covers land in the NE ¼ of Section 12-14-10 EPM. The title is subject to the Crown Lands Act. Prior to acquisition by AECL, the land was held in CT # 948970 in the name of Her Majesty The Queen in Right of Canada. Based on the aerial photography, part of the land might be in agricultural use.

CT # B 4985 – The CT covers land in the S ½ of Section 20-14-11 EPM. The title is subject to the reservations and provisoes contained in the Grant from the Crown and a caveat registered as Instrument No. 209724 (copy attached). Prior to acquisition by AECL, the land was held in CT # 949423 in the name of Her Majesty The Queen in Right of Canada. Part of the plant is currently situated on this title according to the aerial photography.

CT # B 4986 – The CT covers land in the SE ¼ of Section 13-14-10 EPM. The title is subject to the Crown Lands Act. Prior to acquisition by AECL, the land was held in CT # 950132 in the name of Her Majesty The Queen in Right of Canada. Based on the aerial photography, part of the land might be used for agricultural purposes.

CT # B 4987 – The CT covers land in the SE ¼ of Section 12-14-10 EPM. The title is subject to the reservations and provisoes contained in the Grant for the Crown. Prior to acquisition by AECL, the land was held in CT # 950198 in the name of Her Majesty The Queen in Right of Canada. Based on the aerial photography, part of the land is being used for agricultural purposes.

CT # B 4988 – The CT covers land in the SW ¼ Section 19-14-11 EPM. The title is subject to the Crown Lands Act and is also subject to two caveats registered as Instrument No.'s 226725 and 1799838, respectively. Prior to acquisition by AECL, the land was held under CT # 952417 in the name of Her Majesty The Queen in Right of Canada. Based on the aerial photography, the land is being used for agricultural purposes.

CT # B 4989 – The CT covers land in the NE ¼ Section 19-14-11 EPM. The title is subject to the reservations and provisoes contained in the Grant from the Crown. Prior to acquisition by AECL, the land was held under CT # 953818 in the name of Her Majesty The Queen in Right of Canada. Based on the aerial photography, part of the land might be used for agricultural purposes.

CT # B 4990 – The CT covers land in the S ½ of Section 28-14-11 EPM. The title is subject to the Crown Lands Act. Prior to acquisition by AECL the land was held in CT # 954778 in the name of Her Majesty The Queen in Right of Canada. The land is currently being used by AECL according to the aerial photography.

CT # B 4991 – The CT covers land in the SE ¼ Section 19-14-11 EPM. The title is not subject to any encumbrances. Prior to acquisition by AECL, the land was held in CT # 954779 in the name of Her Majesty The Queen in Right of Canada. Based on the aerial photography, the land is being used for agricultural purposes.

CT # B 4992 – The CT covers land in the S ½ of Section 18-14-11 EPM and is bisected by No. 11 Highway. The title is subject to the reservations and provisoes in the Grant from the Crown and is further subject to two caveats registered as Instrument No.'s 1799838 and 226725, respectively. Prior to acquisition by AECL the land was held in CT # 955395 in the name of Her Majesty The Queen in Right of Canada. Based on the aerial photography, the land is being used for agricultural purposes.

CT # B 4993 – The CT covers land in the SW ¼ Section 20-14-11 EPM. The title is subject to the reservations and provisoes in the Grant from the Crown. Prior to acquisition by AECL, the land was held in CT # 956082 in the name of Her Majesty The Queen in Right of Canada. The land is currently being used by AECL as part of the plant site.

CT # B 4994 – The CT covers land in the NW ¼ of Section 19-14-11 EPM adjacent to PTH No. 11. The title is subject to the Crown Lands Act and is also subject to two caveats registered as Instrument No.'s 1799838 and 226725, respectively. Prior to acquisition by AECL, the land was held in CT # 956083 in the name of Her Majesty The Queen in Right of Canada. Based on the aerial photography, the land seems to support some limited agricultural use.

CT # B 4995 – The CT covers land in Section 18-14-11 EPM. The title is subject to the reservations and provisoes in the Grant from the Crown and is also subject to two caveats registered as Instrument No.'s 1799838 and 226725, respectively. Prior to acquisition by AECL, the land was held in CT # 956279 in the name of Her Majesty The Queen in Right of Canada. Based on the aerial photography, the land is being used for agricultural purposes.

CT # B 4996 – The CT covers land in the N ½ of Section 18-14-11 EPM. The title is subject to reservations and provisoes in the Grant from the Crown and is also subject to two caveats registered as Instrument No.'s 1799838 and 226725, respectively. Prior to acquisition by AECL, the land was held under CT # 957995 in the name of Her Majesty The Queen in Right of Canada. Based on the aerial photography, the land is being used for agricultural purposes.

CT # B 4997 – The CT covers lands in the N ½ of Section 19-14-11 EPM. The title is subject to the reservations and provisoes in the Grant from the Crown. Prior to acquisition by AECL, the land was held in CT # 959189 in the name of Her Majesty The Queen in Right of Canada. Based on the aerial photography, the land is being used for agricultural purposes.

CT # B 4998 – The CT covers land in the NW ¼ of Section 29-14-11 EPM. The title is subject to the reservations and provisoes in the Grant from the Crown. Prior to acquisition by AECL, the land was held in CT # 960330 in the name of Her Majesty The Queen in Right of Canada. Based on the aerial photography, the land is not being used for any commercial, residential or agricultural purposes.

CT # B 4999 – The CT covers land in the NW ¼ of Section 28-14-11 EPM. The title is subject to the Crown Lands Act. Prior to acquisition by AECL, the land was held in CT # 975955 in the name of Her Majesty The Queen in Right of Canada. Based on the aerial photography, the land is not being used for any commercial, residential or agricultural purposes.

CT # A 12172 – The CT covers parts of Sections 18, 19, 20 & 29-14-11 EPM. The title excepts mines and minerals for the land contained with Public Road Plan No. 5986 (closed) in Sections 18 & 19 and is subject to reservations and provisoes in the Grant from the Crown. The title is subject to a caveat registered as Instrument No. 192664, (copy attached). Prior to acquisition by AECL, the land was held under CT #'s 848053, 849091 and 991821 in the name of Her Majesty The Queen in Right of Manitoba. Based on the aerial photography, the land located to the West of the River is being used agriculturally.

CT # B 12922 – Parcel A, Plan No. 9216 WLTO. This CT is owned by Manitoba Hydro Electric Board and appears to be a substation on the plant site. The title is free and clear of all encumbrances and comes from CT # B 4985 – AECL.

CT # C 49602 – The CT covers land around the plant site as well as Parcel B, Plan No. 9216 WLTO. Parcel B is subject to a caveat registered as Instrument No. 209724. This area contains part of the plant site. This land was acquired from CT # B 66216, previous owner Peter Manisto, farmer.

Title Summary

Based on the foregoing, AECL has free and clear title to the lands as shown on the attached drawing subject to certain terms and conditions as outlined either on the title description or by way of registered instrument.

Encumbrances

Instrument # 209724 – This is a utility caveat in favour of the Manitoba Hydro Electric Board granting an easement over Parcel B, Plan No. 9216. Among other things, this grants access to Parcel A, Plan No. 9216 along the length of Parcel B and allows Parcel B to be used for Hydro purposes as outlined in the caveat.

Instrument # 1799838 – This is a utility caveat in favour of the Manitoba Telephone System granting an easement over CT #'s B 4988, B 4992, B 4995, B 4996 and B 4994 along PTH # 11, specifically within the boundaries of Plan No. 31094 as shown on the attached plan. The lands included in the caveat can be used for telephone purposes as outlined in the caveat.

Instrument # 226725 – This is a utility caveat in favour of the Manitoba Telephone System granting an easement in the same general area as Instrument No. 1799838. This caveat could probably be withdrawn.

Instrument # 192664 – This is an agreement between the Province of Manitoba (Crown) and AECL dealing with the development of the plant, townsite, various roads, a bridge, the establishment of a Local Government District among other things. This is a wide ranging agreement committing AECL to many things, among them:

> Item 11: "to construct a private road" which I take to mean the access road to the plant across AECL's lands.
> Item 7: "before offering the land to third parties, offer to re-sell the land to the Province"

This caveat affects Title No.'s 971330, 971327, 978792, 978791, 971329, 971332, 978793, 971330, 978794, 971331, 971328, A 2124 and A 12172.

Historic Search

Part of the requirements of this report is to determine who AECL acquired title from, ultimately and by what method. Private owners only. Namely:

CT # B 66216 – Peter Manisto – Farmer – Legal Subdivision 1 & 8 – Section 20-14-11 EPM. Acquired by expropriation by the Crown (Canada) Now CT # C 49602 – AECL by virtue of Federal Grant.

CT # 991821 – Crown (Manitoba) – Public Road Plan No. 5986 (closed) – Acquired by consent – Now CT # A 12172.

CT # 947732 – Roy Biedler – Farmer – Part NW ¼ Section 28-14-11 EPM – Acquired by expropriation by Crown (Canada) CT # 975955 now CT # B 4999.

CT # 957942 – Olavi Valfrid Hanvisto – Farmer – All that portion of NW ¼ Section 29-14-11 EPM lying to the East of the right bank of the Winnipeg River except Plan No. 6014 WLTO – Acquired by expropriation by the Crown (Canada) CT # 960330 now CT # B 4998 – AECL

CT # 953859 ½ - Michael Bruchanski – Farmer – S ½ of Section 28-14-11 EPM except Plan No. 3400 WLTO – Acquired by expropriation by the Crown (Canada) CT # 954778 now CT # B 4990 – AECL

CT # 854823 – Ingrid Gustafson – administratrix – Part LS 1, 2, 3, 6, 7 & 8 Fractional Section 18-14-11 EPM – Acquired by expropriation by the Crown (Canada) CT # 955395 now CT # B 4992 – AECL

CT # 834775 – Sanford Petersen – SE ¼ Section 12-14-10 EPM – Acquired by expropriation by the Crown (Canada) CT # 950198 now CT # B 4987 - AECL

CT # 773563 – RM of Lac du Bonnet – Part of LS 4 Section 20-14-11 EPM lying East of Winnipeg River except Plan No. 6014 WLTO – Acquired by expropriation by the Crown (Canada) CT # 956082 now CT # B 4993 – AECL

CT # 754354 – Chistoffer Chistiansen Balness – Farmer – NE ¼ Section 13-14-10 EPM – Acquired by expropriation by the Crown (Canada) CT # 948969 now CT # B 4983 – AECL

CT # 723686 – RM of Lac du Bonnet – Fractional LS 11 & 14 Section 19-14-11 EPM except Plan No. 6073 WLTO – Acquired by expropriation by the Crown (Canada) CT # 956083 now CT # B 4994 – AECL

CT # 669515 – Adolf Sixten Holmberg – Farmer – NE ¼ Section 12-14-10 EPM – Acquired by the Crown (Canada) – CT # 948970 apparently by expropriation. There is no notice of intended expropriation on CT # 669515 but it does appear on CT # 948970. Now CT # B 4984 – AECL

CT # 660042 – Henry Sikora – Farmer – LS 10 & 15 Section 19-14-11 EPM – Acquired by expropriation by the Crown (Canada) CT # 953818 now CT # B 4989 – AECL

CT # 630180 – Henry Sikora – Farmer – LS 2, 3, 6 & 7 Section 19-14-11 EPM except Plan No.'s 5986 and 6973 WLTO – Acquired by expropriation by the Crown (Canada) CT # 952417 now CT # B 4988 – AECL

CT # 602665 - Carl and Beret Gustafson – life estate acquired by expropriation by Crown (Canada) CT # 957995 now CT # B 4996 – AECL

CT # 602663 – Eric Gustafson – Farmer – Part Section 18-14-11 EPM except Plan No.'s 6014 and 6073 – Acquired by expropriation by the Crown (Canada) CT # 956279 now CT # B 4995 – AECL

CT # 602662 – Eric Gustafson – Farmer – relates to life lease CT # 602665 – Acquired by expropriation by Crown (Canada) CT # 957641 now B 4996 – AECL

CT # 587281 – Rolf Larson – Farmer – LS 2, 3, 6 & 7 Section 20-14-11 EPM except Plan No. 6014 – Acquired by expropriation by the Crown (Canada) CT # 949423 now CT # B 4985 – AECL

CT # 566770 – Michael Brushanski – Farmer – Fractional LS 1 & 8 Section 19-14-11 EPM except Plan No. 6014 WLTO – Acquired by expropriation by the Crown (Canada) CT # 954779 now CT # B 4991 – AECL

CT # 556792 – Ottar Hegland – Farmer – SE ¼ Section 13-14-10 EPM - Acquired by expropriation by the Crown (Canada) CT # 950132 now CT # B 4986 – AECL

CT # 506175 – Michael Brushanske – Merchant – LS 9 & 16 Section 19-14-11 EPM – Acquired by expropriation by the Crown (Canada) CT # 959189 now CT # B 4997 – AECL

Summary

The scope of the project is to determine:

a) Extent of Atomic Energy Corporation Ltd. (AECL) holdings in the area of the existing plant site.
b) To report on any encumbrances
c) To determine how the land was acquired; expropriation or agreement
d) To determine from who the land was acquired; Historic Search
e) To provide a drawing showing the relative location of each title.

Extent of Title

AECL has valid title to various lands as shown on the attached drawing.

Ownership is held under 32 real property titles. See Appendix A.

Manitoba Hydro has two holdings within the plant site area; a powerline and what appears to be a substation. These areas are both shown on the referenced drawing.

AECL ownership extends to the Ordinary High Water Mark of the Winnipeg River but does not include the Winnipeg River.

Encumbrances

Certain encumbrances exist on most of the titles either through certain terms and conditions as outlined within the title description or by way of registered instrument.

Most of the encumbrances within the title itself deal with reservations and provisoes dealing with mines and minerals and the like. In these circumstances, AECL has the surface rights while the Crown holds the mineral rights and associated rights. While we could search each original transfer to determine the Crown's rights, I doubt it would serve any beneficial purpose at this point.

There are several utility caveats filed on some of the titles. These are generally used to allow access for maintenance, repair and re-construction of the utility if and when required.

Instrument No. 192664 is registered against the lands originally acquired from the Crown (Manitoba) and is essentially an agreement to do any number of things, some on an ongoing basis. It may be wise to review this agreement with the benefit of legal counsel.

Land Acquisition & Historic Searches

A total of 19 properties were acquired from private owners including the RM of Lac du Bonnet. These all appear to have been acquired by means of expropriation by the Crown (Canada) and then transferred to AECL. See Appendix B. All other lands were acquired from the Crown (Manitoba). See Appendix C.

Other Matters

Manitoba Hydro holds title to Parcel A, Plan No. 9216 WLTO which, according to the aerial photographs, appears to be a sub-station located South of the lagoon in the NE corner of the plant site and Power Line Plan No. 3400.

The Roadway system, including the access road to the plant site, with the exception of the access road South of the South limit of Section 8 & 9-14-11 EPM, is owned by AECL. The access Roadway Plan No. 8865 is partially owned by AECL under Certificate of Title No. A 65250. The Government Road Allowance which forms part of Right of Way Plan No. 8865 has been legally closed by Instrument No. G 40480 but we can find no record of transfer. In effect, AECL owns those portions of Plan No. 8865 East and West of the Government Road Allowance which the Crown (Manitoba) owns the Government Road Allowances, AECL does not own any Government Road Allowances with the exception of the closed road allowances mentioned in the foregoing title report. AECL does not own P.T.H. No. 11 or its associated Drain Plan No. 15336.

AECL appears to be a Riparian owner for its lands adjacent to the Winnipeg River.

An aerial photograph of the plant site is appended hereto as Appendix D.

signed,

A. G. Degner, M.L.S., C.L.S.
December 17, 2002

Appendix A – Current Titles

9906/25

WL-11020-041-000
AECL-OFFICIAL USE ONLY

Cert. No. C 49602

JUN 04 1969

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED,

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, Firstly: Legal Subdivisions One and Eight of Section Twenty in the Fourteenth Township and Eleventh Range, East of the Principal Meridian, in Manitoba, excepting out of both of said Legal Subdivisions all those portions thereof contained within the limits of a survey the plan of which is filed in the Winnipeg Land Titles Office, as No. 9216. Subject to the reservations and provisoes contained in the Grant from the Crown.

Secondly: all that portion of Parcel Lettered "B" as shewn on said Plan No. 9216, contained within the limits of said Legal Subdivisions One and Eight. Subject to the reservations and provisoes contained in the Grant from the Crown.

ADDRESS FOR SERVICE

++++

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Twenty-second day of January One thousand nine hundred and seventy - four

Signed in the presence of

Deputy District Registrar

for Winnipeg,

Subject to such exceptions, reservations, limitations, interests, rights and equities as may be mentioned in the original grant from the Crown or in the Real Property Act, and to such rights-of-way or other easements as may be established by any competent authority, and to such leases or tenancies as may be subsisting at the date of the certificate, and to such rights of expropriation, if any, as may be vested in any person or authority, and to such zoning by-laws as may be passed by the council of any municipality in which the land is situated, and to such subdivision control as may be established under The Planning Act or under the provisions of the charter of any city relating to subdivision control, and to such restrictions as may be established under The Town Planning Act or under the provisions of the charter of any city relating to residential areas or zoning.

(1) A "zoning regulation" as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.

(2) Any limitation or restriction under The Highways Protection Act or a permit issued under The Highways Protection Act.

Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

9906/25

WL-11020-041-000
AECL-OFFICIAL USE ONLY

Cert. No. B12922

JUN 04 1999

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

THE MANITOBA HYDRO-ELECTRIC BOARD

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, Parcel Lettered "A" which parcel is shewn bordered pink on a plan of survey of part of the South East Quarter of Section Twenty - 14 - 11 East, in Manitoba, filed in the Winnipeg Land Titles Office as No. 9216. Subject to the reservations and provisoes contained in the Grant from the Crown.

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Ninth day of August One thousand nine hundred and sixty-eight

Signed in the presence of

Deputy District Registrar for Winnipeg,

161 This certificate is subject to the provisions of the Act, and the conditions in such memorandum. (2) Any town planning scheme or by-law authorised under The Town Planning Act or The Municipal Act of the charter of any city relating to residential areas or zoning passed by any municipal corporation under "The Municipal Act" made under that act and deposited in the Land Titles Office. (1) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office. Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11020-041-000 MAY 12 1999
AECL-OFFICIAL USE ONLY
Cert. No. B 4999

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, The North-West Quarter of Section Twenty-eight in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, excepting thereout all that portion thereof taken for the right-of-way for Manitoba Power Company Transmission Line as the same is shewn coloured pink on a Plan filed in the Winnipeg Land Titles Office as No.3400, and also excepting thereout all mines and minerals, together with the right to enter, locate prospect, mine for and remove minerals and all other estates, rights and interest reserved to the Crown under the Crown Lands Act.

ADDRESS FOR SERVICE

****

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Fifteenth day of April One thousand nine hundred and sixty-eight

Signed in the presence of

Deputy District Registrar for Winnipeg.

(a) Any right of expropriation by statute.
(b) Any cert... is pe... ued out...
(i) The title of a person adversely in actual occupation, of and rightly entitled, to the land at the time it was brought under the Act, and who continues in such occupation, unless such encumbrance, lien or interest has been registered since the date of the certificate, and
(j) Any tax, assessment or charge under The Town Planning Act or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11020-041-000 1999
AECL-OFFICIAL USE ONLY
Cert No. B 4998

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows. All that portion of the North-West Quarter of Section Twenty-nine in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, which lies East of the Right bank of the Winnipeg River as shewn on a map or plan of survey of said Township, approved and confirmed at Ottawa on the Nineteenth day of May A.D. 1916 by Edouard Deville, Surveyor General of Dominion Lands and of record in the Department of the Interior, excepting out of the land above described all those portions taken for water storage as shewn on a Plan deposited in the Winnipeg Land Titles Office as No. 6014. Subject to the reservations and provisoes contained in the Grant from the Crown.

ADDRESS FOR SERVICE

****

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Fifteenth day of April One thousand nine hundred and sixty-eight

Signed in the presence of

Deputy District Registrar for Winnipeg,

(h) Any right of expropriation by statute.
(i) The title of a person adversely in actual occupation, of and rightly entitled, to the land at the time it was brought under the Act, and who continues in such occupation;
(j) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11020-044-000 MAY 2 1968
AECL-OFFICIAL USE ONLY
Cert. No. B 4997

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, Legal Subdivisions Nine and Sixteen of Section Nineteen in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba. Subject to the special reservations and provisoes contained in the Grant from the Crown.

ADDRESS FOR SERVICE

****

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Fifteenth day of April One thousand nine hundred and sixty-eight

Signed in the presence of

Deputy District Registrar for Winnipeg,

Act, and who continues in such occupation;
(f) Caveats affecting the land registered since the date of the certificate, and
(g) Any town planning scheme or by-law authorized under The Town Planning Act or under the provisions of the charter of any city relating to town planning and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(h) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11020-041-000-000
AECL-OFFICIAL USE ONLY

Cert. No. B 4996

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, All that portion of Fractional Section Eighteen in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, which lies to the North of a line drawn parallel to the Northern limit of said Section from a point in the Western limit of said Fractional Section distant Southerly thereon seventeen hundred and sixty feet from the said Northern limit, excepting thereout all those portions taken for public roads as the same are shewn on Plans registered in the Winnipeg Land Titles Office as Nos. 5986 and 6073, and excepting out of the North-East Quarter of said Fractional Section all that portion taken for water storage as the same is shewn bordered red on a Plan registered in the said Office as No. 6014. Subject to the reservations and provisoes contained in the Grant and Transfers from the Crown.

ADDRESS FOR SERVICE

****

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Fifteenth day of April One thousand nine hundred and sixty-eight

Signed in the presence of

Deputy District Registrar for Winnipeg,

(1) The title of a person adversely in actual occupation, of and rightly entitled, to the land at the time it was brought under the Act, and who continues in such occupation;
(j) Caveats affecting the land registered since the date of the certificate; and
(k) Any town planning scheme or by-law authorized under The Town Planning Act or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.

This land includes all mines and minerals, and the right of working the same, and all roads and public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11020-041-000
AECL-OFFICIAL USE ONLY

MAY 12 1999

Cert. No. B 4995

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, All that portion of Fractional Section Eighteen in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, which lies between two lines drawn parallel to the Northern limit of said Section from points in the Western limit of said Fractional Section, distant Southerly thereon seventeen hundred and sixty feet and thirty-five hundred and twenty feet respectively from said Northern limit, excepting thereout all that portion thereof contained within the limits of Fractional Legal Subdivision Six of said Section and excepting out of the East half of said Section all those portions taken for Water Storage as the same is shewn bordered red on a Plan deposited in the Winnipeg Land Titles Office as No. 6014, and excepting out of the Fractional West half and South-East Quarter of said Section those portions taken for a public road as shewn on a Plan deposited in the said Office as No. 6073. Subject to the reservations and provisoes contained in the Grant and Transfers from the Crown.

ADDRESS FOR SERVICE

****

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Fifteenth day of April One thousand nine hundred and sixty-eight

Signed in the presence of

Deputy District Registrar for Winnipeg.

(i) The title of a person who is in actual occupation, of any highway entitled to the land [illegible] ght un-
Act, and who continues in such occupation;
(j) Any subsisting lease registered since the date of the certificate; and
(k) Any town planning scheme or by-law authorized under The Town Planning Act or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-110-141-000 MAY 12 1999
AECL-OFFICIAL USE ONLY
Cert. No. B 4994

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, Fractional Legal Subdivisions Eleven and Fourteen of Section Nineteen in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, excepting out of the land above described all that portion thereof taken for a public road as the same is shewn on a Plan deposited in the Winnipeg Land Titles Office as No. 6073. Subject to any subsisting reservations contained in the Crown Lands Act.

ADDRESS FOR SERVICE

****

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Fifteenth day of April One thousand nine hundred and sixty-eight

Signed in the presence of

Deputy District Registrar for Winnipeg,

(a) and who continues in such occupation;
(j) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under The Town Planning Act or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11020-041-000
AECL-OFFICIAL USE ONLY

Cert. No. B 4993

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, All that portion of Legal Subdivision Four of Section Twenty in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, which lies to the East of the Winnipeg River as shewn on a map or plan of survey of said Township, approved and confirmed at Ottawa on the Eighth day of June A.D. 1923 by Thomas Shanks for the Surveyor General of Dominion Lands, excepting thereout all that portion taken for water storage as the same is shewn bordered red on a plan deposited in the Winnipeg Land Titles Office as No. 6014. Subject to the reservations and provisoes contained in the Grant from the Crown.

ADDRESS FOR SERVICE

****

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Fifteenth day of April One thousand nine hundred and sixty-eight

Signed in the presence of

Deputy District Registrar for Winnipeg.

(1) The title of a person adversely in actual occupation, of and rightly entitled to the land at the time it was brought under Act, and who continues in such occupation;
(j) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under The Town Planning Act or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-1[illegible]-041-000 1999
AECL-OFFICIAL USE ONLY
Cert No. B 4992

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, Firstly: All those portions of Legal Subdivisions One, Two, Seven and Eight of Fractional Section Eighteen in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, which lie to the South of a line drawn parallel to the Northern limit of said Section from a point in the Western limit of said Fractional Section distant Southerly thereon thirty-five hundred and twenty feet from said Northern limit, excepting out of said Legal Subdivisions Two and Seven those portions taken for a public road and shewn coloured pink on a Plan registered in the Winnipeg Land Titles Office as No. 6073, and excepting out of said Legal Subdivision Eight all that portion thereof taken for water storage as shewn on a Plan filed in the said Office as No. 6014.

Secondly: Fractional Legal Subdivisions Three and Six of said Section Eighteen, excepting out of said Fractional Legal Subdivision Three the most Northerly four hundred and eighty-two feet in perpendicular depth of the most Southerly seven hundred and eighty-two feet in perpendicular depth of the most Westerly three hundred and sixty-one and one-half feet in perpendicular width thereof, and further excepting out of said Fractional Legal Subdivision Three all that portion thereof taken for a public road as same is shewn coloured pink on a Plan of same registered in the said Office as No. 4693, and excepting out of said Legal Subdivision Six that portion taken for said public road as shewn on said Plan No. 6073. Subject to the reservations and provisoes contained in the Grant and Transfers from the Crown.

ADDRESS FOR SERVICE

****

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Fifteenth day of April One thousand nine hundred and sixty-eight

Signed in the presence of

Deputy District Registrar for Winnipeg.

(i) The title of a person adversely in actual occupation, of and rightly entitled, to the land at the time it was brought under Act, and who continues in such occupation;
(j) Caveats affecting the land registered since the date of the certificate; and
(k) Any town planning scheme or by-law authorized under The Town Planning Act or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.

Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11020-041-000
AECL-OFFICIAL USE ONLY

Cert. No. B 4991

MANITOBA

Certificate of Title

UNDER THE REAL PROPERTY ACT

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, Fractional Legal Subdivisions One and Eight of Section Nineteen in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, excepting thereout all that portion taken for water storage as shewn on a Plan registered in the Winnipeg Land Titles Office as No. 6014.

ADDRESS FOR SERVICE

****

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Fifteenth day of April One thousand nine hundred and sixty-eight

Signed in the presence of

Deputy District Registrar for Winnipeg.

...ody rights ...ntitle... ...tute.
(i) The title of a person adversely in actual occupation, of and rightly entitled to the land at the time it was brought under Act, and who continues in such occupation;
(j) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under The Town Planning Act or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11020-041-009
AECL-OFFICIAL USE ONLY

Cert. No. B 4990

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, The South half of Section Twenty-eight in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, excepting out of the South-West Quarter of said Section all that portion thereof taken for the Right-of-Way for the Manitoba Power Company Transmission Line as the same is shewn on a Plan filed in the Winnipeg Land Titles Office as No. 3400, and excepting out of the balance of the land above described all mines and minerals, together with the right to enter, locate, prospect, mine for and remove minerals and all other estates, rights and interests reserved to the Crown under the Crown Lands Act.

ADDRESS FOR SERVICE

****

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Fifteenth day of April One thousand nine hundred and sixty-eight

Signed in the presence of

Deputy District Registrar for Winnipeg,

Act, and who continues in such occupation; actual
(j) Caveats affecting the land registered since the date of the certificate; and
(k) Any town planning scheme or by-law authorized under "The Town Planning Act or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.
Rights of way embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WLM-2020-042-0[illegible]
MAY 12 1999
AECL-OFFICIAL USE ONLY
Cert. No. B 4989

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, Legal Subdivisions Ten and Fifteen of Section Nineteen in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba.

Subject to the reservations and provisoes contained in the Grant from the Crown.

ADDRESS FOR SERVICE

****

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Fifteenth day of April One thousand nine hundred and sixty-eight

Signed in the presence of

Deputy District Registrar for Winnipeg,

(i) The title of a person adversely in actual occupation, of and rightly entitled, to the land at the time it was brought under Act, and who continues in such occupation;
(j) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under "The Town Planning Act or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning;
(l) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11020-041-000
AECL-OFFICIAL USE ONLY
Perf. No. B 4988

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows. Fractional Legal Subdivisions Three and Six and Legal Subdivisions Two and Seven of Section Nineteen in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, excepting out of said Legal Subdivision Two all that portion taken for a public road, as same is shewn on a Plan registered in the Winnipeg Land Titles Office as No. 5986, and excepting out of said Legal Subdivisions Three and Six all those portions taken for a public road as same is shewn on a Plan deposited in the said Office as No. 6073. Subject to any subsisting reservations contained in the Crown Lands Act.

ADDRESS FOR SERVICE

****

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Fifteenth day of April One thousand nine hundred and sixty-eight

Signed in the presence of

Deputy District Registrar for Winnipeg.

(h) Any right of expropriation by statute.
(i) The title of a person lawfully in actual occupation, of and rightly entitled, to the land at the time it was brought under the Act, and who continues in such occupation; and
(j) Liveries affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under The Town Planning Act or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.
Public highways enhanced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11038-CM-002 1999
AECL-OFFICIAL USE ONLY
Cert. No. B 4987

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, The South-East Quarter of Section Twelve in the Fourteenth Township and Tenth Range, East of the Principal Meridian in Manitoba. Subject to the reservations and provisoes contained in the Grant from the Crown.

ADDRESS FOR SERVICE

****

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Fifteenth day of April One thousand nine hundred and sixty-eight

Signed in the presence of

Deputy District Registrar for Winnipeg,

(i) The title of a person adversely in actual occupation, of and rightly entitled, to the land at the time it was brought under the Act, and who continues in such occupation;
(j) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under The Town Planning Act or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11020-041-000
AECL-OFFICIAL USE ONLY
Part No B 4986

MANITOBA

Certificate of Title

UNDER THE REAL PROPERTY ACT

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows. The South-East Quarter of Section Thirteen in the Fourteenth Township and Tenth Range, East of the Principal Meridian in Manitoba. Subject to the reservations and provisoes contained in the Crown Lands Act.

ADDRESS FOR SERVICE

****

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Fifteenth day of April One thousand nine hundred and sixty-eight

Signed in the presence of

Deputy District Registrar for Winnipeg.

(c) The title of a person adversely in actual occupation, of and rightly entitled, to the land at the time it was brought under the Act, and who continues in such occupation,
(j) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under The Town Planning Act or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11020-041-000 MAY 12 1999
AECL-OFFICIAL USE ONLY

Cert. No. B 4985

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, Legal Subdivisions Two, Three, Seven and Fractional Legal Subdivision Six all of Section Twenty in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, as the same are shewn on a map or plan of said Township, approved and confirmed at Ottawa on the Eighth day of June A.D. 1923 by T. Shanks for the Surveyor General, excepting out of said Legal Subdivisions Three and Six all that portion taken for water storage as the same is shewn on a Plan deposited in the Winnipeg Land Titles Office as No. 6014. Subject to the reservations and provisoes contained in the Grant from the Crown.

NO. H90751 TRANSFER OF
Pt. L.S. 2 for Pcl. A. PLG 9216
TO The Man. Hydro-Electric Board
REG Aug 9-68
VIDE CERT. B 12922
DEP. DIST. REGISTRAR

ADDRESS FOR SERVICE

****

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Fifteenth day of April One thousand nine hundred and sixty-eight

Signed in the presence of

Deputy District Registrar for Winnipeg.

(i) The title of a person adversely in actual occupation, of and rightly entitled, to the land at the time it was brought under the Act, and who continues in such occupation;
(j) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under The Town Planning Act or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11020-MAY 12 1993
AECL-OFFICIAL USE ONLY
Cert. No. B 4984

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, The North-East Quarter of Section Twelve in the Fourteenth Township and Tenth Range, East of the Principal Meridian in Manitoba. Subject to the reservations and provisoes contained in the Crown Lands Act.

ADDRESS FOR SERVICE

****

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Fifteenth day of April One thousand nine hundred and sixty-eight

Signed in the presence of

Deputy District Registrar for Winnipeg,

any such ... title, ... actual ... on adv... on, of a ... ly entit... le land ... ime it ... ght un ... Act, and who continues in such occupation;
(j) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under The Town Planning Act or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11020-041-0002 1955
AECL-OFFICIAL USE ONLY

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

Cert. No. B 4983

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, The North-East Quarter of Section Thirteen in the Fourteenth Township and Tenth Range, East of the Principal Meridian in Manitoba. Subject to the reservations and provisoes contained in the Crown Lands Act.

ADDRESS FOR SERVICE

****

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Fifteenth day of April One thousand nine hundred and sixty-eight

Signed in the presence of

Deputy District Registrar for Winnipeg,

(i) The title of a person adversely in actual occupation, of and rightly entitled to the land at the time it was brought under Act, and who continues in such occupation;
(j) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under The Town Planning Act or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 07 1999

Cert. No. 723686

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

THE RURAL MUNICIPALITY OF LAC DU BONNET

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows FRACTIONAL LEGAL SUBDIVISIONS ELEVEN AND FOURTEEN OF SECTION NINETEEN IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE, EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, SUBJECT TO ANY SUBSISTING RESERVATIONS CONTAINED IN THE CROWN LANDS ACT.

(1) Any town planning scheme or by-law authorised under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.

Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this TWENTY-NINTH day of JULY One thousand nine hundred and FIFTY

Signed in the presence of

Deputy District Registrar for Winnipeg

WL-11020-041-000
JUN 02 1999
FOR OFFICE USE ONLY

Cert. No. 956083

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

HER MAJESTY THE QUEEN IN RIGHT OF CANADA

IS now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows,

FRACTIONAL LEGAL SUBDIVISIONS ELEVEN AND FOURTEEN OF SECTION NINETEEN IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE, EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, EXCEPTING OUT OF THE LAND ABOVE DESCRIBED ALL THAT PORTION THEREOF TAKEN FOR A PUBLIC ROAD AS THE SAME IS SHEWN ON A PLAN DEPOSITED IN THE WINNIPEG LAND TITLES OFFICE AS NO 6073. SUBJECT TO ANY SUBSISTING RESERVATIONS CONTAINED IN THE CROWN LANDS ACT.

NO. H74690 TRANSFER OF all
TO Atomic Energy of Canada Ltd.
REG. Apr 15-61
NEW CERT B4994 DEP. DIST. REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this THIRTEENTH day of APRIL One thousand nine hundred and SIXTY-ONE

Signed in the presence of

Deputy District Registrar
for Winnipeg

(1) Any zoning regulation, as that expression is defined in the Municipal Act, or by-law passed by municipality under "The Municipal Act" or "The Metropolitan Winnipeg Act" or any other Act of the Province of Manitoba relating to planning or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

Made under and pursuant to the Land Titles Act (CANADA)

JUN 07 1999

Cert. No. 669515

MANITOBA

Certificate of Title

UNDER THE REAL PROPERTY ACT

ADOLF SIXTEN HOLMBERG

OF LAC DU BONNET IN MANITOBA, FARMER.

IS now seized of an estate in fee simple in possession subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows THE NORTH EAST QUARTER OF SECTION TWELVE IN THE FOURTEENTH TOWNSHIP AND TENTH RANGE, EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA. SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE CROWN LANDS ACT.

No. C36239 TRANSFER of All

To H.M.H. Quee (Mines)

Registered Dec 1/60

Title Cert. No. 948970

Deputy District Registrar

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this SIXTH day of DECEMBER One thousand nine hundred and FORTY-SEVEN

Signed in the presence of

Deputy District Registrar for Winnipeg

WL-11020-041-000
AECL - FOR US ONLY
JUN 02 1999

Cert. No. 948970

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

HER MAJESTY THE QUEEN, IN THE RIGHT OF CANADA

is now seized of an estate in fee simple in possession, subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, THE NORTH-EAST QUARTER OF SECTION TWELVE IN THE FOURTEENTH TOWNSHIP AND TENTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE CROWN LANDS ACT.

NO. H74624 TRANSFER OF all
TO Atomic Energy of Canada Ltd
REG. April 15 68
NEW CERT B 4984
DEP. DIST. REGISTRAR

IN WITNESS WHEREOF *I have hereunto signed my name and affixed my Seal of Office this* FIRST *day of* DECEMBER, *One thousand nine hundred and* SIXTY

Signed in the presence of

E. L. Mayo

Deputy District Registrar for Winnipeg

(k) Any town planning scheme or by-law authorized under "The Town Planning Act" or any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.

Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

(l) Any zoning regulation as that expression is defined in the aeronautics act (CANADA) made under that act and registered as land against land.

WL-11020-MAY 12 1999
AECL-OFFICIAL USE ONLY
Cert. No. A 65250

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, All those portions of the North West Quarter of Section Four and of the North East Quarter of Section Five, in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba, shewn as a right of way and coloured pink on a plan registered in the Winnipeg Land Titles Office as No. 8865, excepting thereout all mines and minerals, together with the right to enter, locate, prospect, mine for and remove minerals, and all other estates, rights and interests reserved to the Crown under the Crown Lands Act.

ADDRESS FOR SERVICE

oooooooo

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Thirteenth day of May One thousand nine hundred and sixty-six.

Signed in the presence of

J. Bertzyanski

Deputy District Registrar
for Winnipeg,

(1) The title of a person adversely in actual occupation, of and rightly entitled, to the land at the time it was brought under the Act, and who continues in such occupation;
(j) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under The Town Planning Act or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11020-041-000
AECL-OFFICIAL USE ONLY

MAY 31 1999

Cert. No. A 12172

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED .

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, FIRSTLY: All those portions of Legal Subdivisions Fourteen and Fifteen of Section Eighteen and of Legal Subdivision Two of Section Nineteen in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba taken for a Public Road as the same is shewn coloured pink on a plan registered in the Winnipeg Land Titles Office as No. 5986, (now closed) which lies to the East of the straight production Southerly of the Eastern limit of the Public Road crossing said Section Nineteen as said Public Road is shewn coloured pink on a plan deposited in the said Office as No.6073 without reserving unto the Crown, those reservations set forth in "The Crown Lands Act" but excepting all Mines and Minerals (the parties having agreed that the expression "Mines and Minerals" does not include gravel) which may be found, in upon or under the said Lands. SECONDLY: All those portions of the East half of Section Eighteen, of the Southeast Quarter of Section Nineteen and of the Southwest Quarter of Section Twenty all in the said Township and Range contained within the limits shewn bordered red on a plan deposited in the said Office as No. 6014. Subject to the reservations and provisoes contained in the Grant from the Crown. THIRDLY: All that portion of the Northwest quarter of Section Twenty-nine in the said Township and Range lying to the East of the right bank of the Winnipeg River contained within the limits shewn bordered red on said Plan No. 6014. Subject to the reservations and provisoes contained in the Grant from the Crown.

oooooooo

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Thirtieth day of October One thousand nine hundred and sixty-three.

Signed in the presence of

D Shepherd

Deputy District Registrar for Winnipeg,

(i) The right of a person adversely in actual occupation, of any right, title, estate, or interest in land which it was sought under the Act, and who continues in such occupation;
(j) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under The Town Planning Act or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11020-041-000
AECL-OFFICIAL USE ONLY

Cert. No. A 2124

A-2124

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, Firstly: All those portions of the West Half of Section Seventeen and of the West Half of Section Twenty in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba contained within the limits shewn bordered green on a plan deposited in the Winnipeg Land Titles Office as No. 6014. Secondly: All that portion of the Southwest Quarter of Section Twenty-nine in the said Township and Range lying to the East of the right bank of the Winnipeg River contained within the limits shewn bordered green on said plan No. 6014. Thirdly: All those portions of the Government Road Allowance lying East of and adjoining Sections Eighteen and Nineteen in the said Township and Range which lie between a straight line drawn from the South East angle of said Section Eighteen to the South-west angle of Section Seventeen in the said Township and Range and a straight line drawn from the Northeast angle of said Section Nineteen to the North West angle of Section Twenty in the said Township and Range which is not covered by any of the waters of the Winnipeg River, as said Road Allowance and Winnipeg River are shewn on a map or plan of said Township, approved and confirmed at Ottawa on the Eighth day of June, 1923, by P. Shanks. Excepting out of all of the lands above described all mines and minerals(which expression "Mines and Minerals" does not include gravel) which may be found in, upon or under the said lands.

oooooooo

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Twenty-third day of May One thousand nine hundred and sixty-three.

Signed in the presence of

Deputy District Registrar

for Winnipeg,

Any right of appropriation by statute, actual occupation, of and rightly entitled, to the land at the time it was brought under the provisions of the charter of the title of a person registered under the provisions of the charter of the title of a person registered under the provisions of the charter of the title of a person registered

WL-11020-041-000
AECL-OFFICIAL USE ONLY
Cert. No. 978794

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, Section Twenty-seven and the North East Quarter of Section Twenty-eight all in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, excepting out of all of the land above described all mines and minerals other than gravel which may be found in, upon or under the said land.

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Sixteenth day of April One thousand nine hundred and Sixty-two

Signed in the presence of

Deputy District Registrar for Winnipeg,

Any certificate of title issued out of a court in the province and registered since the date of the certificate, and who continues in such occupation;
(f) Any subsisting right of way or other easement created by any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning;
(g) Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate shall otherwise expressly provide;
(h) Any mining regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.

WL-11020-041-000
AECL-OFFICIAL USE ONLY

MAY 12 1999

Cert. No. 978793

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, The North East Quarter of Section Twenty-six and all of Sections Twenty-two and Twenty-three, in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, excepting out of all of the land above described all mines and minerals other than gravel which may be found in, upon or under the said land.

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Sixteenth day of April One thousand nine hundred and Sixty-two

Signed in the presence of

Deputy District Registrar for Winnipeg,

(E) Any certificate of title granted out of a court in the province based on a claim of
(i) The right of a person adversely in actual occupation of and rightly entitled to the land at the time it was brought under the Act, and who continues in such occupation; and
(ii) Any title acquired since the date of the certificate, and
(2) Any rights acquired by the municipality under "The Town Planning Act" or under the provisions of the charter of any city relating to zoning schemes or by-law authorized under "The Town Planning Act" or the charter of any city and any by-law passed by any municipal corporation under "the Municipal Act" or the charter of any city relating to residential areas or zoning.
(j) Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.
(m) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.

WL-1102047-0002 MAY 12 1999
AECL-OFFICIAL USE ONLY
Cert. No. 978792

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, The East half of Section Nine, the North half, the South East Quarter, and Legal Subdivisions Five and Six, of Section Sixteen, Legal Subdivisions Eight, Nine and Sixteen of Section Seventeen, Legal Subdivisions Nine and Sixteen of Section Twenty and all of Section Twenty-one, all in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, excepting out of Legal Subdivisions Five, Twelve and Thirteen, of said Section Sixteen and out of the West half of said Section Twenty-one all those portions thereof taken for the Right of Way for Transmission Line of the Manitoba Power Company Limited as same is shewn colored pink on a plan filed in the Winnipeg Land Titles Office, as No. 3400, and excepting out of all of the land above described all mines and minerals other than gravel which may be found in, upon or under the said land.

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Sixteenth day of April One thousand nine hundred and Sixty-two

Signed in the presence of

Deputy District Registrar for Winnipeg,

(i) The date of a patent given under the Public Lands Act, and
(j) Caveats affecting the land registered since the date of the certificate, and who continues in such occupation:
(k) Any by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city relating to any town plan scheme or zoning by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality
(m) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.

WL-11020-041-000 MAY 12 1989
AECL-OFFICIAL USE ONLY
Cert. No. 978791

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, All of Sections Ten, Fourteen and Fifteen in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, excepting out of all of the land above described all mines and minerals other than gravel which may be found in, upon or under the said land.

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Sixteenth day of April One thousand nine hundred and Sixty-two

Signed in the presence of

Deputy District Registrar for Winnipeg,

Any certificate of lis pendens lapsed part of a caveat to the province and ... of the ... (a) Any rights of expropriation by statute. (b) The title of a person adversely in actual occupation of and rightly entitled to the land at the time it was brought under the Act, and who continues in such occupation since the date of the certificate, and (c) Any subsisting lease or agreement for lease registered under "The Town Planning Act" or under the provisions of the charter of any city relating to town planning schemes or by-law authorized under "The Municipal Act" or the charter of any city relating to and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning. (f) Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality (m) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.

WL-11020-041-000
AECL-OFFICIAL USE ONLY

Cert. No. 971333

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, All those portions of the Government Road Allowances (now closed) in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba, as the same are shewn on a map or plan of said Township, approved and confirmed at Ottawa on the Eighth day of June A.D. 1923 by T. Shanks for the Surveyor General contained within the limits bounded as follows: On the South by the Southern limits of Sections Eight, Nine, Ten and Eleven and their straight productions; on the East by the Eastern limits of Sections Eleven, Fourteen, Twenty-three and Twenty-six and their straight productions; on the North by the Northern limits of Sections Twenty-six, Twenty-seven, Twenty-eight and Twenty-nine and their straight productions and on the West by the right bank of the Winnipeg River, all of said Sections being in the said Township and Range, excepting thereout all those portions of the East-West Road Allowances lying between Sections Nine and Sixteen and between Sections Twenty-one and Twenty-eight in said Township and Range which lie between the straight productions of the Eastern and Western limits of the land taken for the Manitoba Power Company Limited Transmission Line Right-of-Way, as the same is shewn on a plan filed in the Winnipeg Land Titles Office as No. 3400, excepting thereout all mines and minerals, other than gravel, which may be found in, upon or under the said lands.

oooooooo

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Twenty-second day of November One thousand nine hundred and sixty-one.

Signed in the presence of

Deputy District Registrar

for Winnipeg,

(k) Any right of appropriation by statute.
(l) The title of a person adversely in actual occupation of and rightly entitled to the land at the time it was brought under the Act, and who continues in such occupation:
(i) Caveats affecting the land registered since the date of the certificate, and
(j) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city relating to residential districts or zoning passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential districts or zoning and any by-law passed by any municipality
(k) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city relating to residential districts or zoning and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential districts or zoning and any by-law passed by any municipality
(l) Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality
(m) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.

WL-11020-041-000
AECL-OFFICIAL USE ONLY

Cert. No. 971332

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

IS now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, all that portion of the North-West quarter of Section Twenty in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba, which lies to the West of the Most Westerly limit of the land taken for Water Storage, as the same is shewn bordered green on a Plan deposited in the Winnipeg Land Titles Office, as No. 6014, excepting thereout all mines and minerals, other than gravel, which may be found in, upon or under the said land.

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Twenty-second day of November One thousand nine hundred and sixty-one

Signed in the presence of

Deputy District Registrar

for Winnipeg,

Act, ... land ... entitled ... actual ... of an ... it will ... land ... not under ... continued ... (j) Caveats affecting the land registered since the date of the certificate and (k) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning. (l) Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality (m) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.

WL-11020-041-000
AECL-OFFICIAL USE ONLY
Cert. No. 971330

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, the South half and the Northwest quarter of Section Twenty-six in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba, excepting thereout all mines and minerals, other than gravel, which may be found in, upon or under the said lands.

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Twenty-second day of November One thousand nine hundred and sixty-one

Signed in the presence of

Deputy District Registrar

for Winnipeg,

Act, and who continues in such occupation;
(j) Caveats affecting the land registered since the date of the certificate, and
(k) A certified plan of subdivision registered under "The Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality
(m) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.

WL-11020-041000 2 1999
AECL-OFFICIAL USE ONLY
Cert. No. 971331

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

IS now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, the East half of Section Twenty-nine, the West half of the North-East quarter of Section Twenty and all those portions of the North-West quarter of Section Twenty and of the South-west quarter of Section Twenty-nine which lie to the East of the most Easterly limit of the land taken for Water Storage, as the same is shewn bordered green on a Plan deposited in the Winnipeg Land Titles Office, as No. 6014, all in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba, excepting thereout all mines and minerals, other than gravel, which may be found in, upon or under the said lands.

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Twenty-second day of November One thousand nine hundred and sixty-one

Signed in the presence of

Deputy District Registrar
for Winnipeg,

(i) The title of a person adversely in actual occupation of and rightly entitled to the land as against the registered owner thereof.
Act, and who continues in such occupation:
(j) Caveats affecting the land registered since the date of the certificate; and
(k) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality
(m) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.

WL-11020-041-000
AECL-OFFICIAL USE ONLY
Cert. No. 971329

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, Section Eleven in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, excepting thereout all mines and minerals, other than gravel, which may be found in, upon or under the said Lands.

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Twenty-second day of November One thousand nine hundred and sixty-one

Signed in the presence of

Deputy District Registrar

for Winnipeg,

Act, and who continues in such occupation:
(j) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city relating to any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas including embraced in the description of the land included in a certificate shall be deemed to be excluded unless
(l) Public highways
the certificate is the Crown or a municipality
(m) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.

WL-11020-041-000 DEC 12 1999
AECL-OFFICIAL USE ONLY
Cert. No. 971328

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, all that portion of the South-west quarter of Section Seventeen in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, which lies to the West of the Western limit of the land taken for Water Storage as the same is shewn bordered green on a plan deposited in the Winnipeg Land Titles Office as No.6014, excepting thereout all mines and minerals, other than gravel, which may be found in, upon or under the said lands.

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Twenty-second day of November One thousand nine hundred and sixty-one

Signed in the presence of

Deputy District Registrar
for Winnipeg.

(i) The title of a person adversely in actual occupation of and rightly entitled to the land at the time it was brought under Act, and who continues in such occupation:
(j) Caveats affecting the land registered since the date of the certificate and
(k) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city, and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.
(m) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.

WL-11020-041-000
AECL-OFFICIAL USE ONLY
Cert. No. 971327

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ATOMIC ENERGY OF CANADA LIMITED

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, the West half of Section Nine, Legal Subdivisions Three and Four of Section Sixteen and Legal Subdivisions One, Seven, Ten and Fifteen of Section Seventeen, and all those portions of the East half of Section Eight and of the West half and Legal Subdivision Two of said Section Seventeen which lie to the East of the Right Bank of the Winnipeg River, all in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, excepting out of the said West half of Section Nine and of Legal Subdivision Four of said Section Sixteen all those portions thereof taken for the Right of Way for Transmission Line of the Manitoba Power Company Limited, as same is shewn coloured pink on a plan filed in the Winnipeg Land Titles Office as No.3400, and excepting out of the balance of the land above described all mines and minerals other than gravel, which may be found in, upon or under the said lands.

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Twenty-second day of November One thousand nine hundred and sixty-one

Signed in the presence of

Deputy District Registrar

for Winnipeg,

(1) The title of a person adversely in actual occupation at the date of the certificate, and who continues in such occupation:
Act, and
(j) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality
(m) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.

Appendix B – Private Owners' Titles & Crown Canada Titles

WL-1102004-000 JUN 01 1999
AECL-OFFICIAL USE ONLY

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF MANITOBA

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, All those portions of Legal Subdivisions Fourteen and Fifteen of Section Eighteen and of Legal Subdivision Two of Section Nineteen in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba, taken for a Public Road, as the same is shewn coloured pink on a plan registered in the Winnipeg Land Titles Office, as No. 5986.

No. F75721 TRANSFER OF
pt ex Mx M
Atomic Energy of Canada Ltd.
Oct 30 '63
A 17172
VIDE CERT REGISTRAR

Contains only M & M

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Second day of November One thousand nine hundred and Sixty-two

Signed in the presence of

Deputy District Registrar
for Winnipeg,

Any transfer of the property, leasehold, sub-lease or a mortgage in the province and registered since the date of the certificate of title, and who continues in such occupation;
(k) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
(l) Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality
(m) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 07 1999

Cert. No. B 66216

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

PETER MANISTO

of Township Fourteen and Range Eleven East, in Manitoba, Farmer,

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, Legal Subdivisions One and Eight of Section Twenty in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba, subject to the reservations and provisoes contained in the Grant from the Crown.

No. 7104836/2 TRANSMISSION by DEATH FEDERAL GRANT
In consequence of the death of GRANT
all the estate in the within
All
is transmitted to Atomic Energy
of Canada Ltd.
under No. 22174
and entered as No. C79602
Winnipeg District Registry

N.B.

"Parcel B - Plan 9216 on Pt."

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Seventh day of January One thousand nine hundred and seventy - one

Signed in the presence of

G B Falls

Deputy District Registrar
for Winnipeg,

any city and any by-law passed by any municipal corporation under The Municipal Act or the charter of any city, town or village in force or coming into force requiring as that expression is defined in the Assessment Act (CANADA) made under that act and deposited in the Land Titles Office.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

Cert. No. 947132

MANITOBA

JUN 07 19[illegible]

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ROY BIEDLER,

OF LAC DU BONNET, IN MANITOBA, FARMER,

IS now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, THE NORTH-WEST QUARTER OF SECTION TWENTY-EIGHT IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE, EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, EXCEPTING THEREOUT ALL THAT PORTION THEREOF TAKEN FOR THE RIGHT OF WAY FOR MANITOBA POWER COMPANY TRANSMISSION LINE AS THE SAME IS SHEWN COLOURED PINK ON A PLAN FILED IN THE WINNIPEG LAND TITLES OFFICE AS NO 3400, AND ALSO EXCEPTING THEREOUT ALL MINES AND MINERALS, TOGETHER WITH THE RIGHT TO ENTER, LOCATE, PROSPECT, MINE FOR AND REMOVE MINERALS, AND ALSO OTHER ESTATES, RIGHTS AND INTEREST RESERVED TO THE CROWN UNDER THE CROWN LANDS ACT.

No. E 94878 TRANSFER of All

To The Queen

Registered Feb 20/67

Vide Cert. No. 975955 [illegible] District Registrar

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this FOURTEENTH day of NOVEMBER, One thousand nine hundred and SIXTY

Signed in the presence of

E. J. Mayo

Deputy District Registrar for Winnipeg

(c) Any drainage levy or mechanic's lien affecting the land.
(d) Any order of attachment, judgment or order for the payment of money against the registered owner of the land, registered since the date of the certificate of title, and this has been maintained in force under any Act of the province relating thereto.
(e) Any certificate of the pendency lis[illegible] out of a court in the province and registered since the date of the certificate of title.
(f) Any right of expropriation by statute.
(g) The title of a person adversely in actual occupation of and rightly entitled to the land at the time it was brought under the Act, and who continues in such occupation;
(h) Caveats affecting the land registered since the date of the certificate, and
(i) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.

Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

(i) Any mining regulation as the expression is defined in the Acts made under that Act and known as the Land Titles Office.

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 02 1999

Cert. No. 975955

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

HER MAJESTY THE QUEEN IN RIGHT OF CANADA

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, The North West Quarter of Section Twenty-eight in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, excepting thereout all that portion thereof taken for the right of way for Manitoba Power Company Transmission Line as the same is shewn coloured pink on a plan filed in the Winnipeg Land Titles Office, as No. 3400, and also excepting thereout all mines and minerals, together with the right to enter, locate, prospect, mine for and remove minerals, and all other estates, rights and interest reserved to the Crown under the Crown Lands Act.

NO. 174690 TRANSFER OF
TO. Atomic Energy of Canada Ltd
REG. Apr 15-68
NEW CERT. B4999 DIST. REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Twentieth day of February One thousand nine hundred and Sixty-two

Signed in the presence of

Deputy District Registrar for Winnipeg,

[redacted]

(l) Public Highways" embraced in the description of the land included in a certificate shall be deemed to be conveyed unless the certificate is to the Crown or a municipality.
(m) Any zoning regulation as that expression is defined in the Assumption Act (CANADA) made under this Act and deposited in the Land Titles Office.

WL-11020-041-000
AECL-OFFICIAL USE ONLY

Cert. No. 957942 ✓

JUN 07 1999

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

Olavi Valfrid Haavisto,

of Lac du Bonnet Post Office, in Manitoba, Farmer,

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, All those portions of the North-west quarter of Section Twenty-nine in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, lying East of the right bank and lying West of the left bank of the Winnipeg River as shewn on a map or plan of survey of said Township approved and confirmed at Ottawa on the Nineteenth Day of May A.D.1916 by Edouard Deville, Surveyor General of Dominion Lands and of record in the Department of the Interior, excepting out of the land above described firstly: all that portion taken for a public road as shewn on a plan registered in the Winnipeg Land Titles Office as No.7202, and secondly: all those portions taken for Water Storage as shewn on a plan deposited in the said Office as No.6014. Subject to the reservations and provisoes contained in the Grant from the Crown.

No. 31873 TRANSFER OF Bal
TO Olavi L. Haavisto
REG. May 7/61
VIDE T. 683269 DEPT. DIST. REGISTRAR

To J. Sherwin Q.C. Winnipeg
Registered June 13/61 Deputy District Registrar
Title Cert. No. 960330

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Ninth day of May One thousand nine hundred and sixty-one

Signed in the presence of

E. L. Mayo

Deputy District Registrar for Winnipeg,

(1) Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is in the Crown or a municipality
(2) "Municipality" means a municipality as defined in the Municipal Act and any by-law passed by any municipal corporation under the authority of any Act relating to residential areas or zoning.
(3) "Aeronautics Act" means the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 0 2 1999

Cert. No. 960330

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

HER MAJESTY THE QUEEN IN RIGHT OF CANADA

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, All that portion of the North-west quarter of Section Twenty-nine in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba, which lies East of the Right Bank of the Winnipeg River as shewn on a map or plan of survey of said Township approved and confirmed at Ottawa on the Nineteenth Day of May A.D.1916 by Edouard Deville, Surveyor General of Dominion Lands and of record in the Department of the Interior, excepting out of the land above described all those portions taken for water storage as shewn on a plan deposited in the Winnipeg Land Titles Office as No.6014. Subject to the reservations and provisoes contained in the Grant from the Crown.

NO. N74690 TRANSFER OF all
TO Atomic Energy of Canada Ltd
REG Apr 15-68
NEW CERT. B4998 DEP. DIST. REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Thirteenth day of June One thousand nine hundred and sixty-one

Signed in the presence of

Deputy District Registrar for Winnipeg,

residential areas or zoning.
(l) Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality
(m) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.

Cert. No. 953595

JUN 07 1999

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

MICHAEL BRUCHANSKI

OF LAC DU BONNET, IN MANITOBA, FARMER,

IS now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, THE SOUTH HALF OF SECTION TWENTY-EIGHT, IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, EXCEPTING OUT OF THE SOUTH-WEST QUARTER OF SAID SECTION ALL THAT PORTION THEREOF TAKEN FOR THE RIGHT OF WAY FOR MANITOBA POWER COMPANY TRANSMISSION LINE AS THE SAME IS SHEWN ON A PLAN FILED IN THE WINNIPEG LAND TITLES OFFICE AS NO 3400 AND EXCEPTING OUT OF THE BALANCE OF THE LAND ABOVE DESCRIBED ALL MINES AND MINERALS, TOGETHER WITH THE RIGHT TO ENTER, LOCATE, PROSPECT, MINE FOR AND REMOVE MINERALS AND ALL OTHER ESTATES, RIGHTS AND INTERESTS RESERVED TO THE CROWN UNDER THE CROWN LANDS ACT.

No. EH87611 TRANSFER of all

To H. Gasser

Registered Mar 22-61

Vide C 951778

Deputy District Registrar

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this SEVENTH day of MARCH One thousand nine hundred and SIXTY-ONE

Signed in the presence of

Deputy District Registrar for Winnipeg

WL-11020-041-000
AECL CONFIDENTIAL USE ONLY

JUN 02 1999

Cert. No. 954778

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

HER MAJESTY THE QUEEN IN RIGHT OF CANADA

I, now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, THE SOUTH HALF OF SECTION TWENTY-EIGHT IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, EXCEPTING OUT OF THE SOUTH-WEST QUARTER OF SAID SECTION ALL THAT PORTION THEREOF TAKEN FOR THE RIGHT OF WAY FOR THE MANITOBA POWER COMPANY TRANSMISSION LINE AS THE SAME IS SHEWN ON A PLAN FILED IN THE WINNIPEG LAND TITLES OFFICE AS NO 3400 AND EXCEPTING OUT OF THE BALANCE OF THE LAND ABOVE DESCRIBED ALL MINES AND MINERALS, TOGETHER WITH THE RIGHT TO ENTER, LOCATE, PROSPECT, MINE FOR AND REMOVE MINERALS AND ALL OTHER ESTATES, RIGHTS AND INTERESTS RESERVED TO THE CROWN UNDER THE CROWN LANDS ACT.

NO. H74690 TRANSFER OF all
TO Atomic Energy of Canada Ltd.
REG. April 15-61
NEW CERT. B4990
DEP. DIST. REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this TWENTY-SECOND day of MARCH One thousand nine hundred and SIXTY-ONE

Signed in the presence of

Deputy District Registrar
for Winnipeg

(j) Any zoning regulations that may be registered in the Land Titles Office against the title to the land described herein;
(k) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning;
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

(1) Any zoning regulations that may be registered in the aeronautics act (CANADA) made under that Act and registered as last mentioned in the Land Titles Office.

Cert. No. 854823

MANITOBA

JUN 07 1999

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

INGRID GUSTAFSON OF LAC DU BONNET POST OFFICE, IN MANITOBA, WIDOW OF OSCAR GUSTAFSON, AS ADMINISTRATRIX OF THE ESTATE OF THE SAID OSCAR GUSTAFSON, LATE OF THE SAME PLACE, FARMER, DECEASED,

IS now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, FIRSTLY: ALL THOSE PORTIONS OF LEGAL SUBDIVISIONS ONE, TWO, SEVEN AND EIGHT OF FRACTIONAL SECTION EIGHTEEN IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE, EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, WHICH LIE TO THE SOUTH OF A LINE DRAWN PARALLEL TO THE NORTHERN LIMIT OF SAID SECTION FROM A POINT IN THE WESTERN LIMIT OF SAID FRACTIONAL SECTION DISTANT SOUTHERLY THEREON THIRTY-FIVE HUNDRED AND TWENTY FEET FROM SAID NORTHERN LIMIT, EXCEPTING OUT OF SAID LEGAL SUBDIVISIONS TWO AND SEVEN THOSE PORTIONS TAKEN FOR A PUBLIC ROAD AND SHEWN COLOURED PINK ON A PLAN REGISTERED IN THE WINNIPEG LAND TITLES OFFICE AS NO 6073; AND EXCEPTING OUT OF SAID LEGAL SUBDIVISION EIGHT ALL THAT PORTION THEREOF TAKEN FOR WATER STORAGE AS SHEWN ON A PLAN FILED IN SAID OFFICE AS NO 6014.

SECONDLY: FRACTIONAL LEGAL SUBDIVISIONS THREE AND SIX OF THE SAID SECTION EIGHTEEN, EXCEPTING OUT OF SAID FRACTIONAL LEGAL SUBDIVISION THREE THE MOST NORTHERLY FOUR HUNDRED AND EIGHTY-TWO FEET IN PERPENDICULAR DEPTH AND THE MOST SOUTHERLY SEVEN HUNDRED AND EIGHTY-TWO FEET IN PERPENDICULAR DEPTH OF THE MOST WESTERLY THREE HUNDRED AND SIXTY-ONE AND ONE-HALF FEET IN PERPENDICULAR WIDTH THEREOF, AND FURTHER EXCEPTING OUT OF SAID FRACTIONAL LEGAL SUBDIVISION THREE ALL THAT PORTION THEREOF TAKEN FOR A PUBLIC ROAD AS SAME IS SHEWN COLOURED PINK ON A PLAN OF SAME REGISTERED IN THE WINNIPEG LAND TITLES OFFICE AS NO 4693, AND EXCEPTING OUT OF SAID LEGAL SUBDIVISION SIX THAT PORTION TAKEN FOR SAID PUBLIC ROAD AS SHEWN ON SAID PLAN NO 6073. SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE GRANT AND TRANSFERS FROM THE CROWN

No. E50073 TRANSFER of ALL To The Queen Registered AM 3/61 1953395 Deputy District Registrar

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of Office this FOURTH day of OCTOBER One thousand nine hundred and FIFTY-SIX

Signed in the presence of

Deputy District Registrar for Winnipeg

JUN 02 1999
AECL-OFFICIAL USE ONLY

Cert. No. 955395

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

HER MAJESTY THE QUEEN IN RIGHT OF CANADA

IS now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, FIRSTLY: ALL THOSE PORTIONS OF LEGAL SUBDIVISIONS ONE, TWO, SEVEN AND EIGHT OF FRACTIONAL SECTION EIGHTEEN IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE, EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, WHICH LIE TO THE SOUTH OF A LINE DRAWN PARALLEL TO THE NORTHERN LIMIT OF SAID SECTION FROM A POINT IN THE WESTERN LIMIT OF SAID FRACTIONAL SECTION DISTANT SOUTHERLY THEREON THIRTY-FIVE HUNDRED AND TWENTY FEET FROM SAID NORTHERN LIMIT, EXCEPTING OUT OF SAID LEGAL SUBDIVISIONS TWO AND SEVEN THOSE PORTIONS TAKEN FOR A PUBLIC ROAD AND SHEWN COLOURED PINK ON A PLAN REGISTERED IN THE WINNIPEG LAND TITLES OFFICE AS NO 6073, AND EXCEPTING OUT OF SAID LEGAL SUBDIVISION EIGHT ALL THAT PORTION THEREOF TAKEN FOR WATER STORAGE AS SHEWN ON A PLAN FILED IN THE SAID OFFICE AS NO 6014.

SECONDLY: FRACTIONAL LEGAL SUBDIVISIONS THREE AND SIX OF SAID SECTION EIGHTEEN, EXCEPTING OUT OF SAID FRACTIONAL LEGAL SUBDIVISION THREE THE MOST NORTHERLY FOUR HUNDRED AND EIGHTY-TWO FEET IN PERPENDICULAR DEPTH OF THE MOST SOUTHERLY SEVEN HUNDRED AND EIGHTY-TWO FEET IN PERPENDICULAR DEPTH OF THE MOST WESTERLY THREE HUNDRED AND SIXTY-ONE AND ONE-HALF FEET IN PERPENDICULAR WIDTH THEREOF, AND FURTHER EXCEPTING OUT OF SAID FRACTIONAL LEGAL SUBDIVISION THREE ALL THAT PORTION THEREOF TAKEN FOR A PUBLIC ROAD AS SAME IS SHEWN COLOURED PINK ON A PLAN OF SAME REGISTERED IN THE SAID OFFICE AS NO 4693, AND EXCEPTING OUT OF SAID LEGAL SUBDIVISION SIX THAT PORTION TAKEN FOR SAID PUBLIC ROAD AS SHEWN ON SAID PLAN NO 6073.

SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE GRANT ~~FR~~ AND TRANSFERS FROM THE CROWN.

NO. H7469 TRANSFER OF all
TO Atomic Energy of Canada Ltd
REG. April 5-68
NEW CERT. B4992 DEP. DIST. REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this THIRD day of APRIL One thousand nine hundred and SIXTY-ONE

Signed in the presence of

Deputy District Registrar
for Winnipeg

(L) Any zoning regulation as that expression is defined in the assumption act (CANADA) made under that act and approved as the Land Titles Office certificate is to the Crown or a municipality.

Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the
(i) Any town planning scheme or by-law enacted under the "Planning Act" or under the charter of any city and
(j) Any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas
Covenants affecting the land registered since the date of the certificate, and

Cert. No. 838/1950

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

SANFORD
~~BRANKHORN~~ PETERSEN,

OF LAC DU BONNET POST OFFICE, IN MANITOBA, FARMER,

IS now seized of an estate in fee simple in possession, subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, THE SOUTH-EAST QUARTER OF SECTION TWELVE, IN THE FOURTEENTH TOWNSHIP AND TENTH RANGE, EAST OF THE PRINCIPAL MERIDIAN, IN MANITOBA, SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE GRANT FROM THE CROWN

No. E38837 TRANSFER of
All
To The Queen
Registered 1 Dec 21/50
Vide Cert. No. 95198 Deputy District Registrar

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of Office this SEVENTH day of NOVEMBER One thousand nine hundred and FIFTY-FIVE

Signed in the presence of

E. A. Rogers

Deputy District Registrar
for Winnipeg

WL-11020-041-000
AECL - OFFICIAL USE ONLY
JUN 02 1999

Cert. No. 950198

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

(C) Any zoning regulation as that expression is defined in the Planning Act (CANADA) made by any municipal corporation under the Municipal Act of Manitoba or any by-law passed by any municipal corporation under the Municipal Act of Manitoba or any Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

HER MAJESTY THE QUEEN IN RIGHT OF CANADA

IS *now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows,* THE SOUTH-EAST QUARTER OF SECTION FIVE (5) IN THE FOURTEENTH TOWNSHIP AND TENTH RANGE, EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA.

SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE GRANT FROM THE CROWN.

NO. H2440 TRANSFER OF all
TO Atomic Energy of Canada Ltd.
REG. Apr 15-68
NEW CERT. 64987
DEPUTY REGISTRAR

IN WITNESS WHEREOF *I have hereunto signed my name and affixed my Seal of office this* TWENTY-FIRST *day of* DECEMBER, *One thousand nine hundred and* SIXTY

Signed in the presence of

E. Mayo

Deputy District Registrar
for Winnipeg

Cert. No. JUN 07 1999
773563

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

THE RURAL MUNICIPALITY OF LAC DU BONNET

IS now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, ALL THOSE PORTIONS OF LEGAL SUBDIVISIONS FOUR AND FIVE OF SECTION TWENTY IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE, EAST OF THE PRINCIPAL MERIDIAN, IN MANITOBA, WHICH LIE TO THE EAST OF THE WINNIPEG RIVER, AS SHEWN ON A MAP OR PLAN OF SURVEY OF SAID TOWNSHIP APPROVED AND CONFIRMED AT OTTAWA ON THE EIGHTH DAY OF JUNE, A.D. 1929, BY THOMAS SHANKS, FOR THE SURVEYOR GENERAL OF DOMINION LANDS, SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE GRANT FROM THE CROWN.

No. 651563 TRANSFER of
Kit C
To The Queen
Registered Apr 13/61
Title Cert. No. 756082 Deputy District Registrar

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this SIXTEENTH day of JANUARY One thousand nine hundred and FIFTY-THREE

Signed in the presence of

A Normandeau

E O'Brien
Deputy District Registrar
for Winnipeg

The land mentioned in a certificate of title shall by implication and without special mention in the certificate, unless the contrary be expressly declared, be deemed to be subject to:
Any original grant from the Crown.
Any municipal charge, rate or assessment existing at the date of the certificate of title.
Any right-of-way or other easement, howsoever created, upon, over or in respect of the land.
Any subsisting lease or agreement for a lease for a period not exceeding three years, where there is actual occupation of the land thereunder.
Any drainage levy or mechanics' lien affecting the land.
Any order of attachment, judgment or order for the payment of money under the registration Act of the land since the date of the certificate of title, and which has been maintained in force under the provisions of any Act of the province relating thereto.
Any certificate of lis pendens issued out of a court in the province and registered since the date of the certificate of title.
Any right of expropriation by statute.
The title of a person adversely in actual occupation of and rightly entitled to the land at the time it was brought under the Act, and who continues in such occupation.
Create affecting the land registered since the date of the certificate of title
Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

Receipt No. 2 2 2

WL-11020-041-000
AECL UNOFFICIAL USE ONLY

JUN 02 1999

MANITOBA

Cert. No. 956082

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

HER MAJESTY THE QUEEN IN RIGHT OF CANADA

IS *now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that* AT *piece or parcel of land known and described as follows* ALL THAT PORTION OF LEGAL SUBDIVISION FOUR OF SECTION TWENTY IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE, EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, WHICH LIES TO THE EAST OF THE WINNIPEG RIVER AS SHEWN ON A MAP OR PLAN OF SURVEY OF SAID TOWNSHIP APPROVED AND CONFIRMED AT OTTAWA ON THE EIGHTH DAY OF JUNE A.D. 1923 BY THOMAS SHANKS FOR THE SURVEYOR GENERAL OF DOMINION LANDS, EXCEPTING THEREOUT ALL THAT PORTION TAKEN FOR WATER STORAGE AS THE SAME IS SHEWN BORDERED RED ON A PLAN DEPOSITED IN THE WINNIPEG LAND TITLES OFFICE AS NO 6014: SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE GRANT FROM THE CROWN.

NO. H74690 TRANSFER OF all
TO Atomic Energy of Canada Ltd.
REG. Apr 15-63
NEW CERT. B4993 DEP. DIST. REGISTRAR

IN WITNESS WHEREOF *I have hereunto signed my name and affixed my Seal of office this* THIRTEENTH *day of* APRIL
One thousand nine hundred and SIXTY-ONE
Signed in the presence of

Deputy District Registrar
for Winnipeg

(1) Any existing reservation as that expression is defined in the municipal act (CANADA) or zoning. Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

JUN 07 1999

Cert. No. 754354

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

CHRISTOFFER CHRISTIANSEN BALNESS

OF LAC DU BONNET POST OFFICE, IN MANITOBA, FARMER

IS now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, THE NORTH-EAST QUARTER OF SECTION THIRTEEN IN THE FOURTEENTH TOWNSHIP AND TENTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA. SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE CROWN LANDS ACT

No. 836238 TRANSFER of
ACC
to H.M. Queen (Man.)
Registered Dec 1/52
Title Cert No. 815269
Deputy District Registrar

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this EIGHTEENTH day of FEBRUARY One thousand nine hundred and FIFTY-TWO

Signed in the presence of

Deputy District Registrar for Winnipeg

WL-11020-041-000
JUN 02 1999
AECL OFFICIAL USE ONLY

Cert. No. 948969

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

HER MAJESTY THE QUEEN, IN RIGHT OF CANADA,

now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, THE NORTH-EAST QUARTER OF SECTION THIRTEEN IN THE FOURTEENTH TOWNSHIP AND TENTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA. SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE CROWN LANDS ACT.

NO. H 74690 TRANSFER OF all
TO Atomic Energy of Canada Ltd
REG. April 15 68
NEW CERT B4983 DEP. DIST. REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this FIRST day of DECEMBER, One thousand nine hundred and SIXTY

Signed in the presence of

E. F. Mayo

Deputy District Registrar
for Winnipeg

(k) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the charter of any city, any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.

Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded, unless the certificate is to the Crown or a municipality.

(L) Any zoning regulation as that expression is defined in the Planning Act (CANADA) made under that Act and registered as Land Regulation

JUN 07 1999

Cert. No. 660042

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

HENRY SIKORA
OF MILNER RIDGE POST OFFICE IN MANITOBA, FARMER.

IS now seized of an estate in fee simple in possession subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all those pieces or parcels of land known and described as follows LEGAL SUBDIVISIONS TEN AND FIFTEEN OF SECTION NINETEEN IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA

SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE GRANT FROM THE CROWN.

No. E 46733 TRANSFER of
all
To Her Majesty the Queen in Canada
Registered Mar. 6. 61
Vide Cert. No 953818
Deputy District Registrar

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this TENTH day of JULY One Thousand nine hundred and FORTY-SEVEN

Signed in the presence of

Deputy District Registrar
for Winnipeg

Any taxes
Any municipal charge, rate or assessment accruing at the date of the certificate, or subsequently imposed on the land.
Any right-of-way or other easement, however created, upon, over or in respect of the land.
Any subsisting lease or agreement for a term not exceeding three years, where there is actual occupation of the land thereunder.
Any drainage levy or mechanics' lien affecting the land.
Any order of attachment, judgment or order for the payment of money against the registered owner of the land, registered since the date of the certificate of title, and which has been maintained in force under the provisions of any Act of the province relating thereto.
Any certificate of lis pendens issued out of a court in the province and registered since the date of the certificate of title.
Any right of expropriation by statute.
The title of a person adversely in actual occupation of and rightly entitled to the land at the time it was brought under the Act, and who continues in such occupation;
Caveats affecting the land registered since the date of the certificate, and
Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
Public highways enclosed in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11020-041-00
AECL-OFFICIAL USE ONLY
JUN 02 1999

Cert. No. ~~9521~~ 952417

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

HER MAJESTY THE QUEEN IN RIGHT OF CANADA

IS *now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows,* FRACTIONAL LEGAL SUBDIVISIONS THREE AND SIX AND LEGAL SUBDIVISIONS TWO AND SEVEN OF SECTION NINETEEN IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE, EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, EXCEPTING OUT OF SAID LEGAL SUBDIVISION TWO ALL THAT PORTION TAKEN FOR A PUBLIC ROAD, AS SAME IS SHEWN ON A PLAN REGISTERED IN THE WINNIPEG LAND TITLES OFFICE AS NO 5986 AND EXCEPTING OUT OF SAID LEGAL SUBDIVISION THREE AND SIX ALL THOSE PORTIONS TAKEN FOR A PUBLIC ROAD AS SAME IS SHEWN ON A PLAN DEPOSITED IN SAID OFFICE AS NO 6073, SUBJECT TO ANY SUBSISTING RESERVATIONS CONTAINED IN THE CROWN LANDS ACT.

NO. H74690 TRANSFER OF all
TO Atomic Energy of Canada Ltd.
REG. April 5-68
NEW CERT B4988 DEP. DIST. REGISTRAR

IN WITNESS WHEREOF *I have hereunto signed my name and affixed my Seal of office this* SEVENTH *day of* FEBRUARY *One thousand nine hundred and* SIXTY-ONE *Signed in the presence of*

E. L. Mayo

Deputy District Registrar for Winnipeg.

(E) Any town planning scheme or by-law approved under "The Town ... Act" or any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.
(L) Any ... in the ... Act (CANADA)

WL-11020-041-000
AECL-OFFICIAL USE ONLY

Cert. No. 602665

MANITOBA

JUN 23 1999

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

CARL GUSTAFSON, FARMER AND BERET GUSTAFSON, HIS WIFE BOTH OF LAC DU BONNET POST OFFICE IN MANITOBA, ARE NOW SEIZED OF A LIFE ESTATE DURING THE TERM OF THEIR JOINT NATURAL LIVES AND UPON THE DEATH OF EITHER TO THE SURVIVOR A LIFE ESTATE DURING THE TERM OF HIS OR HER NATURAL LIFE

~~now seized of an estate in fee simple in possession~~ subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows ALL THAT PORTION OF FRACTIONAL SECTION EIGHTEEN IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, WHICH LIES TO THE NORTH OF A LINE DRAWN PARALLEL TO THE NORTHERN LIMIT OF SAID SECTION FROM A POINT IN THE WESTERN LIMIT OF SAID FRACTIONAL SECTION DISTANT SOUTHERLY THEREON SEVENTEEN HUNDRED AND SIXTY FEET FROM THE SAID NORTHERN LIMIT SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE GRANT ERR AND TRANSFERS FROM THE CROWN.

REQUEST No. F29618
TO ISSUE NEW TITLE FOR
all within limits Plan 6075
TO Hester B. Chalmers
REG. Nov. 2-62
VIDE CERT. 991821
DEP. DIST. REGISTRAR

new memo
Request No. 933583 to issue New Certificate of Title for part of LSD 11 as shown on Plan 6075 (Morris) Plan 6075 Signed this 7th day of June 1961 A.D. Registrar
Deputy District Registrar
Cert. No. 848053

new memo
NO. 557459 CANCELLED OF Part of Plan 5980 & 6073
TO The Queen (Manitoba)
REG. May 10/61
NEW CERT. 957995 A.B. Gamer DEP. DIST. REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this EIGHTEENTH day of DECEMBER One thousand nine hundred and FORTY-FOUR

Signed in the presence of

W. Hackman

Deputy District Registrar
for Winnipeg

WL-11020-041-000
ACCOUNT JUN 02 1999

Cert. No. 957995

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

HER MAJESTY THE QUEEN IN RIGHT OF CANADA

of the City of the Town of Transcona, in

as joint tenants and not as tenants

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows: All that portion of Fractional Section Eighteen in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba, which lies to the North of a Line drawn parallel to the Northern limit of said section from a point in the Western limit of said Fractional Sections distant Southerly thereon Seventeen Hundred and Sixty feet from the said Northern limit, excepting thereout all those portions taken for public roads as the same are shewn on plans registered in the Winnipeg Land Titles Office as Nos. 5986 and 6073 and excepting out of the North-East Quarter of said Fractional Section all that portion taken for water storage as the same is shewn bordered red on a plan registered in the said office as No. 6014. Subject to the reservations and provisoes contained in the Grant and Transfers from the Crown.

NO. H74690 TRANSFER OF all
TO Atomic Energy of Canada Ltd
REG Nov 15-68
NEW CERT B4996 DEP. DIST. REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Tenth day of May, One thousand nine hundred and Sixty-one.

Signed in the presence of

Deputy District Registrar for Winnipeg,

[redacted]

residential areas or zoning.
(l) Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality
(m) Any zoning regulation as that expression is defined in the Assessment Act, (CANADA), made under that act, and deposited in the Land Titles Office.

WL-11020-041-000
AECL-OFFICIAL USE ONLY

Cert. No. 602663

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

ERIC GUSTAFSON
OF LAC DU BONNET POST OFFICE IN MANITOBA, FARMER

IS *now seized of an estate in fee simple in possession subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows* ALL THAT PORTION OF FRACTIONAL SECTION EIGHTEEN IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA WHICH LIES BETWEEN TWO LINES DRAWN PARALLEL TO THE NORTHERN LIMIT OF SAID SECTION FROM POINTS IN THE WESTERN LIMIT OF SAID FRACTIONAL SECTION DISTANT SOUTHERLY THEREON SEVENTEEN HUNDRED AND SIXTY FEET AND THIRTY-FIVE HUNDRED AND TWENTY FEET RESPECTIVELY FROM SAID NORTHERN LIMIT EXCEPTING THEREOUT ALL THAT PORTION THEREOF CONTAINED WITHIN THE LIMITS OF FRACTIONAL LEGAL SUBDIVISION SIX OF SAID SECTION, SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE GRANT AND TRANSFERS FROM THE CROWN.

O333583 Instr. to Water Power Comm. (Man.) Dom. 60 Yr. June 26 "

O51963 Sat. by Letter 6073 "

Apr 17/61 "

96379 NEW CPRT. DEP. DIST. REGISTRAR

IN WITNESS WHEREOF *I have hereunto signed my name and affixed my Seal of office this* EIGHTEENTH *day of* DECEMBER *One thousand nine hundred and* FORTY-FOUR

Signed in the presence of

Deputy District Registrar
for Winnipeg

Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded.

WL-11020-041-000
AECL OFFICIAL USE ONLY

JUN 02 1999

Cert. No. 956279

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

HER MAJESTY THE QUEEN IN RIGHT OF CANADA

IS now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, ALL THAT PORTION OF FRACTIONAL SECTION EIGHTEEN IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, WHICH LIES BETWEEN TWO LINES DRAWN PARALLEL TO THE NORTHERN LIMIT OF SAID SECTION FROM POINTS IN THE WESTERN LIMIT OF SAID FRACTIONAL SECTION, DISTANT SOUTHERLY THEREON SEVENTEEN HUNDRED AND SIXTY FEET AND THIRTY-FIVE HUNDRED AND TWENTY FEET RESPECTIVELY FROM SAID NORTHERN LIMIT, EXCEPTING THEREOUT ALL THAT PORTION THEREOF CONTAINED WITHIN THE LIMITS OF FRACTIONAL LEGAL SUBDIVISION SIX OF SAID SECTION AND EXCEPTING OUT OF THE EAST HALF OF SAID SECTION ALL THOSE PORTIONS TAKEN FOR WATER STORAGE AS THE SAME IS SHEWN BORDERED RED ON A PLAN DEPOSITED IN THE WINNIPEG LAND TITLES OFFICE AS NO. 6014 AND EXCEPTING OUT OF THE FRACTIONAL WEST HALF AND SOUTH EAST QUARTER OF SAID SECTION THOSE PORTIONS TAKEN FOR A PUBLIC ROAD AS SHEWN ON A PLAN DEPOSITED IN THE SAID OFFICE AS NO. 6073. SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE GRANT AND TRANSFERS FROM THE CROWN.

NO. H74690 TRANSFER OF all
TO Atomic Energy of Canada Ltd.
REG Apr 15-65
NEW CERT B4995
DEP. DIST. REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this SEVENTEENTH day of APRIL, One thousand nine hundred and SIXTY-ONE.

Signed in the presence of

Deputy District Registrar
for Winnipeg

(k) Any town planning scheme or by-law authorized under "The Town Planning Act" or any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.

Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

(1) Any existing registration of that description of land in the certificate of title under the provisions of the Municipal Act (CANADA)

WL-11020-041-000
AECL-OFFICIAL USE ONLY

Cert. No. 602662

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ERIC GUSTAFSON
OF LAC DU BONNET POST OFFICE IN MANITOBA, FARMER

JUN 24 1999

IS now seized of an estate in fee simple in possession subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows ALL THAT PORTION OF FRACTIONAL SECTION EIGHTEEN IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA WHICH LIES TO THE NORTH OF A LINE DRAWN PARALLEL TO THE NORTHERN LIMIT OF SAID SECTION FROM A POINT IN THE WESTERN LIMIT OF SAID FRACTIONAL SECTION DISTANT SOUTHERLY THEREON SEVENTEEN HUNDRED AND SIXTY FEET FROM THE SAID NORTHERN LIMIT SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE GRANT FROM THE CROWN and Transfers

REQUEST No. F29618
TO ISSUE NEW TITLE FOR All of Lot 1 Plan 2,100 57N
In all within limits Plan 6075
TO Hester B. Chalmers
DATED Nov. 2-62
TITLE CERT. 99187 | DEP. DIST. REGISTRAR

NO. 220263 TRANSFER OF Life estate
TO Eric Gustafson et ux
REG. Dec 18/44 | 602665 | DEP. DIST. REGISTRAR
NEW CERT.

Request No. 335883 to issue New Certificate
of The Within Certificate
Title Certificate No. 8480
JUN 26 1958

No. E 5477 Affecting the Within Certificate
To Ed. Plan 2 Lot 1
Registered May 5/71 at 9576 hrs.
Title No. 95769 | District Registrar

IN WITNESS WHEREOF I have hereunto signed my name and caused my Seal of Office to be affixed this EIGHTEENTH day of DECEMBER one thousand nine hundred and FORTY-FOUR

Deputy District Registrar
for Winnipeg

JUN 07 1999

Cert. No. 587281

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

ROLF LARSON

OF LAC DU BONNET POST OFFICE IN MANITOBA, FARMER

IS *now seized of an estate in fee simple in possession subject to* such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all THOSE *piece or parcels of land known and described as follows* LEGAL SUBDIVISIONS TWO, THREE SEVEN AND FRACTIONAL LEGAL SUBDIVISION SIX, ALL IN SECTION TWENTY IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA AS THE SAME ARE SHEWN ON A MAP OR PLAN OF SAID TOWNSHIP, APPROVED AND CONFIRMED AT OTTAWA ON THE EIGHTH DAY OF JUNE, 1923, BY T. SHANKS, FOR THE SURVEYOR GENERAL, SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE GRANT FROM THE CROWN.

No. E37116 TRANSFER of
Balance
To Dec 6 1969
Registered Dec 8/69
Wife Cert. No. 94171/33 Deputy District Registrar

IN WITNESS WHEREOF *I have hereunto signed my name and affixed my Seal of office this* TWENTY-NINTH *day of* FEBRUARY *One thousand nine hundred and* FORTY-FOUR

Signed in the presence of
H. Reynolds

Deputy District Registrar
for Winnipeg

WL-11020-041-000
AER OFFICIAL USE ONLY

JUN 02 1999

Cert. No. 949423

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

(b) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.

Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

(L) Any zoning regulation as that expression is defined in the aeronautics act (CANADA) made under that Act and registered at the Land Titles Office.

HER MAJESTY THE QUEEN IN RIGHT OF CANADA

IS *now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows,* LEGAL SUBDIVISIONS TWO, THREE, SEVEN AND FRACTIONAL LEGAL SUBDIVISION SIX, ALL IN SECTION TWENTY IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, AS THE SAME ARE SHEWN ON A MAP OR PLAN OF SAID TOWNSHIP ~~APPD~~ APPROVED AND CONFIRMED AT OTTAWA ON THE EIGHTH DAY OF JUNE A.D. 1923 BY T. SHANKS FOR THE SURVEYOR GENERAL. EXCEPTING OUT OF SAID LEGAL SUBDIVISIONS THREE AND SIX ALL THAT PORTION TAKEN FOR WATER STORAGE AS THE SAME IS SHEWN ON A PLAN DEPOSITED IN THE WINNIPEG LAND TITLES OFFICE AS NO 6014. SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE~~OR~~ GRANT FROM THE CROWN.

NO. 47469 TRANSFER OF all

TO Atomic Energy of Canada Ltd

REG. April 15-69

NEW CERT. 34985

DEP. DIST. REGISTRAR

IN WITNESS WHEREOF *I have hereunto signed my name and affixed my Seal of office this* EIGHTH *day of* DECEMBER, *One thousand nine hundred and* SIXTY

Signed in the presence of

E. A. Mayo

Deputy District Registrar

for Winnipeg

JUN 07 1999

Cert. No. 566770

MANITOBA

Certificate of Title

UNDER THE REAL PROPERTY ACT

MICHAEL BRUSHANSKI

OF THE MUNICIPALITY OF LAC DU BONNET IN MANITOBA, FARMER,

IS now seized of an estate in fee simple in possession subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all those pieces or parcels of land known and described as follows FRACTIONAL LEGAL SUBDIVISIONS ONE AND EIGHT OF SECTION NINETEEN IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE, EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA.

No. E48765 TRANSFER of Balance

To H.M. (the Queen) Canada

Registered June 22/64

Vide Cert. No. 954779 Deputy District Registrar

NB

M+M received in original grant 20 June 56

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of Office this TWELFTH day of SEPTEMBER One thousand nine hundred and FORTY-TWO.

Signed in the presence of

Deputy District Registrar for Winnipeg

WL-11020-041-000
AEC OFFICIAL USE ONLY

JUN 02 1999

Cert. No. 95477

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

HER MAJESTY THE QUEEN IN RIGHT OF CANADA

IS now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, ~~FRO~~ FRACTIONAL LEGAL SUBDIVISIONS ONE AND EIGHT OF SECTION NINETEEN IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE, EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, EXCEPTING THEREOUT ALL THAT PORTION TAKEN FOR WATER STORAGE, AS SHEWN ON A PLAN REGISTERED IN THE WINNIPEG LAND TITLES OFFICE AS NO 6014.

NO. H74690 TRANSFER OF all
TO Atomic Energy of Canada Ltd.
REG. Apr 15-68
NEW CERT. 34991
DEP. DIST. REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this TWENTY-SECOND day of MARCH One thousand nine hundred and SIXTY-ONE

Signed in the presence of

Deputy District Registrar
for Winnipeg

(k) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the charter of any city, any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.

Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

(1) Any easement [illegible] made under [illegible] Act (CANADA)

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 07 1995

Cert. No. 630180

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

HENRY SIKORA
OF THE MUNICIPALITY OF LAC DU BONNET IN MANITOBA, FARMER;

IS now seized of an estate in fee simple in possession subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all th OSE piece or parcel of land known and described as follows FRACTIONAL LEGAL SUBDIVISIONS THREE AND SIX AND LEGAL SUBDIVISIONS TWO AND SEVEN OF SECTION NINETEEN IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE, EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, SUBJECT TO ANY SUBSISTING RESERVATIONS CONTAINED IN THE CROWN LANDS ACT;

REQUEST No. F29618
TO ISSUE NEW TITLE FOR
Part Lot 5 Plan No 5786
TO Peter B. Chalmers
REG. Nov 2-62
VIDE CERT. 99821
DEP. DIST. REGISTRAR

New memo
NO. E43780 IN FILE CERT. ET
Road Plan 59846073
TO The Queen
REG. Feb 7 61
NEW CERT. 95241 "R.S.B. Graves"
DEP. DIST. REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this TWENTY-SEVENTH day of APRIL One thousand nine hundred and FORTY-SIX;

Signed in the presence of

Deputy District Registrar
for Winnipeg

(1) Caveats affecting the land registered since the date of the certificate, and
(2) Any town planning scheme or by-law authorised under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

WL-11920-041-000
AECL ON FILE ONLY

JUN 02 1999

Cert. No. 953818

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

HER MAJESTY THE QUEEN IN RIGHT OF CANADA

IS *now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that* AT *piece or parcel of land known and described as follows,* LEGAL SUBDIVISON TEN AND FIFTEEN OF SECTION NINETEEN IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE, EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA. SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE GRANT FROM THE CROWN.

NO. 174690 all
TO Atomic Energy of Canada Ltd
REG. 9/6/15-68
NEW CERT. 3-4989 DIST. REGISTRAR

IN WITNESS WHEREOF *I have hereunto signed my name and affixed my Seal of office this* SIXTH *day of* MARCH, *One thousand nine hundred and* SIXTY-ONE.

Signed in the presence of

Deputy District Registrar
for Winnipeg

(1) Any zoning regulation as that expression is defined in the aeronautics act (CANADA) made under that act and registered as the Land Titles Office.

(2) Any by-law of the Municipality of ____ known as the ____ Act" or any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

JUN 07 1999

Cert. No. 556792

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

OTTAR HEGLAND

OF LAC DU BONNET POST OFFICE IN MANITOBA, FARMER

IS now seized of an estate in fee simple in possession subject to such encumbrances liens and interests as are notified by memorandum underwritten or endorsed hereon in all that piece or parcel of land known and described as follows THE SOUTH EAST QUARTER OF SECTION THIRTEEN IN THE FOURTEENTH TOWNSHIP AND TENTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE CROWN LANDS ACT.

No. E 38666 TRANSFER of

Ag

To A. M. McLennan Winnipeg

Registered Dec-20-69

Vide Cert. No. 950132

Deputy District Registrar

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of Office this FIRST day of DECEMBER One thousand nine hundred and FORTY-ONE.

Signed in the presence of

Deputy District Registrar for Winnipeg

WL-2004-0[illegible]
JUN 02 1999
AECL-OFFICIAL USE ONLY

Cert. No. 950132

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

HER MAJESTY THE QUEEN IN RIGHT OF CANADA

IS *now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows,* THE SOUTH-EAST QUARTER OF SECTION THIRTEEN IN THE FOURTEENTH TOWNSHIP AND TENTH RANGE, EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA. SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED I N THE CROWN LANDS ACT.

any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality.

NO. 17468 TRANSFER OF all
TO Atomic Energy of Canada Ltd
REC'D Oct 15 '68
NEW CERT. B 4986 DEP. DIST. REGISTRAR

IN WITNESS WHEREOF *I have hereunto signed my name and affixed my Seal of office this* TWENTIETH *day of* DECEMBER, *One thousand nine hundred and* SIXTY.

Signed in the presence of

Deputy District Registrar
for Winnipeg.

FOR CERTIFICATE OF TITLE NO 506176
SEE AFTER FOLIO 506181 Cert. No. 506175

JUN 07 1999

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

MICHAEL · BRUSHANSKE

OF BROKENHEAD POST OFFICE IN MANITOBA, MERCHANT,

IS now seized of an estate in fee simple in possession subject to such encumbrances liens and interests as are notified by memorandum underwritten or endorsed hereon, in all those pieces or parcels of land known and described as follows: LEGAL SUBDIVISIONS NINE, TEN, FIFTEEN AND SIXTEEN OF SECTION NINETEEN IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, SUBJECT TO THE SPECIAL RESERVATIONS AND PROVISOES CONTAINED IN THE GRANT FROM THE CROWN

No. 702310 TRANSFER of L.L. 10915
To Michael K. Brushanske
Registered Dec. 8-37
Vide Cert. No. 51202 [illegible] Deputy District Registrar

No. E5601C TRANSFER of
Bal.
To The Queen
Registered May 29/61
Vide Cert. No. 99187 [illegible] Deputy Transfer Registrar

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of Office this SEVENTH day of JUNE One thousand nine hundred and thirty SEVEN

Signed in the presence of

[illegible]

[illegible] Deputy District Registrar for Winnipeg

The [illegible] of this Certificate of Title has been [illegible] Dated [illegible]

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 02 19

Cert. No. 959189

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

HER MAJESTY THE QUEEN IN RIGHT OF CANADA

is now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows, Legal Subdivisions Nine and Sixteen of Section Nineteen in the Fourteenth Township and Eleventh Range, East of the Principal Meridian in Manitoba. Subject to the special reservations and provisoes contained in the Grant from the Crown.

NO. H24600 TRANSFER OF all
TO Atomic Energy of Canada Ltd
REG. Apr 15-62
NEW CERT B4997 DIST. REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Twenty-ninth day of May One thousand nine hundred and sixty-one

Signed in the presence of

E. A. Mayor

Deputy District Registrar for Winnipeg,

(1) Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded unless the certificate is to the Crown or a municipality
(m) Any zoning regulation as that expression is defined in the Aeronautics Act (CANADA) made under that act and deposited in the Land Titles Office.

Appendix C – Crown Manitoba Titles

WL-11020-041-000
AECL OFFICIAL USE ONLY

JUN 0 1 1999

Cert. No. 848053

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

No. 1378161 1 Reg. 2nd
Lost Title Advertisement

to REGISTERED 15 Aug. 90

at

SEE COMPUTERIZED DAILY RECORD
District Registrar

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF MANITOBA

IS *now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows.* FIRSTLY: ALL THAT PORTION OF THE NORTHEAST QUARTER OF SECTION FIVE, IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, TAKEN FOR WATER STORAGE AS THE SAME IS SHEWN BORDERED RED ON A PLAN DEPOSITED IN THE WINNIPEG LAND TITLES OFFICE AS NO 6014. SUBJECT TO THE RESERVATIONS CONTAINED IN THE CROWN LANDS ACT. SECONDLY: ALL THAT PORTION OF SECTION EIGHT IN THE SAID TOWNSHIP AND RANGE TAKEN FOR WATER STORAGE AS THE SAME IS SHEWN BORDERED RED ON SAID PLAN NO 6014. SUBJECT TO THE RESERVATIONS, PROVISOES AND CONDITIONS AFFECTING MINES, MINERALS, MINERAL OILS AND OTHER MATTERS AS THE SAME ARE MORE FULLY SET FORTH IN TRANSFERS REGISTERED IN THE SAID OFFICE AS NOS. 676321, 775572, 842766 AND 891165. THIRDLY: ALL THOSE PORTIONS OF THE EAST HALF OF SECTION EIGHTEEN IN THE SAID TOWNSHIP AND RANGE TAKEN FOR WATER STORAGE AS THE SAME ARE SHEWN BORDERED RED ON SAID PLAN NO 6014. SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE GRANTS (TRANSFERS) FROM THE CROWN. FOURTHLY: ALL THOSE PORTIONS OF THE EAST HALF OF THE SOUTH-EAST QUARTER OF SECTION NINETEEN, OF THE SOUTH-WEST QUARTER OF SECTION TWENTY, OF THE EAST HALF OF THE NORTH-EAST QUARTER OF SECTION THIRTY-ONE, OF THE NORTH-EAST QUARTER OF SECTION THIRTY-TWO AND OF THE SOUTH-WEST QUARTER OF SECTION THIRTY-TWO, ALL IN THE SAID TOWNSHIP AND RANGE TAKEN FOR WATER STORAGE AS THE SAME ARE SHEWN BORDERED RED ON SAID PLAN NO 6014. SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE GRANT FROM THE CROWN. FIFTHLY: ALL THAT PORTION OF LEGAL SUBDIVISION THIRTEEN OF SECTION THIRTY-TWO IN THE SAID TOWNSHIP AND RANGE LYING TO THE WEST OF THE LEFT BANK OF THE WINNIPEG RIVER TAKEN FOR WATER STORAGE AS THE SAME IS SHEWN BORDERED RED ON SAID PLAN NO 6014. SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN AN INSTRUMENT FILED IN THE SAID OFFICE AS REAL PROPERTY APPLICATION NO 42171. SIXTHLY: ALL THAT PORTION OF THE NORTH HALF OF SECTION THIRTY-THREE IN THE THIRTEENTH TOWNSHIP AND ELEVENTH RANGE EAST OF THE PRINCIPAL MERIDIAN IN MANITOBA, TAKEN FOR WATER STORAGE AS THE SAME IS SHEWN BORDERED RED ON SAID PLAN NO 6014. SUBJECT TO THE RESERVATIONS AND PROVISOES CONTAINED IN THE GRANT FROM THE CROWN.

IN WITNESS WHEREOF *I have hereunto signed my name and affixed my Seal of office this* TWENTY-SIXTH *day of* JUNE *One thousand nine hundred and* FIFTY-SIX

Signed in the presence of

M. East

E. O'Brien

Deputy District Registrar for Winnipeg

NO. F75721 TRANSFER OF all pcl 13t all Sec 4 19t 20w pcl 4
TO Atomic Energy of Canada Ltd.
REG. act 30-63
VIDE CERT. A18172
DEP. DIST. REGISTRAR

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 0 1 1999

Cert. No. 849091

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF MANITOBA

IS *now seized of an estate in fee simple in possession subject to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all th piece or parcel of land known and described as follows,* ALL THOSE PORTIONS OF THE NORTH-

UARTER OF SECTION TWENTY-NINE OF LEGAL SUBDIVISIONS EIGHT AND NINE OF SECTION THIRTY AND OF THE NORTH-

UARTER OF SECTION THIRTY-TWO, ALL IN THE FOURTEENTH TOWNSHIP AND ELEVENTH RANGE, EAST OF THE PRINCIPAL

AN IN MANITOBA, TAKEN FOR WATER STORAGE AS THE SAME ARE SHEWN BORDERED RED ON A PLAN DEPOSITED IN THE

EG LAND TITLES OFFICE AS NO. 6014 84, EXCEPTING OUT OF SAID NORTH-WEST QUARTER OF SECTION THIRTY-TWO

IAT BORTION THEREOF LYING TO THE WEST OF THE ~~WEST~~ EAST LEFT BANK OF THE WINNIPEG RIVER. SUBJECT TO THE RESER-

S AND PROVISOES CONTAINED IN THE GRANTS FROM THE CROWN.

22223533

INST TYPE: TRANL NO: 219719
FOR: BAL
98/01/08
REC: 97-10-21
NEW TITLE:
Computerized Record

25721 TRANSFER OF all Sec 29
Wpg Rge
Atomic Energy of Canada Ltd.
Oct 30-63
A-12172
DEP. DIST. REGISTRAR

IN WITNESS WHEREOF *I have hereunto signed my name and affixed my Seal of office this* ELEVENTH *day of* JULY *One thousand nine hundred and* FIFTY-SIX

Signed in the presence of

R. Zimmerman

Deputy District Registrar for Winnipeg

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 0 2 1999

Cert. No. 97113

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

HIS MAJESTY THE KING

IN THE RIGHT OF MANITOBA

is now seized of an estate in fee simple ~~in possession~~ subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows:- Section Twenty one in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba.

(a) Rights of any person who may be in actual occupation of the land and who continues in such occupation;
(b) Caveats affecting the land registered since the date of the certificate and
(c) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act," or the charter of any city relating to residential areas or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded.

Filed and Entered in the Winnipeg Land Titles Office as Document No 1857,

By virtue of Cap. 31, Statutes of Man. 1913, the land herein is revested in and re-transferred to His Majesty in the Right of Manitoba by Order of the Lieutenant-in-Council, registered in this office as No. G.R.G.N.

No. A-1182 TRANSFER OF
all ex. M.E.M.
TO Attorney-General of Canada
REG. Apr. 16/62
VIDE CERT. 978-798
DEPT. DIST. REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Ninth day of August One thousand nine hundred and Seven.

Signed in the presence of

(Sgd.) O.Bellavance

(Sgd.) J.H.Brown (SEAL)

Deputy District Registrar for Winnipeg

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 02 1999

Cert. No. 97114

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

HIS MAJESTY THE KING
IN THE RIGHT OF MANITOBA

is now seized of an estate in fee simple ~~in possession~~ subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows :- Section Twenty two in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba.

Any title issued pursuant to an application for registration of an actual occupation of and rightly entitled to the land at the time it was brought under the Act, will be qualified in such description:
(i) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
Public highways entraced in the description of the land included in a certificate shall be deemed to be excluded.

Land duly [illegible] and filed in the Winnipeg Land Titles Office as Deposit No 1617,

By virtue of Cap. 51, Statutes of Man. 1928, the land herein is revested in and re-conveyed to His Majesty in the Province of Manitoba by Order of the Lieutenant-Governor-in-Council, registered in this office as No. 6.49.602...

No. E 1183 TRANSFER OF all sec - M & M.
TO Province of Manitoba
REG. Apr 16/62 at 10 A.M.
VIDE CERT. 97793
DEPUTY REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Ninth day of August One thousand nine hundred and Seven.

Signed in the presence of

(Sgd.) O.Bellavance

(Sgd.) J.H.Brown (SEAL)
Deputy District Registrar
for Winnipeg

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 02 1999

Cert. No. 97115

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

HIS MAJESTY THE KING
IN THE RIGHT OF MANITOBA

is now seized of an estate in fee simple ~~in possession~~ subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows:- Section Twenty three in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba.

(i) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded.

Land Titles Office as Deposit No. 1637.

By virtue of Cap. 51, Statutes of Man. 1952, the land herein is re-vested in and transferred to His Majesty in the Right of Manitoba by Order of the Lieutenant-Council, registered in this office as No. 6492/83

No. F 1183 TRANSFER OF
all Ex M+M
TO Atomic Energy of Canada Ltd
REG. Apr 16/62 "C.A Evans"
VIDE CERT. 97879 DEPT. DIST REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Ninth day of August One thousand nine hundred and Seven.

Signed in the presence of

(Sgd.) O.Bellavance

(Sgd.) J.H.Brown (Seal)

Deputy District Registrar
for Winnipeg

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 02 1999

Cert. No. 97118 ✓

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

HIS MAJESTY THE KING

IN THE RIGHT OF MANITOBA

is now seized of an estate in fee simple ~~in possession~~ subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows :- The North East quarter of Section Twenty six in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba.

(1) The land in actual occupation of and rightly entitled to the land at the time it was brought under the Act, and who continues in such occupation:
(2) Caveats affecting the land registered since the date of the certificate, and
(3) Any town planning scheme or by-law authorised under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded.

Land Titles Office at ... 1887.

By virtue of Cap. 52, 58 Statutes of Man. 1958, the land in this Certificate described is subject to the provisions of the Manitoba Highway Act and to the rights of the Crown in right of Manitoba or of any person deriving title from the Crown, as disclosed in the records of this office as at ... 6 Aug 1963

No. 183 TRANSFER OF all out M.E.M.
TO Dominion Foundry & Co. Ltd.
REG. Apr 16/62 C.A. EVANS
VIDE CERT. 97793 DEPT. DIST. REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Ninth day of August One thousand nine hundred and ~~forty~~ seven.

Signed in the presence of

(Sgd.) O.Bellavance

(Sgd.) J.H.Brown (SEAL)
Deputy District Registrar
for Winnipeg

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 02 1999

Cert. No. 97119

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

HIS MAJESTY THE KING

IN THE RIGHT OF MANITOBA

is *now seized of an estate in fee simple* ~~in possession~~ *subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows* :- Section Twenty seven in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba.

By virtue of Cap. 81, Statutes of Man. 1930, the land herein is revested on and hereinafter to vested in the Right of Manitoba by Order of the Governor-in-Council, registered in this office as No. 647647

No. F1185 TRANSFER OF all ex M+M
TO Atomic Energy of Canada
REG. April 16/62 C A Evans
VIDE CERT. 978794 DEPT. DIST REGISTRAR

Land Titles Office as Document No. 1617.

IN WITNESS WHEREOF *I have hereunto signed my name and affixed my Seal of office this* Ninth *day of* August *One thousand nine hundred and* ~~forty~~ seven.

Signed in the presence of

(Sgd.) O.Bellavance

(Sgd.) J.H.Brown (SEAL)

Deputy District Registrar for Winnipeg

Act, and who continues in such occupation:
(i) Caveats affecting the land registered since the date of the certificate, and
(ii) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city, any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded.

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 02 1999

Cert. No. 97120

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

HIS MAJESTY THE KING

IN THE RIGHT OF MANITOBA

is now seized of an estate in fee simple ~~in possession~~ subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows :- Section Twenty eight in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba.

Act, and who continues in such occupation:
(a) Caveats affecting the land registered since the date of the certificate, and
(b) Any town planning scheme or by-law authorised under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded.

Land Titles Office as Deposit No 1627.

By virtue of Cap. 31, Statutes of Man. 1913, the land herein is reserved and withheld from grant to His Majesty in the Right of Manitoba by Order of the Governor-in-Council, registered in this office as No. 649603

No. E 33563 TRANSFER OF N.W.¼ exc. R.W.D. 3400 sq. ft. C.N.R. Bdg
TO Roy Dales Dec 14/60 '64 - EVANS
REG. VIDE CERT. 94773 DEPT. DIST. REGISTRAR

TRANSFER of S½ exc. R.O.W. plan 3180 E.C.A.
Registered Mar. 7/61 Signature Registrar
Title Cert. No. 95382

No. E 11832 TRANSFER of
Registered Apr. 16/62
Title Cert. No. 98874 Deputy District Registrar

IN WITNESS WHEREOF I have hereunto signed my name and affixed my seal of office this Ninth day of August One thousand nine hundred and ~~forty~~ seven.

In the presence of

(Sgd.) Illegible

(Sgd.) J.H.Brown (SEAL)

Deputy District Registrar
for Winnipeg

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 02 1999

Cert. No. 97112

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

HIS MAJESTY THE KING

IN THE RIGHT OF MANITOBA

is *now seized of an estate in fee simple ~~in possession~~ subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all those pieces or parcels of land known and described as follows* :- Legal subdivisions One, Eight, Nine and Sixteen of Section Twenty in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba.

(1) Any town planning scheme or by-law authorised under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded.

Land Titles Office as Deposit No. 1627.

By virtue of Cap. 31, Statutes of Man. 1933, the land herein described is vested in and re-transferred to His Majesty in the Right of Manitoba by Order of the Government in Council, registered in this office as No. 44962...

No. P 1182 TRANSFER OF L.S. 9 & 16 ex M & M
TO A Towne Energy of Canada Ltd
REG. April 16/62 VIDE CERT. 9786792 J.C.A. Evans II DEPT. DIST. REGISTRAR

NO. K255 TRANSFER OF L.S. 148 & M & M
TO Peter Manisto
REG. Jan 7-71 VIDE CERT. 866210 DEP. DIST. REGISTRAR

IN WITNESS WHEREOF *I have hereunto signed my name and affixed my Seal of office this* Ninth *day of* August *One thousand nine hundred and* Seven.

Signed in the presence of

(Sgd.) O.Bellavance

(Sgd.) J.H.Brown (SEAL)

Deputy District Registrar

for Winnipeg

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 02 1999

Cert. No. 97109

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

HIS MAJESTY THE KING

IN THE RIGHT OF MANITOBA

is now seized of an estate in fee simple ~~in possession~~ subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all those piece or parcel of land known and described as follows:- Legal subdivisions Eight, Nine and Sixteen of Section Seventeen in the Fourteenth Township and Eleventh range East of the Principal Meridian in Manitoba.

(1) Any subsisting reservations or exceptions contained in the original grant from the Crown.
(2) Caveats affecting the land registered since the date of the certificate, and
(3) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded.

By virtue of Cap. 31, Statutes of Man. 1872, the land herein is exempted in and re-granted to and held by the Province of Manitoba by Order of the Governor-in-Council, registered in this office as No. E.W.9.6.02.

Land Titles Office as Deposit No. 1927,

No. E-1182 TRANSFER OF all as to M. & M.
TO Atomic Energy of Can. Ltd.
REG. Apr. 16/52 C.A.F.Evans
VIDE CERT. 9 78792 DEPT. DIST. REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Ninth day of August One thousand nine hundred and ~~forty~~ Seven.

Signed in the presence of

(Sgd.) O.Bellavance

(Sgd.) J.H.Brown (SEAL)
Deputy District Registrar
for Winnipeg

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 02 1999

Cert. No. 97108

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

HIS MAJESTY THE KING

IN THE RIGHT OF MANITOBA

is now seized of an estate in fee simple ~~in possession~~ subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all those piece~~s~~ or parcel of land known and described as follows:- The North half and the South East quarter and Legal subdivisions Five and Six of Section Sixteen in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba.

By virtue of Cap. 51, Statutes of Man. 1973, the land herein is revested in and re-vested to His Majesty in the Right of Manitoba by Order of the Lieutenant-Governor-in-Council, registered in this office as No. 6449/02

No. E-1187 TRANSFER OF all sx-pl-3480 Ex. M&M
TO A. James Energy Oil & Gas Ltd.
REG. Apr. 16/82 "C.A. EVANS"
VIDE CERT. 978792 DEPT. DIST REGISTRAR

1913, and filed in the ... Office
Land Titles Office as Depld No
1957.

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Ninth day of August One thousand nine hundred and ~~forty~~ Seven.

Signed in the presence of

(Sgd.) O.Bellavance

(Sgd.) J.H.Brown (SEAL)
Deputy District Registrar
for Winnipeg

(i) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded.

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 02 1999

Cert. No. 97107

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

HIS MAJESTY THE KING

IN THE RIGHT OF MANITOBA.

IS now seized of an estate in fee simple ~~xxxxxxxxxxxxxxxx~~ subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows :- Section Fifteen in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba.

(i) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorized under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded.

Land Titles Office as at [illegible] No
1937.

By virtue of Cap. 81, Statutes of Man. 1930, the land herein is released in and re-transferred to His Majesty in the Right of Manitoba by Order of the Governor-in-Council, registered in this office as No. 5+4/6.03...

No. F 1182 TRANSFER OF
aw Ex MtM
TO Atomic Energy of Canada Ltd
REG. apr 16/62 } "C. Abraus"
VIDE CERT. 978791 } DEPT. DIST. REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Ninth day of August One thousand nine hundred and ~~forty~~ Seven.

Signed in the presence of

(Sgd.) O.Bellavance

(Sgd.) J.H.Brown (SEAL)

Deputy District Registrar

for Winnipeg.

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 02 1999

Cert. No. 97106

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT."

HIS MAJESTY THE KING

IN THE RIGHT OF MANITOBA.

is now seized of an estate in fee simple ~~in possession~~ subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows :- Section Fourteen in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba.

Act, and who continues in such occupation:
(j) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorised under "The Town Planning Act" or under the provisions of the charter of any city, and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded.

Land Titles Office as Deposit No. 1637.

By virtue of Cap. 51, Statutes of Man. 1930, the land herein is revested in and re-transferred to His Majesty in the Right of Manitoba by Order of the ~~Governor~~ Lieutenant-Governor-in-Council, registered in this office as No. 6 Aug. 602.

No. F-118 TRANSFER OF all ex. M.E.M.
TO Attorney General for Man.
REG. Apr. 16/62 C.H. EVANS
VIDE CERT. 97879 DEPT. DIST. REGISTRAR

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Ninth day of August One thousand nine hundred and ~~forty~~ Seven.

Signed in the presence of

(Sgd.) O.Bellavance

(Sgd.) J.H.Brown (SEAL)
Deputy District Registrar
for Winnipeg

AECL-OFFICIAL USE ONLY

JUN 0 2 1999

Cert. No. 97103

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

HIS MAJESTY THE KING

IN THE RIGHT OF MANITOBA

is now seized of an estate in fee simple ~~in possession~~ subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all that piece or parcel of land known and described as follows :- Section Ten in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba.

By virtue of Cap. 51, Statutes of Man. 1932, the land herein is re-vested in and re-transferred to His Majesty in the Right of Manitoba by Order of the Governor-in-Council, registered in this office as No. 64267

No. E 11882 TRANSFER OF all ex M+W

TO A Towne Energy of Canada Ltd

REG. Apr 16 1968 C.A. Evans

VIDE CERT. 97879 DEPT. DIST REGISTRAR

1913, and filed in the Winnipeg Land Titles Office as Original No. 1637,

IN WITNESS WHEREOF I have hereunto signed my name and affixed my Seal of office this Ninth day of August One thousand nine hundred and ~~forty~~ Seven.

Signed in the presence of

(Sgd.) O.Bellavance

(Sgd.) J.H.Brown (SEAL)

Deputy District Registrar

for Winnipeg.

(i) Caveats affecting the land registered since the date of the certificate, and
(k) Any town planning scheme or by-law authorised under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded.

WL-11020-041-000
AECL-OFFICIAL USE ONLY

JUN 02 1999

Cert. No. 97102

MANITOBA

Certificate of Title

UNDER "THE REAL PROPERTY ACT"

HIS MAJESTY THE KING

IN THE RIGHT OF MANITOBA.

is *now seized of an estate in fee simple ~~in possession~~ subject to such encumbrances liens and interests as are notified by memorandum underwritten (or endorsed hereon) in all th* at *piece or parcel of land known and described as follows* :- The East half of Section Nine in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba.

(a) Any right of appropriation by statute.
(b) The title of a person adversely in actual occupation of and rightly entitled to the land at the time it was brought under the Act, and who continues in such occupation:
(c) Caveats affecting the land registered since the date of the certificate, and
(d) Any town planning scheme or by-law authorised under "The Town Planning Act" or under the provisions of the charter of any city and any by-law passed by any municipal corporation under "The Municipal Act" or the charter of any city relating to residential areas or zoning.
Public highways embraced in the description of the land included in a certificate shall be deemed to be excluded.

Land Titles Office as Deposit No. 1627.

By virtue of Cap. 31, Statutes of Man. 1932, the land herein is re-vested in and re-transferred to His Majesty in the Right of Manitoba by Order of the Governor-in-Council, registered in this office as No. 64966

No. F-1182 TRANSFER OF all sec. M.M.
TO Attorney General of Canada
REG. Apr. 16/62 "C.A.F. 1/4 Hous"
VIDE CERT. 978798 DEPT. DIST REGISTRAR

IN WITNESS WHEREOF *I have hereunto signed my name and affixed my Seal of office this* Ninth *day of* August *One thousand nine hundred and forty-x* Seven.

Signed in the presence of

(Sgd.) O.Bellavance

(Sgd.) J.H.Brown (SEAL)
Deputy District Registrar
for Winnipeg

Appendix D – Plant Site – Aerial View

Appendix E – Registered Encumbrances

THE REAL PROPERTY ACT

I, JOHN FRANCIS FUNNELL
of the City of Winnipeg, in the Province of Manitoba, Solicitor,
make oath and say as follows:

1. I am the Secretary of The Manitoba Hydro-Electric Board, the within named Caveator, and have full knowledge of the matters herein referred to.

2. I believe that The Manitoba Hydro-Electric Board has a good and valid claim upon the said land and I say that this Caveat is not being filed for the purpose of delaying or embarrassing any person interested in or proceeding in any legal transaction.

3. The allegations in the within Caveat are true in substance and in fact.

in the Province of Manitoba,

day of

THE MANITOBA HYDRO-ELECTRIC BOARD

CAVEAT FORBIDDING REGISTRATION

Certificate of Title No.

THE MANITOBA HYDRO-ELECTRIC BOARD
Legal Department

MICROFILMED

AUG 28 1958

I CERTIFY THAT THE INSTRUMENT
IS DULY ENTERED AND THIS IS THE
TRUE LAND TITLES OFFICE COPY
AT MINUTES PAST
ON THE
AUG. 13
O. LR. 11

20774

THE REAL PROPERTY ACT

CAVEAT FORBIDDING REGISTRATION

TO THE DISTRICT REGISTRAR OF THE LAND TITLES DISTRICT OF WINNIPEG

TAKE NOTICE that The Manitoba Hydro-Electric Board (hereinafter called "Manitoba Hydro") claims an equitable estate or interest in an estate in fee simple in possession in the undermentioned land by virtue of an agreement in writing, dated July 9th 1968, made between

ATOMIC ENERGY OF CANADA LIMITED

(hereinafter called the "Grantor") of the First Part and Manitoba Hydro of the Second Part, a true and correct copy of which agreement is attached hereto and marked as Exhibit "A", whereby the Grantor granted to Manitoba Hydro its successors and assigns, the exclusive right, license and easement on over under and through the lands hereinafter described to enter upon, use, commence, operate, maintain, repair, inspect, patrol (including aerial patrol), alter and/or remove an overhead and/or underground electric power line and related plant, equipment and facilities, said land being described as follows:

All that portion of Legal Subdivision 2 of Section 20, in Township 14 and Range 11, East of the Principal Meridian in Manitoba, shown as Parcel "A" on a Plan of Survey entered and filed in the Winnipeg Land Titles Office as No. 9215. Subject to the reservations and provisoes contained in the Grant from the Crown,

standing in the Register in the name of ATOMIC ENERGY OF CANADA LIMITED

and

All those portions of Legal Subdivisions 1 and 8 of Section 20, in Township 14 and Range 11, East of the Principal Meridian in Manitoba, shown as Parcel "B" on a Plan of Survey entered and filed in the Winnipeg Land Titles Office as No. 9216,

Approved
Property Manager
Legal Officer

standing in the Register in the name of HER MAJESTY THE QUEEN IN RIGHT OF CANADA

and Manitoba Hydro forbids the registration of any person as transferee or owner of, or of any instrument affecting the said estate or interest, unless such instrument be expressed to be subject to its claim.

Manitoba Hydro appoints its offices at 820 Taylor Avenue, Winnipeg, Manitoba, as the place at which notices and proceedings relating hereto may be served.

DATED this 19th day of August 1968

THE MANITOBA HYDRO-ELECTRIC BOARD

Per:
Secretary

The address of the registered owner is:

Pinawa, Manitoba

00
USE ONLY

Our File No. 3178L-3276-1

P.I.-19-33

THE MANITOBA HYDRO-ELECTRIC BOARD

GRANT OF EASEMENT

ATOMIC ENERGY OF CANADA LIMITED

(hereinafter called the "Grantor"), being registered as owner of an estate in fee simple in possession,

subject, however, to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon), in all that piece of land situate in the Province of Manitoba and described as follows:

All that portion of Legal Subdivision 2 of Section 20, in Township 14 and Range 11, East of the Principal Meridian in Manitoba, shown as Parcel "B" on a Plan of Survey entered and filed in the Winnipeg Land Titles Office as No. 9216. Subject to the reservations and provisions contained in the Grant from the Crown,

and the Grantor being entitled to be registered as owner of an estate in fee simple in possession subject, however, to such encumbrances, liens and interests as are notified by memorandum underwritten (or endorsed hereon), in all that piece of land situate in the Province of Manitoba and described as follows:

All those portions of Legal Subdivisions 1 and 8 of Section 27, in Township 14 and Range 11, East of the Principal Meridian in Manitoba, shown as Parcel "B" on a Plan of Survey entered and filed in the Winnipeg Land Titles Office as No. 9216,

(hereinafter referred to as the "right-of-way")

in consideration of - - - - - - - - - - One - - - - - - - - - -

P.L.–19–33 (page 2)

7. The rights, licenses and easements hereby granted shall be exercisable forthwith and at any and all times hereafter by Manitoba Hydro, its servants agents and employees, either with or without vehicles, machinery and equipment.

8. Manitoba Hydro may permit The Manitoba Telephone System to attach telephone lines, conduits, cables, ducts and other communications plant and related equipment and facilities as may be erected or placed on the right-of-way by Manitoba Hydro, in which event The Manitoba Telephone System shall have the same rights, licenses and easements and shall observe and perform all same covenants and agreements as are hereby granted to or required of Manitoba Hydro.

9. Manitoba Hydro observing and performing the covenants and agreements on its part to be observed and performed shall and may hold and enjoy the rights, licenses and easements hereby granted without hindrance, molestation or interruption on the part of the Grantor or of any person claiming by, through, under or in trust for, the Grantor.

10. The rights, licenses and easements hereby granted are and shall be of the same force and effect as a covenant running with the land, and this Grant of Easement shall enure to the benefit of Manitoba Hydro, its successors and assigns and shall be binding upon the Grantor and on the successors in title of the Grantor and the owners and occupiers for the time being of the right-of-way or any part thereof.

11. The Grantor covenants with Manitoba Hydro that he has the right to grant the said rights, licenses and easements, notwithstanding any act of the Grantor and that he has done no act to encumber the right-of-way, and that Manitoba Hydro shall have quiet possession of the rights and the said rights, licenses and easements, free from all encumbrances.

IN WITNESS WHEREOF the parties hereto have executed this Grant of Easement, this day of 19

SIGNED, SEALED AND DELIVERED in the presence of

ATOMIC ENERGY OF CANADA LIMITED

Per:

Grantee: President

Grantor:

Secretary

Approved
Property Manager

Legal Officer

Appd AECL

Scope

Terms

Form

THE MANITOBA HYDRO-ELECTRIC BOARD

General Manager

Secretary

MEMORANDUM
of
ENCUMBRANCES, LIENS AND INTERESTS

Name of Holder:	Nature of Encumbrance:	Registration No.

CONSENT

The undersigned

being the

hereby approves of, joins in and consents to the foregoing Grant of Easement, and covenants that Manitoba Hydro shall have quiet possession of the right-of-way and the said rights, licenses and easements thereby granted.

DATED at this day of 19

WITNESS:

11020-SM-000
AECL-OFFICIAL USE ONLY

and

THE MANITOBA HYDRO-ELECTRIC BOARD

Grant of Easement

Re: Certificate of Title No.....

THE MANITOBA HYDRO-ELECTRIC BOARD
Legal Department

L-1933

AFFIDAVIT OF EXECUTION

CANADA
PROVINCE OF MANITOBA
TO WIT:

I, _____ of the _____ in the Province of _____

make oath and say:

of the parties thereto.

AFFIDAVIT OF EXECUTION

CANADA
PROVINCE OF MANITOBA
TO WIT:

I, _____ of the _____ in the Province of _____

make oath and say:

of the parties thereto.

WL-11020-041-001
AECL-OFFICIAL USE

THE REAL PROPERTY ACT

I, Sterling R. Lyon

of the Rural Municipality of Fort Garry,

in the Province of Manitoba, Minister of Mines and Natural Resources,

make oath and say as follows:

1. I am the agent of the within named Caveator.
2. I believe that the Caveator has a good and valid claim upon the said land and I say that this Caveat is not being filed for the purpose of delaying or embarrassing any person interested in or proposing to deal therewith.
3. The allegations in the within Caveat are true in substance and in fact.

Sworn before me at the City of Winnipeg in the Province of Manitoba This 3rd day of March A.D. 1966.

Edward S. McLean
A Commissioner for taking Affidavits, Notary Public in and for the Province of Manitoba.
My Commission expires.....

THE REAL PROPERTY ACT
Reg. Sec. 24, Sub-Sec. 11
CAVEAT FORBIDDING REGISTRATION

Cert. of title Nos.
971333
971327
978792
978791
971329
971332

978793
971330
978794
971331
971328
A 2124
A12172

MAR 9 1966
MICRO-FILMED

1966 Caveat

192664

THE REAL PROPERTY ACT

To the District Registrar of the Land Titles District of WINNIPEG

Take Notice that I, HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF MANITOBA

claim an equitable estate or interest in an estate in fee simple, in possession in the undermentioned land by virtue of an Agreement in writing, dated the 21st day of June, A.D. 1960, whereby Her Majesty the Queen in Right of the Province of Manitoba agreed to sell to Atomic Energy of Canada Limited, the under-mentioned land on the terms and conditions set forth in said Agreement, copy of which is hereto attached and marked with the letter "A":

Certificate of Title No. 971333

All those portions of the Government Road Allowances (now closed) in the Fourteenth Township and Eleventh Range, East of the Principal Meridian, in Manitoba, as the same are shewn on a map or plan of said Township approved and confirmed at Ottawa on the Eighth day of June A.D. 1923, by T. Shanks for the Surveyor General contained within the limits bounded as follows: On the South by the Southern limits of Sections Eight, Nine, Ten and Eleven and their straight productions, on the East by the Eastern limits of Sections Eleven, Fourteen, Twenty-three and Twenty-six and their straight productions, on the North by the Northern limits of Sections Twenty-six, Twenty-seven, Twenty-eight and Twenty-nine and their straight productions and on the West by the right bank of the Winnipeg River, all of said sections being in the said Township and Range, excepting thereout all those portions of the East-West Road Allowances lying between Sections Nine and Sixteen and between Sections Twenty-one and Twenty-eight in said Township and Range, which lie between the straight productions of the Eastern and Western limits of the land taken for the Manitoba Power Company Limited Transmission Line Right-of-Way, as the same is shewn on a plan filed in the Winnipeg Land Titles Office as No. 3400, excepting thereout all mines and minerals, other than gravel, which may be found in, upon or under said lands.

Certificate of Title No. 971327

The West half of Section Nine, Legal Subdivisions Three and Four of Section Sixteen and Legal Subdivisions One, Seven, Ten and Fifteen of Section Seventeen and all those portions of the East half of Section Eight and of the West half and Legal Subdivision Two of said Section Seventeen which lie to the East of the Right Bank of the Winnipeg River, all in the Fourteenth Township and Eleventh Range, East of the Principal Meridian, in Manitoba, excepting out of the said West half of Section Nine and of Legal Subdivision Four of said Section Sixteen all those portions thereof taken for the right of way for Transmission Line of the Manitoba Power Company Limited, as same is shown coloured pink on a plan filed in the Winnipeg Land Titles Office as No. 3400, and excepting out of the balance of the land above described all mines and minerals other than gravel which may be found in, upon or under the said lands.

Certificate of Title No. 978772

The East half of Section Nine, the North half, the South-East Quarter and Legal Subdivisions Five and Six of Section Sixteen, Legal Subdivisions Eight, Nine and Sixteen of Section Seventeen, Legal Subdivisions Nine and Sixteen of Section Twenty and all of Section Twenty-one, all in the Fourteenth Township and Eleventh Range, East of the Principal Meridian, in Manitoba, excepting out of Legal Subdivisions Five, Twelve and Thirteen of said Section Sixteen and out of the West half of said Section Twenty-one all those portions thereof taken for the right of way for the Transmission Line of the Manitoba Power Company Limited, as same is shewn coloured pink on a plan filed in the Winnipeg Land Titles Office as No. 3400, and excepting out of all of the land above described all mines and minerals other than gravel which may be found in, upon or under the said land.

WL-11020-04-1
AECL-OFFICIAL USE ONLY

Certificate of Title No. 978791

All of Sections Ten, Fourteen and Fifteen in the Fourteenth Township and Eleventh Range, East of the Principal Meridian, in Manitoba, excepting out of all of the land above described all mines and minerals, other than gravel, which may be found in, upon or under the said land.

Certificate of Title No. 971329

Section Eleven in the Fourteenth Township and Eleventh Range, East of the Principal Meridian, in Manitoba, excepting thereout all mines and minerals other than gravel, which may be found in, upon or under the said lands.

Certificate of Title No. 971332

All that portion of the North-West quarter of Section Twenty in the Fourteenth Township and Eleventh Range, East of the Principal Meridian, in Manitoba, which lies to the West of the most Westerly limit of the land taken for Water Storage as the same is shewn bordered green on a plan deposited in the Winnipeg Land Titles Office as No. 6014, excepting thereout all mines and minerals, other than gravel, which may be found, in upon or under the said land.

Certificate of Title No. 978793

The North-East quarter of Section Twenty-six and all of Sections Twenty-two and Twenty-three, in the Fourteenth Township and Eleventh Range, East of the Principal Meridian, in Manitoba, excepting out of all of the land above described all mines and minerals other than gravel which may be found in, upon or under the said land.

Certificate of Title No. 971330

The South half and the North-West quarter of Section Twenty-six in the Fourteenth Township and Eleventh Range, East of the Principal Meridian, in Manitoba, excepting thereout all mines and Minerals, other than gravel, which may be found in, upon or under the said lands.

Certificate of Title No. 978794

Section Twenty-seven and the North-East quarter of Section Twenty-eight, all in the Fourteenth Township and Eleventh Range, East of the Principal Meridian, in Manitoba, excepting out of all of the land above described all mines and minerals other than gravel which may be found in, upon or under the said land.

Certificate of Title No. 971331

The East half of Section Twenty-nine, the West half of the North-East quarter of Section Twenty and all those portions of the North-West quarter of Section Twenty and of the South-West Quarter of Section Twenty-nine which lie to the East of the most Easterly limit of the land taken for Water Storage as the same is shewn bordered green on a plan deposited in the Winnipeg Land Titles Office as No. 6014, all in the Fourteenth Township and Eleventh Range, East of the Principal Meridian, in Manitoba, excepting thereout all mines and minerals, other than gravel which may be found in, upon or under the said lands.

Certificate of Title No. 971328

All that portion of the South-West quarter of Section Seventeen in the Fourteenth Township and Eleventh Range, East of the Principal Meridian, in Manitoba, which lies to the West of the Western limit of the land taken for Water Storage as the same is shewn bordered green on a plan deposited in the Winnipeg Land Titles Office as No. 6014, excepting thereout all mines and minerals other than gravel, which may be found in upon or under the said lands.

Certificate of Title No. A2124

Firstly: All those portions of the West half of Section Seventeen and of the West half of Section Twenty in the Fourteenth Township and Eleventh Range East of the Principal Meridian, in Manitoba, contained within the limits shewn bordered green on a plan deposited in the Winnipeg Land Titles Office as No. 6014. Secondly: All that portion of the South-West Quarter of Section Twenty-nine in the said Township and Range lying to the East of the right bank of the Winnipeg River contained within the limits shewn bordered green on said plan No. 6014. Thirdly: All those portions of the Government Road Allowance lying East of and adjoining Sections Eighteen and Nineteen in the said Township and Range, which lie between a straight line drawn from the South-East angle of said Section Eighteen to the South-West angle of Section Seventeen in the said Township and Range, and a straight line drawn from the North-East angle of said Section Nineteen to the North-West angle of Section Twenty in the said Township and Range, which is not covered by any of the waters of the Winnipeg River, as said road allowance and Winnipeg River are shewn on a map or plan of said township approved and confirmed at Ottawa on the Eighth day of June, 1923 by T. Shanks, excepting out of all of the lands above described all mines and minerals (which expression "Mines and Minerals" does not include gravel) which may be found in, upon or under the said lands.

Certificate of Title No. A 12172

Firstly: All those portions of Legal Subdivisions Fourteen and Fifteen of Section Eighteen and of Legal Subdivision Two of Section Nineteen in the Fourteenth Township and Eleventh Range East of the Principal Meridian in Manitoba taken for a Public Road as the same is shewn coloured pink on a plan registered in the Winnipeg Land Titles Office as No. 5986, (now closed) which lies to the East of the straight production Southerly of the Eastern limit of the Public Road crossing said Section Nineteen as said Public Road is shewn coloured pink on a plan deposited in the said Office as No. 6073 without reserving unto the Crown, those reservations set forth in "The Crown Lands Act" but excepting all Mines and Minerals (the parties having agreed that the expression "Mines and Minerals" does not include gravel) which may be found, in upon or under the said lands. Secondly: All those portions of the East half of Section Eighteen, of the Southeast Quarter of Section Nineteen and of the Southwest Quarter of Section Twenty all in the said Township and Range contained within the limits shewn bordered red on a plan deposited in the said Office as No. 6014. Subject to the reservations and provisoes contained in the Grant from the Crown. Thirdly: All that portion of the Northwest Quarter of Section Twenty-nine in the said Township and Range lying to the East of the right bank of the Winnipeg River contained within the limits shewn bordered red on said Plan No. 6014. Subject to the reservations and provisoes contained in the Grant from the Crown.

Standing in the Register in the name of Atomic Energy of Canada Limited

and she forbids the registration of any person as transferee or owner of, or of any instrument affecting the said estate or interest, unless such instrument be expressed to be subject to her claim.

She appoints the offices of the Lands Branch, Department of Mines and Natural Resources, Norquay Building, Winnipeg, Manitoba, as the place at which notices and proceedings relating hereto may be served.

DATED this 16th day of January one thousand nine hundred and sixty four.

SIGNED in the presence of

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF MANITOBA

Minister of Mines and Natural Resources

WL Patterson Fonds
AECL Original Records

THIS AGREEMENT made and entered into as of the 21st day of June, A.D. 1960

This is the Schedule "1" referred to in
Order-in-Council No. 63-276
Derek Bedson
Clerk of the Executive Council

BETWEEN:

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF MANITOBA, represented herein by the Honourable the Minister of Mines and Natural Resources,
(hereinafter called "the Province")

OF THE FIRST PART,

- and -

ATOMIC ENERGY OF CANADA LIMITED, a company as defined in the Atomic Energy Control Act,
(hereinafter called "AECL")

OF THE SECOND PART:

WHEREAS due to the development by AECL of a nuclear research establishment and townsite associated therewith in the neighborhood of Seven Sisters, it is deemed advisable that a Local Government District with a townsite at or near Natalie Lake should be established, and AECL is prepared to assist in the establishment of the District, the location of the townsite and the development and operation of such Local Government District and townsite and it is further deemed advisable that provision be made for other related matters hereinafter referred to:

NOW THEREFORE it is agreed by and between the parties hereto as follows:

1. A Local Government District will be established under The Local Government Districts Act, under the name of "Local Government District of Pinawa", comprising all that portion of the Province of Manitoba shown outlined in green on the plan hereto annexed and marked "A", hereinafter referred to as "the District" and letters patent incorporating the District will include such provisions as may be agreed upon

000
AL USE ONLY

by the parties hereto.

2. AECL will pay such amount to the Rural Municipality of Lac du Bonnet and to the Provincial Treasurer of Manitoba to or for the benefit of Brookfield School District No. 2052 and Agassiz School Division No. 13 as may be agreed upon between AECL and the said municipality and said school district and school division respectively in compensation for the loss of jurisdiction over such lands now included within that municipality's boundaries as will have to be removed therefrom and included in the District in order that the Province may comply with the provisions of section 1 hereof.

3.(a) A townsite will be laid out on that portion of the District shown outlined in yellow on the plan hereto annexed and marked "A" and hereinafter referred to as "the Townsite" and a town planning scheme for the District will be prepared by AECL in conjunction with the Minister of Municipal Affairs and submitted for approval under The Town Planning Act; and a plan of the District will be registered in the Winnipeg Land Titles Office. The preparation of the town planning scheme and all surveys necessary in connection with the initial establishment of the District will be by AECL at its own expense.

(b) A sanitary area under The Public Health Act will be established in the District excluding the Plantsite.

4. AECL will establish a nuclear research establishment on the land lying within the boundary shown outlined in red on the plan hereto annexed and marked "A" which said area is herein referred to as "the Plantsite".

5. AECL, at its own expense, will acquire title in fee simple, excepting mines and minerals other than gravel,

to all the lands lying within the Plantsite and the Townsite other than those lands required for a right-of-way for an electric power transmission line as the same are shown on a plan filed in the Winnipeg Land Titles Office as No. 3400.

6. The Province will close and stop up any and all public roads or road allowances contained within the Plantsite and the Townsite as are agreed upon between the parties hereto and transfer them to AECL without charge and as to the excepted portions mentioned in section 5 the Province will arrange for the granting by the owner thereof to AECL of rights of access, passage and use required for the proper functioning of a nuclear research establishment.

7. The Province will assist AECL to acquire the lands in the Plantsite and the Townsite other than as provided in section 5 and will transfer in fee simple (excepting mines and minerals other than gravel) to AECL the Crown lands in the Plantsite and the Townsite at a price of One Dollar ($1.00) per acre. In the event that AECL at a later date does not require, for the purposes of its operations, any of the land transferred to it by the Province, other than the land in the Townsite, AECL will, before offering the land to third parties, offer to re-sell the land to the Province at the price or rate per acre which AECL paid for the land plus the fair and reasonable value of any improvements thereon.

8. The Province will not, without the consent of AECL, permit the staking or working of any mineral deposit in or under any land included within the boundaries of the Plantsite, and AECL will not, without the consent of the Province, permit gravel to be taken or used except for the purposes of AECL or

the District.

9. The Province will establish a school district under The Public Schools Act, hereinafter referred to as "the School District" to serve the District, the boundaries of which School District will on formation, conform with the boundaries of the District. The Province will make such operating grants to the School District as are authorized by the laws of the Province to be made to school districts. The Province shall appoint an official trustee in accordance with the relevant legislation. The official trustee will be replaced with elected trustees as soon as, in the opinion of the Province and AECL, the time has arrived when such action should be taken. The Province will co-operate with AECL in arranging that education provided in the schools in the District is of the highest standard provided in schools in the Province.

10. (a) A resident administrator will be appointed for the District under the provisions of The Local Government Districts Act with the concurrence of AECL.

(b) The resident administrator so appointed may also be appointed official trustee of the School District.

11. The Province will permit AECL at its own expense, to construct a private road from the point marked "X" on the plan hereto annexed and marked "A" to the boundary of the Plantsite and AECL will be responsible for the future maintenance and repair of the said road as long as it continues to be AECL's private road.

12.(a) Subject to paragraph (b) of this section the Province at its own expense will construct a bridge across the

Winnipeg River at the point marked "X" on the plan hereto annexed and marked "A" and will construct a paved road between the said bridge and the nearest Provincial trunk highway and a further paved road between the bridge and the East boundary of the Townsite; and the Province at its own expense will at all times be responsible for the repair and maintenance of the said bridge and roads; such bridge and roads to be a part of the highway system of the Province of Manitoba.

(b) The bridge and roads referred to in paragraph (a) hereof will be designed and constructed to such specifications as may be agreed upon between the parties and AECL will from time to time and on demand reimburse the Province for one-half the cost of such roads and all costs of construction of such bridge in excess of one-half the cost of construction of a bridge of standard specifications (Seventh Edition of American Association of State Highway Officials standard specification for highway bridges H20-S16-44 Truck - Lane Loading) but not including maintenance or repair.

13. (a) The Province will assure to AECL water rights (so far as the same are not included in the land mentioned in section 5) in and under the Winnipeg River and its tributaries required for the proper functioning of the said research establishment and the Townsite.

(b) The Province, so far as is reasonably within its power, or within the power of any person or corporation deriving rights or powers through the Province, and having regard to the provisions of the Lake of the Woods Control Board Agreement, will ensure that the water levels of the Winnipeg River at the Townsite in the vicinity of section [illegible] Lake Kopt

within the limits of 893.0 and 903.0 and as the Plantsite located between Sections 5 and 32-14-11E are kept within the limits of 830.0 and 845.0, or within such other limits as may from time to time be agreed upon between the parties. Such levels are based upon the 1928 Geodetic Survey and are expressed in feet above mean sea level.

(c) AECL acknowledges that the water level in the Winnipeg River is subject to fluctuations brought about by the opening and closing of the gates of the various hydro electric power plants constructed on the river. AECL will design and construct all buildings and other improvements on lands in the Townsite and Plantsite so as to take into account the fluctuations in river level within the limits fixed by or contemplated by this section. AECL for itself and its successors as operators of the said nuclear research establishment, agrees that it will not make any claim against the Province or any corporation from time to time holding a licence under The Water Rights Act or the Water Power Act to use the waters of the Winnipeg River, in respect of the erosion, slipping or deterioration of the bank of the Winnipeg River, or of damage to any building, improvement or chattel on the bank of the said River caused by fluctuations in the level of the said river within the said limits.

(d) In its operation of the said nuclear research establishment, AECL will use all reasonable precautions to prevent injury or damage to persons, property, fish, wild life or forest

14. (a) The Province agrees that its agency, The Manitoba Telephone System will supply reasonable telephone service, both local and long distance, for the District, including domestic connections within the Townsite. In all respects

ABOVE SPACE FOR USE ONLY

telephone services supplied under this paragraph to AECL shall be subject to the General Tariff of The Manitoba Telephone System as may be established by law from time to time.

(b) It is agreed between the Province and AECL that within the Townsite The Manitoba Telephone System shall have the same rights with respect to the use of highways, streets and lanes for the installation of its plant and equipment as it enjoys under The Manitoba Telephone Act throughout the Province generally.

15. The Province agrees that its agency, Manitoba Hydro, will supply such reasonable quantities of electric power to the Plantsite and the Townsite as may from time to time be available for distribution and the terms and conditions of such supply shall be such as may be agreed upon between AECL and Manitoba Hydro.

16. As and when the town planning scheme is approved and adopted and the lands in the Townsite surveyed and plans of subdivision registered in the Winnipeg Land Titles Office, all that part of the Townsite that is a highway, as the word "highway" is defined in The Municipal Act, including roads, roadways, streets, lanes and public squares, shall be vested in the Province but possession and control thereof shall be in the District.

17.(a) AECL will develop and improve from time to time such residential and commercial lots in accordance with the town planning scheme mentioned in section 3 as may be necessary to meet the reasonable needs of its employees and other persons resident in the Townsite and will sell or lease the same as deemed advisable.

(b) Notwithstanding the provisions of paragraph (a),

hereof AECL, after its initial development, will make available for public sale a minimum of five per cent of the lots as they are developed.

16. AECL will provide or cause to be provided in the Townsite such services and facilities as AECL requires for the orderly development of the Townsite in conformity with the town planning scheme referred to in section 3, to meet the requirements of the nuclear research establishment for residential, commercial, and other accommodation in the Townsite, until such time as the District is incorporated as a municipality as provided for in section 27. AECL shall accordingly:

(1) Construct or cause to be constructed in the Townsite, roads, streets, lanes and sidewalks, the freehold of which shall be vested in the Province and possession in the District.

(2) Construct or cause to be constructed in the Townsite:

(i) Community recreation facilities including a community centre;

(ii) A building or buildings suitable for housing the Townsite offices for the resident administrator and his staff, including policing services and District maintenance services;

(iii) Fire stations including equipment;

and when completed, all such sites, buildings and equipment other than the community recreation facilities, will be transferred by AECL

, to the District without charge.

(3) Construct and equip or cause to be constructed and equipped in the District, school buildings in accordance with the relevant statutory requirements, which building or buildings, together with the equipment and site will, when completed, be vested in and become the property of the School District and the same will be transferred by AECL to the School District without charge.

(4) Instal in such places in the Townsite as AECL deems desirable, sewers and water mains, together with fire hydrants, to service the developed lots, both residential and commercial, in the Townsite and from time to time instal such additional sewers and water mains, as may be required to service any further development that may take place, and all such installations shall be in conformity with the regulations under The Public Health Act, and, as completed, all such installations will vest in and become the property of the District.

(5) Instal such filtration facilities, pumping stations, septic tanks and sewage treatment facilities, all connected to the water and sewer mains in the Townsite, as will ensure to the inhabitants of the Townsite, an adequate supply of potable running water and a sewage disposal system that will comply with the laws of the Province, and all such installations and facilities, on completion, will vest in and become the property of the District and, where the same are located on land

property, the sites will be transferred by AECL to the District without charge; where it is necessary to instal or construct any of the said facilities on property outside the Townsite, the Province will permit such installation or construction by AECL and will transfer all such property and connecting property to the District at a price of One Dollar ($1.00).

(6)(a) construct and equip or cause to be constructed and equipped, a public hospital in the Townsite and AECL will either operate and maintain the same or be responsible for such operation and maintenance, so that it will comply with the laws of the Province; and all patients treated in such hospital who are not insured persons, or who receive services that are not insured services within the meaning of The Hospital Services Act, will be charged either directly or through some agency or third party such lawful amounts as may be set by the hospital management; and for insured services provided to insured persons within the meaning of the aforesaid Act, the hospital will be paid by the Commissioner of Hospitalization such amounts as may be authorized by and determined pursuant to the provisions of that Act and the regulations made thereunder. The Province will make to AECL such payments in respect to the operation of the hospital as are provided in The Manitoba Hospital Insurance Act and any other relevant legislation.

of the Province. AECL will be eligible for the normal hospital construction grants extended by the Province under the National Health Grants Program or otherwise.

(b) AECL having carried out its program of construction and installation of facilities as set out in paragraph (a) of this section will not, except with respect to the community recreation facilities and hospital, be required to operate, maintain or repair such facilities, but on transfer to the District or the School District as hereinbefore provided, the District or the School District as the case may be, will be responsible for all such maintenance, operation or repair; and the District will have power to enter on such of the private property as may be necessary to replace, repair or service sewers or water mains.

(c) The resident administrator will, for the District, administer the water, sewer and other services vested in the District and will charge and collect for such services such rates as may be established under the provisions of The Public Utilities Act or as will be approved by the Public Utilities Board and, if so appointed by Manitoba Hydro, he may act as agent for Manitoba Hydro in connection with the supplying of light and power in the townsite.

19. The resident administrator will arrange for the

removal from the Townsite and for disposal of all ashes, refuse, night soil, waste material, garbage, rubbish and loose material in a manner satisfactory to the Province's Sanitary Inspector and AECL, and may charge for such removal and disposal such sums as the resident administrator may deem necessary, which may be at a flat rate or different rates for different classes of property in the Townsite and he may collect and enforce payment of such sums in such manner as he may deem expedient. Where any such services are rendered to AECL in respect of any of its property in the Townsite, AECL agrees to pay for such services on the same basis as is established for general application. The Province will grant and convey to the District, free of charge, an area or areas outside the Townsite, for use as a nuisance ground, such area or areas to be selected by the resident administrator with the approval of the Province's Sanitary Inspector for the area and AECL and in conformity with the town planning scheme.

20. The Province will grant and convey to the District, free of charge, an area or areas outside the Townsite, for use as cemeteries, such area or areas to be selected by the resident administrator with the approval of AECL and with such other approval as may be required under relevant legislation and in conformity with the town planning scheme.

21. The Province will furnish a duly qualified assessor, who will in each year, or at such longer intervals as may be agreed upon, assess the property in the District excluding the Plantsite, for all purposes and prepare the necessary assessment roll or rolls for the District. The cost of this assessment service will be paid by the District to the Province.

22. Estimates of current expenditures and current revenue (which will be the estimates required by The Local Government Districts Act, The Municipal Act and The Public Schools Act) will be made by the resident administrator and the official trustee or Board of Trustees, as the case may be, for each calendar year as early as possible in that year, and not later than the first day of March, and copies of such estimates will be furnished to the Province and AECL as soon as they are prepared. Such estimates will be subject to the approval of AECL and of the Minister of Municipal Affairs or the Minister of Education, as the case may be.

23. The Province will make such grants to the District as are provided and authorized by the laws of the Province to be made to Local Government Districts.

24. AECL will make annual grants in lieu of taxes to the District for District and School District purposes in such amounts as are found necessary from year to year to maintain municipal services and schools of the School District at a reasonable level without undue hardship to the ratepayers of the District.

25. The resident administrator will keep correct accounts and records of all moneys received by the District from all sources and the expenditure thereof and all such accounts and records will be open to inspection by AECL, and the accounts will be audited annually by an auditor appointed by the Province and a copy of the audit statement will be furnished to AECL.

26. Should the development of the Townsite or nuclear research establishment warrant such action, the Province and

MNR may agree to enlarge the boundaries of the Townsite or the [illegible] and any development of such additional areas will be [illegible] as in the case of the original Townsite or Townsites.

27. The District will be incorporated as a municipality when such development has progressed to the stage where the Province and MNR agree that such action is economically [illegible] and in any such case, a new agreement will be negotiated between MNR, the District, the School District, the municipality and the Province, which when negotiated will replace this agreement.

28. This Agreement will continue in force until a new agreement is negotiated under section 27 but any of the terms and provisions of this agreement may be changed or varied in any case where the parties hereto agree to such change or variation.

29. Whenever provision is made under sections 19 or 20 of this agreement for the grant or conveyance by the Province of any lands or of any interest therein, it is agreed that such provision does not require the Province to acquire any lands if it has disposed of same prior to the request therefor.

30. It is agreed that the letters patent incorporating the District will contain the following provision or provision to that effect:

> "Where, by any Act of the Province, a municipal corporation is made liable for any indebtedness by reason of a person being a resident of that corporation or having his residence therein, those provisions of that Act apply to the Local Improvement District of Pinawa, but the liability of the District shall be limited to the part which it would be liable to pay as a municipality and the Social Allowances Act, section 453 and subsection (2) of section 2 of The Municipal Act shall apply to the District."

into the 21st day of June, 1960, and agree with the Province and the said Company severally to carry out and perform the terms and conditions therein set forth as if the said District and the said resident administrator had been original parties to and had executed and delivered the said agreement.

The Local Government District of Pinawa

by .....
Resident Administrator

.....
Resident Administrator

The Real Property Act

I, John Kenneth Beatty

of the City of Winnipeg,

in the Province of Manitoba, General Counsel of

The Manitoba Telephone System, make oath and say as follows:

1. I am the agent of the within named Caveator.

2. I believe that The Manitoba Telephone System has a good and valid claim upon the said land and I say that this Caveat is not being filed for the purpose of delaying or embarrassing any person interested in or proposing to deal therewith.

3. The allegations in the within Caveat are true in substance and in fact, as I verily believe.

SWORN before me at the City of Winnipeg in the Province of Manitoba, this 22nd day of June A.D. 19 73.

J. K. Beatty

A Barrister at Law entitled to practice as such in the Province of Manitoba.

The Real Property Act

THE MANITOBA TELEPHONE SYSTEM

vs.

ATOMIC ENERGY OF CANADA LIMITED

Caveat Forbidding Registration

CERT. OF TITLE No. B 4988, B 4992, B 4994, B 4995, B 4996

THE MANITOBA TELEPHONE SYSTEM

NO CHO FILED

LAND TITLES OFFICE WINNIPEG, MAN. JUN 22 1973 10:20 A.M.

No. 226725. I CERTIFY THAT THIS INSTRUMENT WAS FILED

No. ... I CERTIFY THAT THIS INSTRUMENT WAS FILED

B. 4988
B. 4992
B. 4994
B. 4995
B. 4996

#226725

AECL-OFFICIAL USE ONLY

M.T.S. Form 1021

The Real Property Act

To the District Registrar for the Land Titles District of Winnipeg

Take Notice that THE MANITOBA TELEPHONE SYSTEM

claims an equitable estate or interest in an estate in fee simple in possession in the undermentioned land by virtue of an agreement in writing, dated the 30th day of May, A.D. 1973, between

ATOMIC ENERGY OF CANADA LIMITED

and The Manitoba Telephone System whereby the said

ATOMIC ENERGY OF CANADA LIMITED

granted to the said Manitoba Telephone System an Easement or Right-of-Way for the purpose of constructing, erecting, laying and maintaining a telephone line, anchor(s) or underground cable, on, over, under, upon, along and across the following described land, namely—

PARCEL I:
All that portion of Fractional Legal Subdivisions 3, 6, 11 and 14 of Section Nineteen (19), in the Fourteenth (14) Township and Eleventh (11) Range, East of the Principal Meridian in Manitoba, which lies between the Eastern limit of the Public Road as the same is shown on a plan deposited in the Winnipeg Land Titles Office as No. 6073, and a line drawn East of, parallel with and perpendicularly distant 40 feet from the said Eastern limit. Subject to any subsisting reservations contained in the Crown Lands Act.

PARCEL II:
All that portion of Fractional Section Eighteen (18), in the Fourteenth (14) Township, and Eleventh (11) Range, East of the Principal Meridian in Manitoba, which lies between the Eastern limit of Public Road as same is shown coloured pink on a plan registered in the Winnipeg Land Titles Office as No. 6073, and a line drawn East of, parallel and concentric with and perpendicularly and radially distant 40 feet from the said Eastern limit. Excepting thereout that portion of Legal Subdivision 14 in said Fractional Section taken for a Public Road as same is shown on a plan registered in the said Office as No. 5980. Subject to the reservations and provisoes contained in the Grant and Transfers from the Crown.

standing in the Register in the name of ATOMIC ENERGY OF CANADA LIMITED,

and it forbids the registration of any person as transferee or owner of, or of any instrument affecting the said estate or interest unless such instrument be expressed to be subject to its claim.

It appoints the office of The MANITOBA TELEPHONE SYSTEM, 489 Empress Street, Winnipeg 10, Manitoba, as the place at which notices and proceedings relating hereto may be served.

The Address of the Registered Owner is
Pinawa, Man.
ROE 1LO

Dated this 20th day of June one thousand nine hundred and Seventy-three.

Signed in the presence of

THE MANITOBA TELEPHONE SYSTEM

per

General Counsel

MAY 29 1973

M.T.S. FORM 1(a)
(1)—4/71
App. Legal Dept.

MANITOBA TELEPHONE SYSTEM

RIGHT-OF-WAY AGREEMENT

Sec. 108 R.P.A.

THIS AGREEMENT made in triplicate this 30 day of May
A.D. Nineteen Hundred and Seventy-three

BETWEEN: ATOMIC ENERGY OF CANADA LIMITED

(Hereinafter called "the Grantor")
Party of the First Part

and

THE MANITOBA TELEPHONE SYSTEM
(Hereinafter called "the System")
Party of the Second Part

1. IN CONSIDERATION of the payment of One-Hundred Twenty dollars ($ 120.00) (the receipt whereof is hereby acknowledged) the Grantor hereby grants to the System, its successors and assigns the right to construct, maintain, repair, remove, and renew additional telephone line or lines with all necessary wires, cables, pedestals, and conduits (all of which is hereinafter referred to as "telephone plant") on, over, along, under and across the following described land, namely:

PARCEL I:

All that portion of Fractional Legal Subdivisions 3, 6, 11 and 14 of Section Nineteen (19), in the Fourteenth (14) Township and Eleventh (11) Range, West of the Principal Meridian in Manitoba, which lies between the Eastern limit of the Public Road as the same is shown on a plan deposited in the Winnipeg Land Titles Office as No. 6073, and a line drawn East of, parallel with and perpendicularly distant 40 feet from the said Eastern limit. Subject to any subsisting reservations contained in the Crown Lands Act.

PARCEL II:

All that portion of Fractional Section Eighteen (18), in the Fourteenth (14) Township, and Eleventh (11) Range, East of the Principal Meridian in Manitoba, which lies between the Eastern limit of Public Road as same is shown on a plan registered in the Winnipeg Land Titles Office as No. 6073, and a line drawn parallel and concentric with and perpendicularly and radially distant 40 feet from said Eastern limit. Excepting thereout that portion of Legal Subdivision 3 of said Fractional Section taken for a Public Road as same is shown on a plan registered in said Office as No. 5986. Subject to the reservations and provisions contained in the Grant and Transfers from the Crown.

and for that purpose to enter on the said land with any vehicles, personnel and equipment necessary for the construction, maintenance, repair, removal of, or the making of any additions to said telephone plant, together with the right to cut or trim any trees upon the said land that in the opinion of the party of the second part, interferes with or is likely to interfere with the said telephone plant or any part thereof.

2. THE GRANTOR hereby grants to the System the right to free and unimpeded access over the said right of way for the above mentioned purposes.

3. THE GRANTOR hereby agrees that the rights and licenses hereby granted shall be exercised forthwith and at any and all times hereafter by the System or by its servants, agents or contractors and without charge.

4. The System shall exercise the rights, licenses and easements hereby granted in a careful and workmanlike manner so as to cause a minimum of inconvenience or damage to the Grantor, and shall make good any such damage.

5. THE GRANTOR covenants and agrees not to erect or permit the erection of any building or structure on the right of way without the consent of the party of the second part.

Address of the Grantee is

MANITOBA TELEPHONE SYSTEM
489 Empress Street, Winnipeg, Manitoba R3C 0A2

SE ONLY

Right-of-Way
Agreement

6. THE GRANTOR will not excavate in, or remove the soil from the said land, if such excavation or removal would endanger the said telephone plant, including any underground cable, without first giving the System reasonable notice of his intention to carry out such excavation or removal, so as to enable the System to take the necessary measures to protect the said cable.

7. It is understood and agreed that in addition to the consideration the System will pay for any damage to crops or other property of the grantor, caused in the exercise of the rights granted herein.

8. TO THE INTENT THAT the burden of all rights, licenses, covenants, and agreements contained in this agreement may run with the said land the Grantor convenants and agrees with the System that the rights, licenses and privileges hereby granted shall enure to the benefit of the System and its successors and assigns and shall be binding upon the grantor and on the successors in title of the grantor and the owners or occupiers for the time being of said land or any part thereof.

IN WITNESS WHEREOF, the said parties have hereunto set their hands and seals, the day and year first written.

SIGNED, SEALED AND DELIVERED
in the presence of

Witness

Witness

THE MANITOBA TELEPHONE SYSTEM

General Counsel

Assistant Secretary

I,
of
agreement within written, hereby consent to the making of the same by the Grantor named therein.

Dated this day of A.D. 19

WITNESS:

The above consent was acknowledged before me by
wife of
apart from her husband, to have been executed by her own free will and accord and without any compulsion on the part of her husband. She has further acknowledged that she is aware of the nature and effect of the same.

Dated at
day of
in the Province of Manitoba, this
A.D. 19

Certificate of Registration

Registered this date 30 May 44

as No. 1099838

I certify that the within instrument was registered in the

Land Titles Office and entered on

Certificate of Title No. [illegible]

[illegible] for District Registrar

New Certificate of Title No.

1799838

MTG FORM 1031
91-12-C7

89/ [illegible] 041-
AECL-OFFICIAL USE ONLY

Caveat

Manitoba
Attorney General
Land Titles

L.T. OFFICE	
PRE-CHECK	
FEE CHARGED	
DOCUMENT NUMBER	

District of Winnipeg

1799838

1. CAVEATOR

THE MANITOBA TELEPHONE SYSTEM, 489 Empress Street, Winnipeg, Manitoba, R3G 3G9,

Claims an interest in the following land and forbids the registration of any instrument affecting this interest unless such instrument be expressed to be subject to its claim.

2. PARTICULARS OF ESTATE OR INTEREST CLAIMED

An agreement in writing, dated the 18th day of May A.D. 19 89 between

Atomic Energy of Canada Limited

and the Manitoba Telephone System whereby the said

Atomic Energy of Canada Limited

granted to said Manitoba Telephone System an Easement or Right-of-Way for the purpose of constructing, erecting, laying and maintaining underground telecommunication lines or cables with pedestals as more specifically referred to in an agreement hereto attached and marked as exhibit "A"

3. LAND (description)

See attached Schedule "A"

TITLE NUMBER(S) B4988, B4992, ☐ B4994, B4995, B4996

*if additional room required, attach schedule

4. NAME AND ADDRESS OF REGISTERED OWNER(S) FOR SERVICE (include postal code)

Atomic Energy of Canada Limited
General Delivery
Pinawa, MB R0E 1L0

*if additional room required, attach schedule ☐

5. ADDRESS OF CAVEATOR FOR SERVICE (include postal code)

THE MANITOBA TELEPHONE SYSTEM, P.O. Box 6666

489 Empress Street, Winnipeg, Manitoba, R3C 3V6

6. SIGNATURE OF CAVEATOR

with William Johnstone

1. That I, ~~Nick Zajic~~ am the Agent of The Manitoba Telephone System, the Caveator, and I verily believe the statements herein are true in substance and in fact.

2. The said Caveator has a good and valid claim upon the within land, and this caveat is not filed for the purpose of delaying or embarassing any person.

DATE		
Y	M	D
89	05	26

~~Nick Zajic~~ William Johnstone ..... W J Johnstone
SIGNATURE

FARM LANDS AFFIDAVIT

7. EVIDENCE — FARM LANDS OWNERSHIP ACT S.M. 1982-83-84 C. 22

~~1. The within lands are not farm lands within the definition of section 1(1) of The Farm Lands Ownership Act; or~~

2. The within farm lands are exempt from The Farm Lands Ownership Act by section 85(13) of The Real Property Act. Particulars: presented by an agency of government.

DATE		
Y	M	D
89	05	26

~~Nick Zajic~~ William Johnstone ..... W J Johnstone
SIGNATURE

8. INSTRUMENT PRESENTED FOR REGISTRATION BY, include address and postal code

The Manitoba Telephone System.

489 Empress Street, P.O. Box 6666, Winnipeg, MB, R3C 3V6

IMPORTANT NOTICE: By virtue of Section 176(3) of The Real Property Act, any statement set out in this document and signed by the party making the statement has the same effect and validity as an oath, affidavit, affirmation or statutory declaration given pursuant to The Manitoba Evidence Act.

Approved as to Form — Registrar General — 90/3/1

WL-11020-041-000
AECL-OFFICIAL USE ONLY

MTS FORM 1032
(1) 10-88

RIGHT-OF-WAY AGREEMENT

89/208.

Sec. 106 R.P.A.

THIS AGREEMENT made in triplicate this 18th day of May
A.D. Nineteen Hundred and Eight-nine
BETWEEN: ATOMIC ENERGY OF CANADA LIMITED

(Hereinafter called "the Grantor"),
Party of the First Part

and

THE MANITOBA TELEPHONE SYSTEM
(Hereinafter called "the System")
Party of the Second Part

1. IN CONSIDERATION of the payment of Six Hundred---------- dollars($600.00) the receipt whereof is hereby acknowledged, the Grantor hereby grants to the System, on, from and after the 18th day of May A.D. Nineteen Hundred and Eighty-nine the right to construct, maintain, repair, remove, and make additions to, telephone and other telecommunication lines with all necessary wires, cables, pedestals, and conduits (all of which is hereinafter referred to as "telecommunication plant") on, over, along, under and across the following described land namely:

Parcel 1. All that portion of fractional L.S.'s 3, 6, 11 and 14 of Sec. 19-14-11 E.P.M. shown as a Right-Of-Way on Plan _____ W.L.T.O. Exc; all mines and minerals.

Parcel 2. All that portion of fractional Sec. 18-14-11 E.P.M. shown as a Right-Of-Way on Plan _____ W.L.T.O. Exc; all mines and minerals.

Address of the Grantee is
MANITOBA TELEPHONE SYSTEM,
489 Empress Street, P.O. Box 6666,
Winnipeg, Manitoba R3C 3V6

and for that purpose to enter on the said land with any vehicle, personnel and equipment necessary for the construction, maintenance, repair, removal of, or the making of any addition to said telecommunication plant, together with the right to cut or trim any trees upon the said land that, in the opinion of the party of the second part, interferes with or is likely to interfere with the said telecommunication plant or any part thereof.

2. THE GRANTOR hereby grants to the System the right of free and unimpeded access to any part of the right of way for the above mentioned purposes.

3. THE GRANTOR hereby agrees that the rights and licenses hereby granted shall be exerciseable forthwith and at any and all times hereinafter by the System or by its servants, agents or employees free and without charge.

4. The System shall exercise the rights, licenses and easements hereby granted in a careful and workmanlike manner so as to cause a minimum of inconvenience or damage to the Grantor, and shall make good any such damage.

5. THE GRANTOR, covenants and agrees not to erect or permit the erection of any building or structure on the right of way without the consent of the party of the second part.

6. THE GRANTOR will not excavate in or remove the soil for the said land, if such excavation or removal would endanger the said telecommunication plant, including any underground cable, without first giving the system reasonable notice of his intention to carry out such excavation or removal so as to enable the System to take necessary measures to protect the said cable.

MANITOBA TELEPHONE SYSTEM

MTS FORM 1022
(1) 10-85

7. It is understood and agreed that in addition to the consideration the System will pay for any damage to crops or other property of the grantor, caused in the exercise of the rights granted herein.

8. The Grantor hereby grants to the System the right of free and unimpeded ingress and egress to and from the right-of-way over and upon lands adjoining the right-of-way which are now or may hereafter be owned by the Grantor insofar as ingress and egress cannot conveniently be had from the right-of-way.

9. TO THE INTENT THAT the burden of all rights, licenses, covenants, and agreements contained in this agreement may run with the said land, the Grantor covenants and agrees with the System that the rights, licenses and privileges hereby granted shall enure to the benefit of the System and its successors and assigns and shall be binding upon the grantor and on the successors in title of the grantor and the owners or occupiers for the time being of said land or any part thereof.

CONSENT AND AUTHORIZATION

I am aware of the fact that the plan has not as yet been registered in the Land Titles Office. When it has been registered I HEREBY AUTHORIZE AND DIRECT the System to insert in the easement, in the blank left for that purpose, the correct registered number of the plan. Such insertion shall be of the same force and effect as though it has been inserted in the easement at the time of execution thereof by me, and the System may after such insertion proceed to register the easement. In the meantime the System is at liberty to enter upon the said land to the extent and subject to the terms specified in the said easement.

IN WITNESS WHEREOF, the said parties have hereunto set their hands and seals, the day and year first written.

SIGNED, SEALED AND DELIVERED
in the presence of

.....
Witness

.....

NOTARY PUBLIN, etc.
DATE
89-05-18
G.M. DRYNAN
PROVINCE OF MANITOBA

THE MANITOBA TELEPHONE SYSTEM

.....
Authorized Signing Officer

ATOMIC ENERGY OF CANADA LIMITED

.....

.....

CONSENT TO EASEMENT

I, the undersigned, having an interest in the land described in the within easement do hereby consent to the within easement, to the amount proposed to be paid as compensation and to the payment thereof to the registered owner or with the approval of the registered owner, to such other person as may be entitled thereto.

Witness _____ Date _____

Witness _____ Date _____

L.S. 3, 6, 11 & 14 of Sec.
19-14-11 E.P.M. & Sec.
18-14-11 E.P.M.

Dated May 6 A.D. 19 89

ATOMIC ENERGY OF CANADA LTD.
TO
THE MANITOBA TELEPHONE SYSTEM

MANITOBA TELEPHONE SYSTEM

RIGHT-OF-WAY AGREEMENT

Sec. 106 R.P.A.

Cert. of Title No. B 4994, ~~B 4988~~,
B 4996, B 4995,
B 4992 B 4988

This is the agreement Referred to in the attached caveat as Exhibit "A."

MANITOBA TELEPHONE SYSTEM

..... L.T.O.
CAVEAT No.: .....
DATE REC'D.: .....

MANITOBA TELEPHONE SYSTEM

MTS FORM 1018 (2) 10-88
Page 2

AECL-OFFICIAL USE ONLY

MTS

MTS FORM(M) 1192
94-02

Schedule

Addition Information

SCHEDULE A

Parcel 1: All that portion of Fractional Legal Subdivisions 11 and 14 of Section 19-14-11 EPM shown as an easement on Plan 31094 WLTO subject to any subsisting reservations contained in the Crown Lands Act.

AFF WIN Lds R o w Pl 31094 Pt B 4994 KW

Parcel 2: All that portion of Fractional Legal Subdivisions 3 and 6 of Section 19-14-11 EPM shown as an easement on Plan 31094 WLTO subject to any subsisting reservations contained in the Crown Lands Act.

Aff L, 3 & 6 Win Lds R o w Pl 31094 Pt B 4738 KW

Parcel 3: All that portion of Fractional Section 18-14-11 EPM which lies to the north of a line drawn parallel to the northern limit of said Fractional Section from a point in the western limit of said Fractional Section distant sly thereon 1760 feet from the said northern limit shown as an easement on Plan 31094 WLTO subject to the reservations and provisoes contained in the Crown Lands Act.

Aff Win Lds R o w Pl 31094 Pt B 4996 KW

Parcel 4: All that portion of Fractional Section 18-14-11 EPM which lies between two lines drawn parallel to the northern limit of said Fractional Section from points in the western limit of said Fractional Section distant sly thereon 1760 feet and 3520 feet respectively from the said northern limit shown as an easement on Plan 31094 WLTO, exc. Fractional Legal Subdivision 6 of said Fractional Section subject to the reservations and provisoes contained in the Grant and Transfers from the Crown.

Aff Win Lds R o w Pl 31094 Pt B 4995 KW

Parcel 5: All that portion of Fractional Legal Subdivision 6 of Section 18-14-11 EPM shown as an easement on Plan 31094 WLTO subject to the reservations and provisoes contained in the Grant and Transfers from the Crown.

Parcel 6: All that portion of Legal Subdivisions 1, 2 and 7 of Fractional Section 18-14-11 EPM which lie to the south of a line drawn parallel to the northern limit of said Fractional Section from a point in the western limit of said Fractional Section distant sly thereon 3520 feet from the said northern limit shown as an easement on Plan 31094 WLTO.

Aff Ls 1, 2 & 7 Win Lds R o w Pl 31094 Pt B 4992 KW

Caveat

This Schedule forms part of _____ between

Atomic Energy of Canada Limited AND Manitoba Telephone System, OF

this 25th day of May 19 94

Best available copies

Dated 6th April, May, 1914.

T.H. DAVIES

-and-

N.BRIT. CAN. IRVIN CO. LTD.

AGREEMENT

re

PARTY WALL.

Archibald & Howell.

THE REAL PROPERTY ACT.

TO THE DISTRICT REGISTRAR for the Land Titles District of Winnipeg.

Take Notice that I John Patterson, of the City of Winnipeg in the Province of Manitoba, Broker, claim an interest in Lot Five (5) as shown on a plan of Survey of part of Lot Eight (8) of the Parish of St. John, registered in the Winnipeg Land Titles Office, Winnipeg Division as Plan No. 410, under and by virtue of a certain Part Sale Agreement dated the Twenty-second day of May, A.D. 1914 and made between T.F. Davies and the North British Canadian Investment Company Limited, copy of which agreement is hereto annexed and under an assignment of the said Part Sale Agreement by operation of law to me by reason of the transfer to me of Lots Six (6) and Seven (7) as shown on a Plan of Survey of part of Lot Eight (8) of the Parish of St. John, registered in the Winnipeg Land Titles office as Plan No. 410, and by reason of my being the present registered owner of the said last mentioned land, and I forbid the registration of any person as transferee or owner of, or of any instrument affecting the said estate or interest, unless such instrument be expressed to be subject to my claim.

I appoint the Law Offices of Messrs. Harper, Hall, Harper, Henry & McTavish, Union Bank Building, Winnipeg, as the place at which notices and proceedings relating thereto may be served.

Dated this 3/2nd day of May, A.D. 1921.

Signed in the presence of)
)
)
)
)
)

THE REAL PROPERTY ACT.

I, John Patterson of the City of Winnipeg in the Province of Manitoba, Caveator make oath and say as follows:

1. That I am the within named caveator.

2. I believe that I have a good and valid claim upon the said land, and I say that this caveat is not being filed for the purpose of delaying or embarrassing any person interested in or proprietary to land thereunto.

SWORN before me at the City of Winnipeg in the Province of Manitoba, this 31st day of May, A.D. 1911.

J. Patterson

Horace F. Lyon.
A Commissioner in B.R. &c.

M E M O R A N D U M O F A G R E E M E N T made this Twenty-second day of May, one thousand eight hundred and ninety-four,

B E T W E E N:

Theophilus H. Davies of Liverpool, England, Gentleman,

Of the First Part,

-and-

The North British Canadian Investment Company, Limited,

Of the Second Part.

W H E R E A S the Party of the First Part is the owner of Lots Six and Seven of Parish Lot First St. John, and the Parties of the Second Part are the owners of Lot Five, according to Plan No. 16 duly filed in the Registry Office for the Winnipeg District;

A N D W H E R E A S the Party of the First Part is about to erect a brick building on said Lots Six and Seven, and it has been agreed between the parties hereto that the Easterly wall of said Building shall be constructed and maintained as a party wall, upon the terms and conditions hereinafter set forth:-

N O W T H I S A G R E E M E N T W I T N E S S E T H:-

1. That the Party of the First Part shall be at Liberty in the erection of said building to use the foundation wall now in existence and which is on said Lots Five and Six, for the purpose of erecting such building, and shall be at liberty to build and construct said wall in such a way as to occupy NINE inches of Lot Five on the Westerly Boundary thereof, said wall to be of least seventeen inches think, and the Party of the First Part agrees to pay for the one half of the stone as already laid in the said foundation at the rate of Twenty Dollars per rood.

3. The said Parties of the Second Part agree to pay one half the cost of the brick to be laid in mortar in the said wall at the rate of Seventeen Dollars per thousand, and to pay the cost

of such piers as may be necessary in the opinion of the Architect to strengthen the said foundation wall.

3. The Parties hereto, their heirs, successors and assigns, shall and may freely and lawfully, but in a workmanlike manner, make use of so much of the said wall as shall be erected on their respective lots as a Party Wall, to be continued and used as such forever.

4. The said Parties of the Second Part agree to forthwith cut off and remove any portion of the building now resting upon the Easterly nine inches of the said Lot Five at their own expense, so as to allow the party of the First Part to proceed at once with the erection of said Party Wall.

5. The Parties hereto respectively covenant that so soon as the Party of the First Part shall have erected and completed the said building on Lots Six and Seven, the payment for the said Stone foundation and brick work, as hereinbefore provided shall be forthwith made by the Parties hereto respectively.

6. And the Parties hereto do hereby mutually covenant and agree to and with each other and their respective heirs, successors and assigns that if it shall hereafter become necessary to repair or rebuild the whole or any portion of the said Party Wall, the expense of such repairing or rebuilding shall be born equally by the said Parties hereto, their respective heirs, successors and assigns and that whenever the said Party Wall or any portion thereof shall be rebuilt it shall be erected on the same spot and so as to take in and occupy not more than Nine Inches of the Westerly Boundary of said Lot Five, nor more than nine inches of the Easterly portion of Lot Six and shall be of the same or similar materials and of like quality with the present wall.

A N D Further it is mutually understood and agreed between the aforesaid parties that this Agreement shall be perpetual and at all times to be construed into a Covenant running with the land.

WL-11020-041-000
AEC OFFICIAL USE ONLY

I N W I T N E S S W H E R E O F the said parties of the Second Part have caused their Corporate Seal to be hereunto affixed verified by the signature of A. Pain their Manager, And the Party hereto of the First Part hath hereunto set his Hand and Seal.

SIGNED, SEALED and DELIVERED)
in the presence of) "A.Pain". (SEAL)
Mgr.

"E. Clive Davies" "Thos. H. Davies" (Seal)

Appendix F – Plan Showing Title Locations

Property Assessment Report

Municipality: 616 - LGD OF PINAWA
Roll No: 2500.000
REAL PROPERTY
Dwelling Units: 0
Frontage or Area: 194.35 ACRES
Legal Description: DESC NE20-14-11E
Civic Address:
School Division: NL S.D.
Community Area: L G D OF PINAWA
Ward:

Certificate of Title / Land Title Office:

2434167 / WINNIPEG 2434799 / WINNIPEG 2434808 / WINNIPEG

Tax Year	Assessment Reference Date	Class	Tax Status	Land	Buildings	Total
2013	Apr 1, 2010	INSTITUTIONAL PROPERTY	EXEMPT	75,900	-	75,900
		INSTITUTIONAL PROPERTY	TAXABLE	168,000	-	168,000
			TOTAL	**243,900**	**0**	**243,900**
2012	Apr 1, 2010	INSTITUTIONAL PROPERTY	EXEMPT	75,900	-	75,900
		INSTITUTIONAL PROPERTY	TAXABLE	168,000	-	168,000
			TOTAL	**243,900**	**0**	**243,900**
2011	Apr 1, 2008	INSTITUTIONAL PROPERTY	EXEMPT	75,900	-	75,900
		INSTITUTIONAL PROPERTY	TAXABLE	168,000	-	168,000
			TOTAL	**243,900**	**0**	**243,900**
2010	Apr 1, 2008	INSTITUTIONAL PROPERTY	EXEMPT	75,900	-	75,900
		INSTITUTIONAL PROPERTY	TAXABLE	168,000	-	168,000
			TOTAL	**243,900**	**0**	**243,900**
2009	2003	INSTITUTIONAL PROPERTY	EXEMPT	25,300	-	25,300
		INSTITUTIONAL PROPERTY	TAXABLE	56,000	-	56,000
			TOTAL	**81,300**	**0**	**81,300**
2008	2003	INSTITUTIONAL PROPERTY	EXEMPT	25,300	-	25,300
		INSTITUTIONAL PROPERTY	TAXABLE	56,000	-	56,000
			TOTAL	**81,300**	**0**	**81,300**

Legal:

NE-20-14-11-E
LS 9 & 16
NW-20-14-11-E
E OF WATER STORAGE 6014
W OF WATER STORAGE 6014

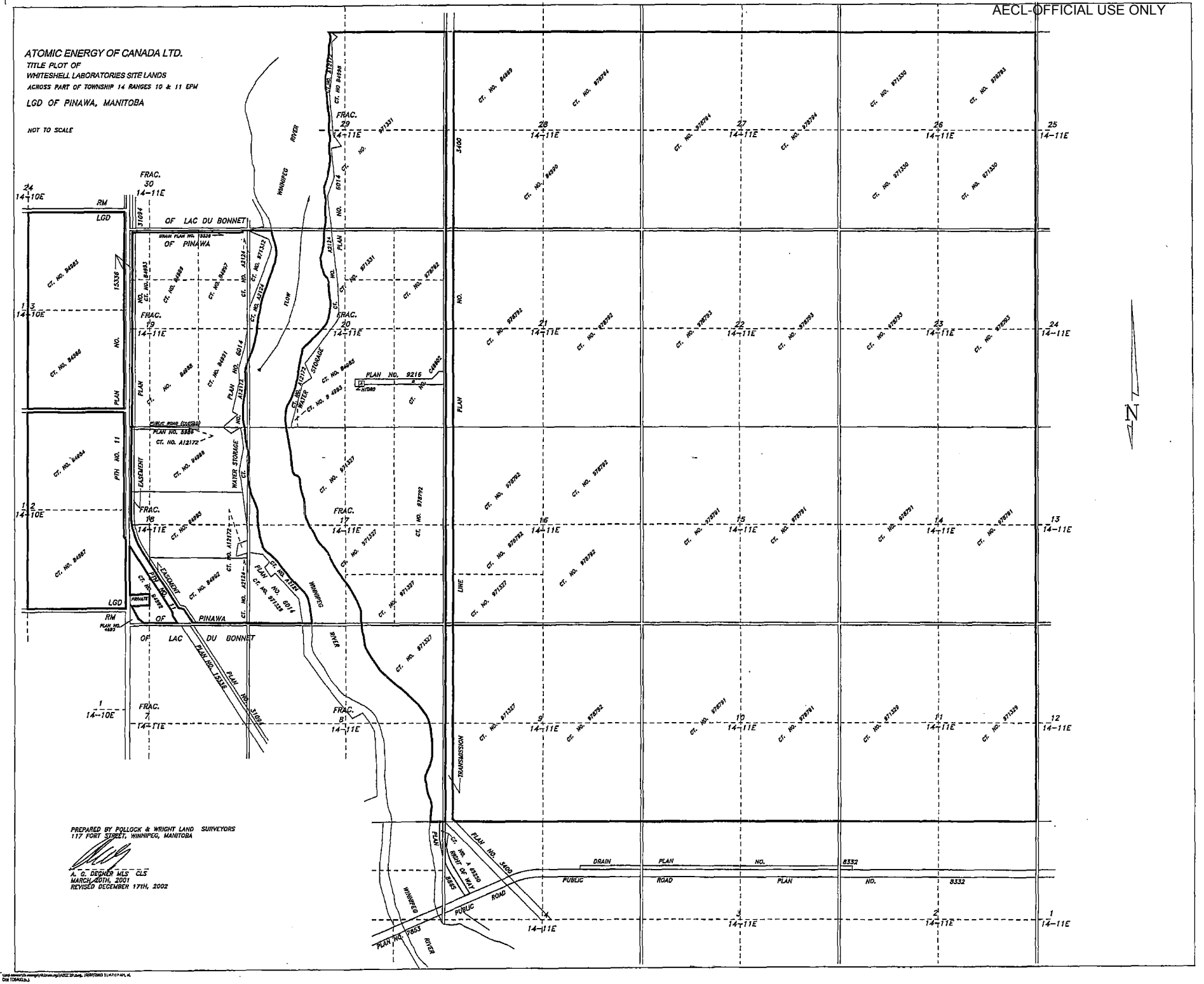
* The assessment information you are viewing was included with the 2013 Assessment Roll that the assessor prepared for the LGD OF PINAWA.

ATOMIC ENERGY OF CANADA LTD.

TITLE PLOT OF
WHITESHELL LABORATORIES SITE LANDS
ACROSS PART OF TOWNSHIP 14 RANGES 10 & 11 EPM

LGD OF PINAWA, MANITOBA

NOT TO SCALE



PREPARED BY POLLOCK & WRIGHT LAND SURVEYORS
117 FORT STREET, WINNIPEG, MANITOBA

A. G. DEGNER MLS CLS
MARCH 20TH, 2001
REVISED DECEMBER 17TH, 2002

AECL Atomic Energy of Canada Limited EACL Énergie atomique du Canada limitée

NLPC-CNLA

145-AECLCNL-26-001-L

2026 April 29

AECL-619022806-19479

Dennis J. Carr
Chief Executive Officer
CNL Representative under the CNLA
Canadian Nuclear Laboratories
286 Plant Rd
Chalk River, ON K0J 1J0

Re: CURRENT CNL APPLICATIONS FOR NUCLEAR FACILITY LICENCE RENEWALS FOR CHALK RIVER LABORATORIES AND WHITESHELL LABORATORIES - EVIDENCE THAT CNL HAS AUTHORITY FROM AECL TO CARRY ON THE LICENSED ACTIVITIES

References:

[1] E-mail from S. Brooks to S. Lemay "URGENT: Site License Application Due to CNSC 2026 April 30" dated 2026 April 23

Dear Mr. Carr,

I am writing in response to your request[1] to provide evidence that Canadian Nuclear Laboratories Ltd. (CNL), as the Canadian Nuclear Safety Commission (CNSC) licensee carrying on the nuclear facility licensed activities at the Chalk River Laboratories and Whiteshell Laboratories sites (together, the Sites), continues to be authorized by Atomic Energy of Canada Limited (AECL), as the owner of the Sites, to carry on the activities to be licensed under the current applications for licence renewals at the Sites.

AECL is a Crown corporation and an agent of His Majesty in right of Canada. AECL is the owner of the lands, assets and liabilities associated with CNL's CNSC licences, including those pertaining to the Sites.

In support of the requirements set forth in Section 3(c) of the Class I Nuclear Facilities Regulations SOR/2000-204 and Sections 3(b) and 4(d) of the Class II Nuclear Facilities and Prescribed Equipment Regulations SOR/2000-205, AECL continues to engage CNL to manage and operate AECL's sites, assets and liabilities under a Government-owned, Contractor-operated contract. I confirm that this contractual arrangement provides CNL with the authority to conduct the activities to be licensed under the current applications for licence renewals at the Sites.

We trust the foregoing is satisfactory.

Atomic Energy of Canada Limited
286 Plant Rd
Chalk River, Ontario
Canada K0J 1J0
Telephone: 613-589-2085

Énergie atomique du Canada limitée
286 rue Plant
Chalk River (Ontario)
Canada K0J 1J0
Téléphone: 613-589-2085

AECL EACL

Yours Truly,

Recoverable Signature

X

Graeme Williamson
Lead Contracting Officer
Signed by: Graeme Williamson

Cc:

E. Bizier, AECL
A. Gottschling, AECL
S. Lemay, AECL
J. Michelson, AECL
G. Williamson, AECL
S. Brooks, CNL
E. Daigle, AECL
K. Heppell-Masys, AECL
A. MacDonald, AECL
E. Miller, AECL
L. Bauer, CNL
D. Carr, CNL
F. Dermarkar, AECL
D. Kryschuk, AECL
R. Mason, AECL
A. O'Haire, AECL
J. Bittner, CNL
G. Kaufmann, CNL
G. Gardner, AECL
R. Laubouet, AECL
J. McLeod, AECL
M. Pagé, AECL
S. Bovingdon, CNL

Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

Fitness for Duty

900-510000-STD-013

Revision 1.2

Information Use

Approved by:	Sarah Epps	2026/02/02
	Director, Labour Relations	Date

Effective Date: 2026/02/02
Mandatory Review by Date: 2029/02/02

Refer to ATOM for current version. Printed copies should not be considered current without first consulting ATOM.

OFFICIAL USE ONLY This Information Asset (IA) and the elements of information contained within it are the property of Atomic Energy of Canada Limited (AECL).

This page is for Content Controls that apply to this document. If no Content Controls apply, none will be listed.

Intellectual Property NOTICE: The attached documents/files/information includes information owned/developed by CNL which has particular value to CNL's business interests (CNL IP). Access is restricted to authorized persons for authorized purposes only. Third party disclosure or use of CNL IP requires a licence or nondisclosure agreement, depending on the nature of the information, failing which such disclosure or use is strictly prohibited.

Revision History

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
1.2	2026/01/28	Issued for "Approval". Minor Change • Section 1: clarified which section does not apply to safety-sensitive or safety-critical • Section 4: Removed definition for Broad Population, Safety-Critical and Safety Sensitive. • Section 4: Removed CBOP from acronym list (not used in document). • Section 6.1: added note for safety-sensitive and safety-critical workers. • Appendix A: Added summary of broad population safety-sensitive and safety-critical positions.	E. Enright	A. Coulas R. Swartz S. Epps	S. Epps
1.1	2026/01/12	Issued for "Approval".	S. Epps	A. Coulas	S. Epps
1.1D1	2025/12/18	Issued for "Review and Comment". Minor Change: Added: - definition of broad population - Clarity on Safety-Sensitive for the purposes of REGDOC 2.2.4 Fatigue Management - Updated References to correct versions	S. Epps	A. Coulas W. Patey R. Swartz	
1	2021/07/09	Issued as "Approved for Use". Direct to new revision to align with Regulatory requirements Removed: - Injury /Illness Management as it is within the OSH Function	E. Edwards	S. Epps N. Caloren T. Cook T. Purcell	T. Cook

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
		under 900-510400-MCP-009, Reporting Injuries and Illnesses (affects Section 1 and 6.4) - Requirements from Purpose section Added: - Safety-Sensitive and Safety Critical Terms - Changed psychological "fitness" to wellness - updated narrative for 6.2 psychological wellness and 6.3 fatigue management to describe available options for supervisors - Section 5.5 added liaison with Fitness for Duty Program Administrator - Section 6 FFD PA arranges drug and alcohol testing - Updated Documented Information and Reference List			
0	2018/03/14	Issued as "Approved for Use". Cancels and supersedes CW-510300-PRO-003, Fitness for Duty		M. Mantha	M. Mantha
D1	2018/02/09	Issued for "Review and Comment".		L. Schryer T. Purcell M. Wagner E. Edwards Y. Dube S. Mistry C. Clark A. Rehman K. Summers J. Gibb D. Hill D. Laxton	

Table of Contents

Section **Page**

1. Scope and Applicability 6

2. Purpose 6

3. Prerequisites 6

4. Definitions and Acronyms 7

4.1 Definitions 7

4.2 Acronyms 7

5. Roles and Responsibilities 8

5.1 Managers / Supervisors 8

5.2 Employees 8

5.3 Sponsors 9

5.4 Health Centre 9

5.5 Human Resources 9

5.6 Union 10

6. Standards 10

6.1 Alcohol and Drugs 10

6.1.1 Determination of the Need to Test 10

6.1.2 Attendance at Testing 11

6.1.3 Testing Devices and Operators 11

6.1.4 Results of Tests 12

6.2 Psychological Wellness 12

6.3 Fatigue Management 13

6.4 Contractors 14

7. Documented Information 14

8. References 14

Appendix A Summary of CNL Safety-sensitive and Safety-Critical Positions 16

1. Scope and Applicability

This Standard applies to CNL employees, save and except those identified below, contractors (including subcontractors, regardless of level), and visitors at workplaces or work sites controlled by CNL, save where a contractor has expressly assumed responsibility for Fitness for Duty under contract for a particular workplace or work site. It also applies to CNL employees performing work at workplaces or work sites not controlled by CNL.

This document applies to the management of fitness for duty, including:

- Alcohol and drugs
- Psychological wellness
- Fatigue management

The provisions in Section 6.1 of this Standard do not apply to CNL employees occupying safety-sensitive or safety-critical positions as defined by REGDOC-2.2.4*, Fitness for Duty, Volume II: Managing Alcohol and Drug Use Version 3* [1]. CNL employees occupying these safety-sensitive and safety-critical positions are subject to the provisions of *Fitness for Duty: Policy on Managing Alcohol and Drug Use* [2]. See Appendix A for a summary of applicable positions.

2. Purpose

CNL is committed to providing a safe environment for all employees, contractors, and visitors. Employees, contractors, and visitors who are not fit for duty may present a safety hazard to themselves, to other persons on site, to CNL facilities, or to the public.

This document establishes CNL's standard for identifying, evaluating, and managing conditions that may result in employee impairment, including use of alcohol or drugs, psychological wellness, and fatigue.

3. Prerequisites

Employees are able to perform their job duties in a safe, secure, productive and effective manner and remain able to do so throughout their entire workdays or shifts.

To ensure the safety and health of individuals at CNL, all employees must be physically and mentally capable of safely performing their job duties in a safe, secure, productive, and effective manner; and must remain able to do so throughout their entire workdays or shifts.

Factors which may affect fitness for duty, including use of drugs or alcohol, psychological wellness, and fatigue, are pro-actively managed.

Alcohol or drug related Fitness for Duty assessments [3] are required under the following circumstances:

- In a reasonable-cause evaluation (if a supervisor, through observed behaviour, has reasonable grounds to believe a worker is unfit for duty).
- If the result of an investigation into a significant event reveals that post-incident testing is warranted.

- As follow-up, to confirm abstinence after the completion of a treatment program for substance abuse or addiction.

Fitness for duty assessments [3] may also be completed when the testing is specifically referenced in an agreement between the employee and CNL. If the employee is unionized, the Union must be a party to the agreement as well.

4. Definitions and Acronyms

This document relies primarily on word meaning as found in common dictionaries. The current *Glossary of Controlled Terms and Acronyms* [4] contains specific meanings for those words that require further clarification.

4.1 Definitions

Addiction	A cluster of behavioural, cognitive, and physiological phenomena that develop after repeated substance use and that typically include a strong desire to take the drug, difficulties in controlling its use, persisting in its use despite harmful consequences, a higher priority given to drug use than to other activities and obligations, increased tolerance, and sometimes a physical withdrawal state.
Continuous Behavioural Observation Program	A course for managers and supervisors, designed to help prevent and manage insider threats by developing the supervisor's ability to recognize and respond to behaviours that may indicate a risk to the security, safety or health of employees, facilities and the public.
Fatigue	A state of reduced mental or physical performance capability resulting from sleep loss, extended wakefulness, phase of the circadian rhythm, or workload.
Fitness for Duty (Fit for duty)	A condition in which workers are physically, physiologically, and psychologically capable of performing the tasks of their assigned jobs within the required standards of safety, attendance, quality, efficiency and behaviour. This includes fatigue considerations.
Impairment	A deterioration of an individual's judgment or a decrease in their physical ability.
Substance Abuse	The harmful or hazardous use of psychoactive substances, including alcohol and drugs.

4.2 Acronyms

EFAP	Employee and Family Assistance Program

FFD PA	Fitness for Duty Program Administrator

5. Roles and Responsibilities

5.1 Managers / Supervisors

Managers and Supervisors are responsible for:

- Completing Continuous Behavioural Observation Program training.
- Creating a schedule for on-call shifts that balances operational needs with employee wellness.
- Promoting a safe and healthy work environment.
- Guiding employees who seek assistance for a personal problem to appropriate resources (e.g. *Employee Family Assistance Program* (EFAP) [6], Health Centre) while maintaining confidentiality.
- Observing the attendance, performance, and behaviour of the employees they supervise.
- Reporting as required when presented with circumstances or knowledge that indicates that an employee may be unfit for duty.
- Ensuring employees, including those in the Broad Population, have sufficient recovery periods to safeguard against fatigue.
- Maintaining records of shift worked and non-compliance(s) with the limits on hours of work and recovery periods, including those that occur during exceptional circumstances for employees filling safety-sensitive positions in regards to managing worker fatigue.

5.2 Employees

All employees are expected to perform their jobs in a safe manner and consistently with established CNL rules, procedures, policies and/or practices. Employees are responsible for:

- Reading, understanding and adhering to CNL policies, programs and procedures governing fitness for duty, and meet their associated responsibilities.
- Reporting fit for duty for any and all scheduled or unscheduled duty and remain fit for duty while on Company business, premises, and worksites.
- Remaining fit for duty for the entirety of on call periods.
- Disclosing at any time, including if called at home unexpectedly and requested to attend work, if unfit for duty as defined by this procedure.
- Taking appropriate action to minimize any safety risk and advise their supervisors if they believe they are unfit for duty for any reason.
- Seeking advice and follow appropriate treatment if they have a current or emerging alcohol or drug problem or any other personal problem that may impact their abilities at work.
- Following agreed-upon monitoring programs after attending treatment for a personal or medical condition.

- Co-operating with any work modification related to safety concerns.
- Encouraging a co-worker to access assistance for any problem that impacts performance or safety.
- Not transferring any work responsibilities, including control of any machinery, vehicle or equipment to any individual suspected of being unfit for duty and promptly report their concerns to their supervisors.
- Notifying their supervisors or a management representative immediately if they believe a co-worker, supervisor/manager, another employee, a contract worker or a visitor is not fit for duty when on Company business, premises or a worksite.
- Co-operating with an investigation into a violation of the policies, programs and procedures governing fitness for duty.

5.3 Sponsors

Sponsors are responsible for interfacing with contractors.

5.4 Health Centre

Health Centre personnel are responsible for:

- Maintaining records of all required medical assessments and any restrictions required.
- Maintaining copies of all medical policies and guidelines used by CNL for examination or assessment.
- Performing/arranging chemical testing as deemed appropriate.

Note: Any document containing medical information about an employee is considered a medical record and is regarded as confidential. The Health Centre maintains medical records in a file separate from all other employee records.

5.5 Human Resources

Human Resources personnel are responsible for:

- Promoting a safe and healthy work environment.
- Promoting this document and encouraging employees to participate in awareness sessions.
- Providing advice to management in addressing contraventions of this document.
- Providing advice to managers/supervisors in addressing job performance issues related to employees who may have a substance use or abuse problem.
- Advising employees and management concerning intervention, the accommodation procedure, and CNL's Benefits Plans.
- Providing information regarding the EFAP [6] to current and new employees.
- Providing support to the Health Centre.
- Liaising with the Fitness for Duty Program Administrator (FFD PA) to arrange referral appointments and providing information on available resources if requested by an employee.

5.6 Union

Unions may be involved by:

- Promoting a safe and healthy work environment.
- Generally promoting this document and encouraging employees to participate in awareness sessions.
- Encouraging and advocating accommodation options (e.g., *Disability Management* [7] in conformity with existing legislation and jurisprudence.
- Participating in a representation role during the investigation of incidents and/or interviews with employees.
- Encouraging and supporting employees to access Employee and Family Assistance Program (EFAP) services and/or Health Centre before performance deteriorates and before violations of this Procedure occur.

6. Standards

6.1 Alcohol and Drugs

Note: This section is not applicable to safety-sensitive and safety-critical workers as defined by REGDOC-2.2.4*, Fitness for Duty, Volume II: Managing Alcohol and Drug Use Version 3* [1]. These workers are subject to requirements in *Fitness for Duty: Policy on Managing Alcohol and Drug Use* [2]. See Appendix A for summary of applicable positions.

It is a violation of CNL's *Code of Conduct* [8] for employees to be under the influence of alcohol, drugs or chemical substances during work hours or when conducting CNL business or representing CNL. It is also a violation to use, possess, or distribute alcohol, drugs or chemical substances on company premises. Over the counter or prescription chemical substances which do not cause an adverse effect to fitness for duty are not subject to this Procedure, provided they are taken as directed.

Should an employee need assistance or advice regarding alcohol or substance abuse, CNL encourages them to seek help by consulting:

- Employee and Family Assistance Program (1-800-387-4765)
- Health Centre (ext. 46643, CRL & PHAI, ext. 62216 WL)
- Renfrew County Addiction Treatment System (613-423-9855)
- Haliburton, Kawartha, Pine Ridge District Health Unit (1-866-888-4577)
- Durham Region Health Department (1-800-841-2729)
- Addictions Foundation of Manitoba (1-800-841-2729)

6.1.1 Determination of the Need to Test

In situations wherein an employee is suspected of being under the influence of alcohol, drugs or chemical substance, immediately notify the employee's supervisor or manager (if known), the Health Centre (FFD PA), Human Resources (Labour Relations), or Security.

Employees who have disclosed a diagnosis of alcohol, drug or chemical dependency to the Health Centre are subject to testing at CNL's discretion. The duration of time for which testing will be conducted is determined upon the employee's return to work and is at CNL's discretion. In all cases CNL's *Workplace Accommodation* [9] procedure is adhered to.

In situations wherein alcohol or drug use is suspected, best practices dictate that more than one person observe and document more than one sign of impairment. Signs of impairment include but are not limited to:

- The smell of alcohol or drugs
- Slurred or other affect to speech
- Abnormal behaviour
- Uncharacteristically impaired judgement
- Affect to motor skills
- Dilated pupils

Following a significant event, if there are concerns regarding fitness for duty, all involved parties are required to immediately undergo alcohol or drug testing as part of the investigation process.

Observed signs of impairment are not required in post incident testing, or when alcohol or drug dependency has been disclosed to the Health Centre. In cases wherein testing is conducted solely as a follow up to a disclosure of dependency, all such testing is done in consultation with the Health Centre.

6.1.2 Attendance at Testing

The FFD PA is notified of the decision to test at >CNL Fitness for Duty and will arrange testing. Outside of regular office hours, the FFD PA on-call is also contacted directly by phone (contact numbers accessed on myCNL), to arrange testing. The employee's supervisor accompanies the employee to testing (other than that based on self-disclosure of addiction).

Union representation is afforded to any unionized employee who requests it or who may be sufficiently impaired so as to be unable to request representation and is subject to alcohol or drug testing, provided that a representative is on site and available to attend within a reasonable time period.

6.1.3 Testing Devices and Operators

The primary device used at CNL for alcohol testing is the Lifeloc Phoenix 6. Other test methods are used in situations wherein the primary testing device is not available or is not functional. Testing for drugs is normally conducted through urine testing.

All testing for the presence of alcohol or drugs is done in accordance with equipment manufacturer's instructions, and only by a test administrator who has been trained, qualified, and authorized to perform such testing.

Health Centre staff at Whiteshell and Chalk River locations, are trained, qualified and authorized to perform all alcohol or drug testing during times at which the Health Centre is operational. For all other CNL locations, during regular office hours, testing is arranged by the FFD PA through the Third-Party Administrator (Driver Check).

Any after-hours, testing is arranged by the FFD PA on-call, through Driver Check.

6.1.4 Results of Tests

A positive result on the device is presumed to be an accurate indicator both of the presence of the substance being tested for and of impairment. If the affected employee wishes to dispute the results, then they may direct their split sample ("B" Sample) be tested at CNL's expense.

An employee who tests positive for alcohol or drugs is placed on investigatory leave, pending the outcome of further investigation. Any person who tests positive for drugs or above a 0.049 blood alcohol content is provided with transportation home by taxi, after providing their vehicle keys to the test administrator. In the event that such person refuses the transportation arrangement and indicates a desire to drive off site, Security is notified and instructed to call 911, provide the name of the individual and a description of the vehicle, and report that the employee is suspected of being impaired.

6.2 Psychological Wellness

Employees who are experiencing or who have questions regarding psychological, emotional, or cognitive impairment are encouraged to seek help by consulting:

- Health Centre (ext. 46643 (CRL & PHAI), ext. 62216 (WL))
- Employee and Family Assistance Program (1-800-387-4765) [6]

Dramatic and sudden changes in normal behaviour may be signs than an employee is experiencing stress, personal or workplace problems, or medical or psychological issues which may affect psychological fitness for duty.

If it is determined that the individual does not present an immediate threat to themselves or others, then the following course of action is taken when the Supervisor or Manager addresses the concern with the employee:

1. Complete the *Fitness for Duty Assessment* [3].
2. Approach your concern as a workplace performance issue (if appropriate).
3. Raise the possibility of providing accommodation [9] if needed.
4. Refer the Worker to the *Employee Family Assistance Program* (EFAP) [6].
5. Assure the employee that conversations or meetings with the EFAP are confidential.
6. Set a time to meet again to review the employee's performance.

7. Document this meeting fully and send completed *Fitness for Duty Assessment* [3] to the FFD PA at >CNL Fitness for Duty.

Should questions arise concerning an employee's ability to perform the essential duties of the employee's position because of apparent psychological or cognitive impairment, an assessment is conducted to determine whether the employee presents an imminent danger to themselves or to others. In such cases, a licensed healthcare professional is contacted (Health Centre, or 911 (if outside of CRL or Whiteshell)), as is situationally appropriate to conduct a psychological assessment. The confidential details of the psychological assessment are not disclosed to CNL but a recommendation of overall fitness for duty is provided as well as any workplace limitations or restrictions.

If the assessment determines the observed workplace behaviours or conduct are not the result of underlying psychological issue and the employee is deemed psychologically fit for duty, then the behaviour or conduct is addressed through remedial or disciplinary action as necessary (See steps 1-7 above).

If the assessment determines an underlying psychological issue contributed to workplace behaviours or conduct and the employee is deemed psychologically unfit for duty, then limitations and restrictions identified following assessment by a licensed healthcare professional are addressed through *Disability Management* [7] and *Workplace Accommodation* [9].

Although the presence of one or more abnormal behaviours does not necessarily indicate that a Worker is psychologically unfit for duty, abnormal behaviours should not be ignored as they may be precursors to a more serious event. Consult with the Health Centre to assist in determining how to proceed.

6.3 Fatigue Management

Worker fatigue is managed with the aim of minimizing the potential for errors that could affect nuclear safety and security by managing the risks associated with fatigue, managing the level of fatigue Workers experience at work, and reducing the likelihood and consequences of fatigue related errors. Worker fatigue is a state of reduced mental or physical performance capability resulting from sleep loss, extended wakefulness, phase of the circadian rhythm or workload.

Work hours are in accordance with CNL's *Standard Hours of Work* procedure [10]. Shifts are designed, implemented, and tracked in accordance with Section 4 of *REGDOC-2.2.4 Fitness for Duty: Managing Worker Fatigue* [5]as appropriate. Safety-sensitive positions as defined in *REGDOC-2.2.4 Fitness for Duty: Managing Worker Fatigue* [5], have additional hours of work controls as defined in *Standard Hours of Work* [10]. See Appendix A for a summary of applicable positions.

The management of fatigue is a shared responsibility between CNL and all employees. All employees must be well rested and physically, emotionally, and mentally capable for safely performing the essential functions of their job, ensuring the safety and health of individuals, equipment, and facilities. Employees who feel they are not physically or mentally fit to perform

their duties due to fatigue must immediately disclose this fact to their Supervisor prior to the commencement of their shift, or at the first opportunity thereafter.

Supervisors oversee employees and monitor for signs that indicate an employee's fitness for duty due to fatigue may be in question. In either case (self-disclosure or observed behaviour), the Supervisor and employee discuss options to assist the employee in regaining alertness which may include standing up, walking around, or a short rest. If an employee is deemed not fit to safely and competently perform their duties due to fatigue even after offered options, then, during regular work hours the employee is sent to the Health Centre for assessment with the *Fitness for Duty Assessment* [3]. Outside regular hours, notification is sent by email to >CNL Fitness for Duty, and a taxi is provided to take the employee home safely. The Supervisor contacts the employee prior to their next scheduled shift to verify fitness for duty.

Employees on a 24-hour shift do not require supervisory approval to sleep during designated rest times. In the event of an emergency on site or the requirement to provide emergency support to another organization, employees are assigned time to rest or sleep as deemed appropriate by management.

When an act or omission by a Worker may have caused or contributed to a safety significant incident, a *Fitness for Duty Assessment* [3] is completed.

6.4 Contractors

Contractors who are not physically, mentally and emotionally fit for duty at all times while on CNL property may present a safety hazard to themselves, to other employees and contractors, to CNL facilities, or to the public.

In situations wherein a contractor is observed to be exhibiting signs of impairment, there is a presumption of impairment until such time as documentation of testing is provided to CNL by their employer demonstrating fitness for duty.

In all cases wherein a contractor is unfit for duty, the contract sponsor works with the contractor's employer to ensure that such individual is removed immediately from CNL property and alerts Procurement.

7. Documented Information

Creation, Capture and Use of Information Assets [11] provides current information on the storage, preservation, turnover and retention requirements for records.

- *Fitness for Duty Assessment* [3]

8. References

[1] *Fitness for Duty, Volume II, Managing Alcohol and Drug Use, Version 3,* REGDOC-2.2.4, Canadian Nuclear Safety Commission, January 2021.

[2] *Fitness for Duty: Policy on Managing Alcohol and Drug Use*, 900-510000-STD-015,

[3] *Fitness for Duty Assessment*, 900-510000-FM-008114, 71952246.

[4] *Glossary of Controlled Terms and Acronyms*, https://cnllnc.sharepoint.com/sites/TermsandDefinitions

[5] *Fitness for Duty: Managing Worker Fatigue, REGDOC-2.2.4,* Volume I, Canadian Nuclear Safety Commission, March 2017.

[6] *Employee Family Assistance Program*, 900-510900-MCP-001, 40863551.

[7] *Disability Management,* 900-510900-MCP-002, 40863548.

[8] *Code of Conduct,* 900-513700-STD-009, 47089167.

[9] *Workplace Accommodation,* 900-510000-MCP-003, 12605704.

[10] *Standard Hours of Work,* 900-510000-STD-000606, 59952492.

[11] *Creation, Capture and Use of Information Assets,* 900-511300-STD-003, 50746207.

Appendix A Summary of CNL Safety-sensitive and Safety-Critical Positions

Broad Population: Population of workers who have the potential through their work activities to pose a risk to nuclear safety or security. [5]			
Safety-sensitive: A position that has a role in the operation of a high-security site, where impaired performance could result in a significant incident affecting the environment, the public, the health and safety of workers and others at the site, or the safety and security of the facility. This definition applies to all workers who are regularly required to rotate through or regularly relieve others in safety-sensitive positions. Those who directly supervise working-level positions, or who may perform the same duties or exercise the same responsibilities as safety-sensitive positions, are deemed to hold safety-sensitive positions. [REGDOC-3.6]			
Safety-critical: With respect to fitness for duty, a position certified or authorized by the CNSC that requires workers to make decisions and take actions that have a direct and immediate impact on nuclear safety and security of a high-security site. [REGDOC-3.6]			
REGDOC Identified Positions	**CNL Broad Population Positions**	**CNL Safety-sensitive Positions**	**CNL Safety-critical Positions**
REGDOC-2.2.4 Fitness for Duty: Managing Worker Fatigue **[5]**			
Safety-sensitive positions shall include: 1. certified workers 2. the following security personnel: nuclear security officers, onsite nuclear response force (NRF) members and designated non-NRF personnel	Firefighter Armourer Operating Engineer (Powerhouse)	Nuclear Security Officer (NSO) Nuclear Response Force Officer (NRF) Tiered Response Force (TRF)	N/A

***REGDOC-2.2.4 Fitness for Duty Volume II: Managing Alcohol and Drug Use* [1]**			
Safety-critical positions shall include: 1. workers certified under Class I Nuclear Facilities Regulations subsection 9(2) excluding certified health physicists 2. onsite nuclear response force (NRF) members **For the purposes of alcohol and drug testing, safety-sensitive positions shall include:** 3. certified health physicists 4. the following security personnel: nuclear security officers (NSOs), and designated non-NRF personnel 5. emergency response teams / fire brigade	N/A	NRU Certified Health Physicist NSO Security Training Officer Armourer Dedicated Control Room Operator (CRL) Emergency Operations Centre Commander Firefighter Fire Training Officer Fire Prevention Officer	Nuclear Response Force Officer (NRF) Tiered Response Force (TRF)

Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

Fitness for Duty - Policy on Managing Alcohol and Drug Use

900-510000-STD-015

Revision 1.0

Information Use

Approved by:	Sarah Epps	2026/03/24
	Director, Labour Relations	Date

Effective Date: 2026/03/24
Mandatory Review by Date: 2029/03/24

Refer to ATOM for current version. Printed copies should not be considered current without first consulting ATOM.

OFFICIAL USE ONLY This Information Asset (IA) and the elements of information contained within it are the property of Atomic Energy of Canada Limited (AECL).

This page is for Content Controls that apply to this document. If no Content Controls apply, none will be listed.

Intellectual Property NOTICE: The attached documents/files/information includes information owned/developed by CNL which has particular value to CNL's business interests (CNL IP). Access is restricted to authorized persons for authorized purposes only. Third party disclosure or use of CNL IP requires a licence or nondisclosure agreement, depending on the nature of the information, failing which such disclosure or use is strictly prohibited.

Revision History

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
1	2025/02/28	Issued for Approval. Major changes include: Section 1 & Section 2 – updated the wording. Section 4.1 - minor changes to definition wording. Section 5 – updated roles & responsibilities • 5.2 – Bullet added - participating in supervisory awareness training, including the Continuous Behaviour Observation Program; • 5.4 Medical Review Officer (MRO) responsible: o for receiving and reviewing laboratory results generated by an employee's drug testing program; o evaluating medical explanations for certain drug test results. • 5.5 Substance Abuse Professional (SAP) responsible for: o evaluating Workers in Safety Sensitive and Safety-Critical positions for a substance use disorder including, making recommendations for treatment and	S. Epps	A. Coulas	S. Epps

		post-treatment follow up care and testing; ○ determining if the Worker can safely return to duties; ○ communicating recommendations with the Fitness for Duty Program Administrator • 5.6 Collectors responsible for: ○ Collection and processing of alcohol and drug samples as per the Standard. • 5.7 Escorts responsible for: ○ ensuring the Worker(s) are escorted directly to the designated onsite testing location and maintaining supervision; ○ ensuring oversight of the Worker(s) at all times until collection is completed. • Section 6 renumbered and broke out additional sub-headings • Section 8 updated References			
D1D	2024/09/25	Issued for “Review and Comment”.	S. Epps	S. Epps A. Coulas	

0	2021/07/09	Issued as “Approved for Use”. Note: The contents of this document cannot be altered without consultation with the CNL Legal and LR to ensure continued alignment with REGDOC-2.2.4 Fitness for Duty: Managing Alcohol and Drug Use, requirements.	E. Edwards	N. Caloren	T. Cook

Table of Contents

Section **Page**

1. Scope and Applicability 8
2. Purpose 8
3. Prerequisites 8
4. Definitions and Acronyms 8
   - 4.1 Definitions 9
   - 4.2 Acronyms 11
5. Roles and Responsibilities 11
   - 5.1 Workers 11
   - 5.2 Supervisors and Managers 12
   - 5.3 Fitness for Duty Program Administrator 12
   - 5.4 Medical Review Officer (MRO) 13
   - 5.5 Substance Abuse Professional (SAP) 13
   - 5.6 Collectors 13
   - 5.7 Escorts 13
6. Standards 13
   - 6.1.1 Illicit Drugs and Mood-Altering Substances 13
   - 6.1.2 Alcohol and Cannabis 14
   - 6.1.3 Medications 14
   - 6.1.4 On Call Shift/Standby Duty 14
   - 6.1.5 Unexpected Call 14
   - 6.2 Prevention, Assistance, and Rehabilitation 15
   - 6.2.1 Prevention 15
   - 6.2.2 Managing Performance 15
   - 6.2.3 Reporting Requirements for Workers 15
   - 6.2.4 Post-Treatment Care 15

6.2.5 Modified Work 16
6.2.6 Confidentiality 16
6.3 Investigation Procedures 16
6.3.1 Unfit for Duty Situations 16
6.3.2 Possession of Alcohol or Drugs 16
6.4 Hosting Situations 17
6.4.1 Social Events 17
6.4.2 Business Hosting 17
6.5 Consequences of a Policy Violation 17
6.5.1 General Requirements 17
6.5.2 Conditions for Continued Employment 17
6.6 Alcohol and Drug Testing Procedure 18
6.6.1 Application 18
6.6.2 Alcohol and Drug Testing 18
6.6.2.1 Pre-Placement Testing 18
6.6.2.2 For-Cause Reasonable Grounds Testing 18
6.6.2.3 Post-Incident Testing 19
6.6.2.4 Return-To-Duty Testing 20
6.6.2.5 Follow-up Testing 20
6.6.2.6 Random Testing 20
6.7 Testing Standards 20
6.8 Refusal to Test 23
6.9 Characteristics of Alcohol and Drug Testing Procedures 23
6.10 Third Party Provider 23
6.10.1 Sample Collection 24
6.10.2 Alcohol Testing 24
6.10.3 Point of Collection Testing 24
6.10.4 Drug Testing (other than for THC) 24
6.10.5 Drug Testing for THC 25
6.10.6 Results and the MRO 25

6.10.7 Quality Assurance 25

7. Documented Information 25

8. References 26

1. Scope and Applicability

Workers: The provisions in this Standard apply to all workers employed in Safety-Sensitive or Safety-Critical positions at all times while they are engaged in Company Business, when on Company Premises and Worksites, and/or when operating vehicles and equipment in the course of their duties for the Company.

Union Representation: In certain circumstances, Workers may be subject to a collective agreement and may be entitled to union representation. Canadian Nuclear Laboratories, (CNL) shall comply with all collective agreement rights and obligations when applying this Standard.

This Standard is subject to periodic review and assessment, and modifications will be made as deemed appropriate by CNL to ensure effectiveness of this Standard and to respond to evolving needs. This review will include a review of trends which will inform potential modifications.

2. Purpose

Canadian Nuclear Laboratories (CNL or the Company) is committed to protecting workers, contractors, the public and property from safety concerns at CNL premises and worksites. Safety is of central importance in a nuclear environment and is a primary and core value for CNL.

Stakeholders in the nuclear industry recognize that the promotion of safe workplaces must involve the constant identification of safety concerns and effective safety protocols through which to address those concerns.

The use of illicit drugs and other mood-altering substances, and the inappropriate use of alcohol, cannabis, and medications, can adversely impact the safety and well-being of Workers, the work environment, and job performance. Therefore, a fitness for duty program that addresses alcohol and other drug use, and possession is not only required by *REGDOC-2.2.4, Fitness for Duty, Volume II, Managing Alcohol and Drug Use* [1] as a condition of licence, but is consistent with the “defence-in-depth” concept that underpins and informs all effective nuclear safety programs.

This Standard (also referred to as Policy) forms one part of our overall approach to managing fitness for duty at CNL Premises and Worksites.

3. Prerequisites

There are no general requirements applicable to this document.

4. Definitions and Acronyms

This document relies primarily on word meaning as found in common dictionaries. The current *Glossary of Controlled Terms and Acronyms* [2] contains specific meanings for those words that require further clarification.

4.1 Definitions

Alcohol	Refers to beer, wine and distilled spirits, and includes medications or other products that contain alcohol.
Cannabis	Refers to any product containing Tetrahydrocannabinol (THC) whether in smokable, vaporized, edible or other form.
Company Business	Refers to all business activities undertaken by Workers during Company operations, whether conducted on or off Company Premises or Worksites and whether during or outside of regular working hours.
Company Premises or Worksites	Include but are not necessarily restricted to all land, facilities and worksites where Company Business is conducted regardless of whether owned, leased or otherwise controlled by the Company. This includes all surrounding ground, parking lots and leased or rented space.
Drug	Means cannabis, illicit drugs, medications, or other mood-altering substances. For the purposes of this Policy, drugs are those substances that have the potential to cause impairment that may impact fitness for duty.
Drug Paraphernalia	Refers to any object of material which, for the purposes of this Policy, is associated with the use of any drug and includes any product or device that may be used to tamper with a drug testing sample.
Escort	Refers to the individual designated by CNL to escort a Worker to be tested once the decision to test has been made.
Fitness for Duty/Fit for Duty	Is the condition in which Workers are physically, physiologically, and psychologically capable of competently and safely performing their job tasks.
Fitness for Duty Program Administrator	Refers to the worker designated by CNL as responsible for the overall administration and management of this Policy.
High-Security Site	Means a nuclear power plan or a nuclear facility where Category I or II nuclear material is processed, used, or stored.
Illicit Drug	Means any drug or impairing substance, the use, sale, possession, purchase, or transfer of which is restricted or prohibited by law.

Medical Review Officer (MRO)	Refers to a person who is a licensed physician and board-certified as a medical review officer responsible for receiving and reviewing laboratory results generated by an employer's drug testing program and evaluating medical explanations for certain drug test results.
Medication	Refers to a drug obtained legally, either over the counter or through a duly qualified health professional's prescription or appropriate authorization, the use of which has the potential to cause impairment that may negatively impact fitness for duty.
Mood-Altering Substance	Refers to any product that is legally or illegally used, which has the potential to cause impairment that may negatively impact fitness for duty.
Safety-Critical Position	Refers to a nuclear position certified (see *REGDOC-2.2.3 Volume III, Certification of Persons Working at Nuclear Power Plants* [3]) or authorized (see *REGDOC-2.12.1, High-Security Sites: Nuclear Response Force* [4]) by the Canadian Nuclear Safety Commission that requires workers to make decisions and take actions that have a direct and immediate impact on nuclear safety and security of the High Security Site. For the purposes of this Policy, Safety-Critical positions are: 1. Workers certified under Class 1 Nuclear Facilities Regulations subsection 9 (2), excluding Certified Health Physicists 2. Onsite Nuclear Response Force (NRF) members
Safety-Sensitive Position	Refers to a position that has a role in the operation of a High Security Site, where impaired performance could result in a significant incident affecting the environment, the public, the health and safety of Workers and others at site, or the safety and security of the facility. This includes all Workers who are regularly required to rotate through or regularly relieve in Safety-Sensitive Positions. Those who directly supervise working-level positions, or who may perform the same duties or exercise the same responsibilities as Safety-Sensitive Positions, are deemed to hold Safety-Sensitive Positions. For the purposes of this Policy, Safety-Sensitive Positions are: 1. Certified Health Physicists 2. Nuclear Security Officers (NSOs), and designated non-NRF personnel 3. Emergency Response Teams (ERTs) / fire brigade

Substance Abuse Professional	Refers to an individual trained, and with expertise and clinical experience, in the diagnosis and treatment of alcohol and drug related disorders.
Supervisor or Manager	Refers to a Worker designated by CNL as a Supervisor or Manager who, as part of their duties, is typically responsible for overseeing the performance of other Workers.
Worker	Refers to all employees employed in safety-sensitive and safety-critical positions, including temporary, term, part-time, and casual employees, who are on the CNL payroll.
Unfit for Duty	A condition in which Workers are not physically, physiologically, or psychologically capable of competently and safely performing their job tasks.

4.2 Acronyms

BAC	Blood Alcohol Content
GC/MS	Gas Chromatography/Mass Spectrometry
LC/MS	Liquid Chromatography-tandem Mass Spectrometry
MRO	Medical Review Officer
POCT	Point of Collection Test
SAP	Substance Abuse Professional

5. Roles and Responsibilities

Responsibility for ensuring the success of this Policy and for maintaining productive and secure operations is shared between Workers, Supervisors and Managers, the Fitness for Duty Program Administrator and CNL.

5.1 Workers

Workers are required, at all times, to perform their job in a manner that is safe and consistent with established Company policies, procedures, and practices.

Workers' responsibilities include, but are not limited to the following:

- reading, understanding and complying with this Policy;
- reporting and remaining fit for duty while conducting Company Business;

- disclosing a substance use disorder or suspected substance use disorder to the CNL Health Centre and seeking appropriate treatment;
- exploring with their duly qualified health professional or pharmacist whether medications have the potential to cause impairment that may negatively impact the Worker's fitness for duty after explaining their job functions and the fitness for duty requirements of this Policy;
- following appropriate treatment, where recommended or prescribed by the Worker's duly qualified health professional(s), as contemplated in this Policy;
- complying with modified work where restrictions have been identified;
- immediately reporting any situation in which another Worker does not appear fit for duty while conducting Company Business; and
- co-operating with investigations under this Policy.

In addition, Workers are encouraged to intervene as appropriate to encourage a co-Worker to access assistance before a substance use disorder impacts a Worker's fitness for duty.

5.2 Supervisors and Managers

Supervisors and Managers' responsibilities include but are not limited to, those listed above and the following:

- participating in supervisory awareness training, including the Continuous Behaviour Observation Program (SECU-1001-ONLINE);
- guiding Workers who seek assistance for a substance use disorder or for alcohol or drug use to appropriate resources (e.g., the Employee and Family Assistance Program (EFAP) [5], /Substance Abuse Professional (SAP) or resources available in the community);
- advising the Fitness for Duty Program Administrator or Health Centre when they become aware that a Worker may have a problem with a substance use disorder or with alcohol or drug use so that an appropriate assessment may be arranged; and
- taking appropriate steps to investigate possible violations of this Policy.

5.3 Fitness for Duty Program Administrator

Fitness for Duty Program Administrator's responsibilities include, but are not limited to, the following:

- ensuring consistent administration of this Policy;
- resolving questions related to the interpretation of this Policy;
- coordinating development and delivery of Worker education and Manager and Supervisor training programs to support this Policy;
- supporting Managers and Supervisors in meeting their responsibilities under this Policy;
- where deemed appropriate by CNL, making arrangements for an assessment with a SAP as required under this Policy; and

- ongoing management of this Policy.

5.4 Medical Review Officer (MRO)

A Medical Review Officer is responsible:

- for receiving and reviewing laboratory results generated by an employee's drug testing program;
- evaluating medical explanations for certain drug test results.

5.5 Substance Abuse Professional (SAP)

A Substance Abuse Professional is responsible for:

- evaluating Workers in Safety Sensitive and Safety-Critical positions for a substance use disorder including, making recommendations for treatment and post-treatment follow up care and testing;
- determining if the Worker can safely return to duties;
- communicating recommendations with the Fitness for Duty Program Administrator

5.6 Collectors

Collectors are responsible for:

- Collection and processing of alcohol and drug samples as per the Standard.

5.7 Escorts

Escorts are responsible for:

- ensuring the Worker(s) are escorted directly to the designated onsite testing location and maintaining supervision;
- ensuring oversight of the Worker(s) at all times until collection is completed.

6. Standards

Workers are required to report for work fit for duty and to remain so while conducting Company Business.

6.1.1 Illicit Drugs and Mood-Altering Substances

The following are prohibited:

- the consumption, possession, distribution, offering or sale of illicit drugs or related drug paraphernalia while conducting Company Business or on Company premises;
- the distribution, offering or sale of mood-altering substances while conducting Company Business or on Company premises; and
- reporting for work, conducting Company Business or being on Company premises while unfit for duty due to the use of illicit drugs or other mood-altering substances.

6.1.2 Alcohol and Cannabis

The following are prohibited:

- the consumption, possession, distribution, offering or sale of alcohol or cannabis while conducting Company Business or on Company premises;
- consumption of any product containing alcohol or cannabis while conducting Company Business or on Company premises, including during meals and breaks; and
- reporting for work or conducting Company Business while unfit for duty due to the use of alcohol or cannabis.

The only exceptions are in respect of the first and second bullets above for alcohol at CNL social functions where approved (refer to 6.4 Hosting Situations).
Cannabis use is not permitted at CNL social functions.

6.1.3 Medications

Workers are required to responsibly use medications, including those that are prescribed and those that are over the counter. Medications of concern are those that have the potential to cause impairment that may negatively impact fitness for duty. The following are prohibited:

- reporting for work or conducting Company Business while unfit for duty due to the use of medications;
- the intentional misuse of medications prior to reporting for work or while conducting Company Business; and
- distribution, offering or sale of prescription medications while conducting Company Business or on Company premises.

It is incumbent upon Workers who need to use a medication to:

- explore with their duly qualified health professional or pharmacist whether the medication can negatively impact fitness for duty after explaining their job functions;
- act responsibly and use a safe alternative medication choice that will not negatively impact fitness for duty, when available; and
- advise the Health Centre of restrictions caused by the medication without delay and comply with appropriate Company-approved modified duties or other course of action to minimize safety risk if the medication being used has the potential to cause impairment that may negatively impact fitness for duty.

6.1.4 On Call Shift/Standby Duty

Workers who are on call or standby to work are responsible to be fit for duty consistent with these Policy standards for the entirety of their assigned on call shift/standby duty.

6.1.5 Unexpected Call

If unexpected circumstances arise where a Worker is requested to perform unscheduled services, the requirement to report for work fit for duty continues to apply. If the called Worker

is unfit for duty, they must declare that this is the case when called to perform unscheduled services and are prohibited from attending at Company premises or performing Company Business until fit for duty.

6.2 Prevention, Assistance, and Rehabilitation

Workers who seek assistance or declare a substance use disorder are not relieved from their obligations related to fitness for duty.

6.2.1 Prevention

CNL recognizes that a substance use disorder is often a treatable illness and that early intervention greatly improves the probability of a lasting recovery. Prevention and early detection of potential problems relating to alcohol or drug use is a key objective of this Policy. Workers experiencing substance use disorders are encouraged to access assistance through the Company *Employee and Family Assistance Program (EFAP)* [5], by working with a SAP, or through their duly qualified health professional or appropriate community services.

6.2.2 Managing Performance

Workers are subject to normal performance monitoring and management. Alcohol or drug use and substance use disorders can have significant impact upon job performance and, as such, Workers whose fitness for duty is being compromised by a substance use disorder or suspected substance use disorder should raise this with the Company's Health Centre at the earliest opportunity so that appropriate assistance can be sought as soon as possible.

6.2.3 Reporting Requirements for Workers

Workers are required to contact the CNL Health Centre and report their concern if they believe they have a substance use disorder that impacts or that may impact their fitness for duty so that assessment and appropriate treatment may be arranged. Where deemed appropriate by CNL, Workers are supported through a treatment and aftercare program consistent with the SAP's recommendations and the applicable benefit coverage. The Worker is expected to attend the assessment and comply with the resulting recommendations.

6.2.4 Post-Treatment Care

Workers who are absent from work in order to complete primary treatment (e.g., residential or out-patient treatment) for substance use disorders are required to comply with the aftercare program, if any, recommended by a duly qualified health professional affiliated with the program as a condition of returning to work and may be required to enter into a written agreement outlining the conditions governing their return to work and the consequences for failing to meet those conditions.

6.2.5 Modified Work

Where a duly qualified health professional, SAP, or other counselling professional identifies limitations, restrictions and/or safety risks directly or indirectly related to a Worker's alcohol or drug use, modified work may be assigned to the Worker. Workers are expected to comply with the modified work program.

6.2.6 Confidentiality

Medical privacy is respected, and confidentiality is maintained as appropriate.

6.3 Investigation Procedures

6.3.1 Unfit for Duty Situations

Where there are reasonable grounds to believe that a Worker is unfit for duty, the Worker is taken to a private place. A Supervisor or Manager attends at the private place.

The Worker is advised by the Supervisor or Manager as to why they appear to be unfit for duty and is given the opportunity to explain why they appear to be unfit for duty.

If there are immediate medical concerns, arrangements are made for appropriate medical attention to be provided.

Based on all the circumstances, if a Supervisor or Manager concludes the Worker may be unfit for duty, appropriate action is taken, which may include any or all of:

- removal from duty pending further investigation, including where there are grounds to believe alcohol or drug use may be a factor in the Worker's fitness for duty;
- referral for an alcohol and drug test if there are reasonable grounds to believe alcohol or drug use may be a factor in the Worker's fitness for duty (refer to Section 6.6Alcohol and Drug Testing Procedure);
- the need for a referral for an alcohol or drug test is verified by at least two people (one of whom is a Supervisor or Manager);
- assigning an individual to act as an escort; and
- any other action appropriate to the situation.

6.3.2 Possession of Alcohol or Drugs

In addition to existing CNL policies regarding searches on Company premises, CNL may investigate any situation in respect of which there are grounds to believe that illicit drugs or related drug paraphernalia, cannabis or alcohol are in a Worker's possession or control while present on Company premises or worksites.

6.4 Hosting Situations

6.4.1 Social Events

Responsible alcohol use may be permitted at CNL social functions, where approved by CNL. In the case of any such social events, appropriate measures are taken for the safety and well-being of individuals present and the community. No alcohol may be consumed by Workers who will be attending to Company Business following the social event on the same day.

6.4.2 Business Hosting

If alcohol is made available to CNL guests in the course of Company Business (e.g., restaurant meetings), Workers are expected to use prudent judgment, and hosts are expected to act responsibly in hosting others.

6.5 Consequences of a Policy Violation

6.5.1 General Requirements

Workers must comply with the Policy. If a Worker is found to have violated this Policy, they may be subject to discipline up to and including termination of employment. Workers may be suspended with pay pending the outcome of an investigation into whether a Policy violation has occurred.

All Workers are accountable for their conduct, including Workers who may suffer from substance use disorders.

CNL complies with applicable human rights legislation in applying this Policy.

6.5.2 Conditions for Continued Employment

Workers who are found to have violated the Policy but whose employment is not terminated as a result, may be required to enter into an agreement governing their continued employment, where appropriate, in consultation with the Worker's duly qualified health professional(s).

Before resuming Safety-Sensitive or Safety-Critical duties following a positive alcohol or drug test, Workers are referred for a mandatory substance abuse evaluation and will not be reinstated until a recommendation for reinstatement is received from a duly qualified health professional.

Workers assessed as having a substance use disorder may not resume their duties until they have met conditions for reinstatement, as recommended by the duly qualified health professional.

6.6 Alcohol and Drug Testing Procedure

6.6.1 Application

The following table sets out the **mandatory** alcohol and drug testing categories.

Table 1 Mandatory Alcohol and Drug Testing Categories

Workgroup	Pre-Placement	For-Cause Reasonable Grounds	Post-Incident	Return to Duty/Follow Up	Random
Workers in Safety-Sensitive Positions	NO	YES	YES	YES	NO
Workers in Safety-Critical Positions	YES	YES	YES	YES	YES

6.6.2 Alcohol and Drug Testing

6.6.2.1 Pre-Placement Testing

All applicants subject to mandatory Pre-Placement Testing must pass an alcohol and drug test as a condition of placement to the position. This requirement applies to external applicants who have been extended offers of employment for, and to Workers currently not but who are seeking to be placed in, a Safety-Critical Position.

6.6.2.2 For-Cause Reasonable Grounds Testing

For-Cause Reasonable Grounds is used when there are reasonable grounds to believe, through observed behaviour, physical condition, or after receiving credible information, that an individual is unfit to perform his or her duties due to the adverse effects of alcohol or drug use. The For-Cause Reasonable Grounds testing decision is verified by at least two people (at least one of whom is a Supervisor). The basis for the decision to test is documented as soon as practicable. If there are immediate medical concerns, arrangements are made for appropriate medical attention to be provided. The Fitness for Duty Assessment [7] is based on specific observations of indicators, including but not limited to the following:

- observed use or evidence of use of alcohol or drugs;
- erratic or atypical behaviour or changes in behaviour;
- changes in physical appearance or speech patterns;
- physical indicators of impairment; and
- any other observations that suggest alcohol or drug use is impacting fitness for duty.

Once the decision to test is made, the individual to be tested must remain under constant supervision until escorted by an Escort to the sample collection site.

6.6.2.3 Post-Incident Testing

Alcohol and drug testing is required after a significant work-related incident or accident in which an act or omission may have caused or contributed to the incident or accident. The determination of what constitutes a significant work-related incident or accident that will attract testing is based on the specific circumstances of the situation, including the nature and significance of the incident and the explanation given by individuals involved. The decision to engage testing is made by the Supervisor investigating the incident, after consultation with a Manager.

An incident or accident for the purposes of this Policy, is any unintended event, including operating errors, equipment failures, initiating events, accident precursors, near misses or other mishaps, or unauthorized acts, malicious or non-malicious, the consequences or potential consequences of which are not negligible from the point of view of protection or safety. An incident or accident has safety significance where it has a detrimental impact on protection or safety and includes, but is not limited to:

- reducing margins to (or exceeding) the accepted limits;
- increasing risk to the health, safety and security of persons, property or the environment;
- impairing special safety systems or safety functions for accident mitigation;
- reducing defence in depth; and causing radioactive releases and spills of hazardous substances, injuries to workers or the public, including an event that results in a dose of radiation being received by a person, organ or tissue in excess of the applicable limits prescribed by the *Radiation Protection Regulations* [8].

Failure to report a significant work-related incident or accident is a violation of this Policy.

The following process applies:

- the decision to test is made as soon as possible after the work-related incident or accident;
- testing may not be required if there is immediate evidence that the actions or omissions of the individuals involved in the incident or accident were not a contributing factor to the event (e.g., structural or mechanical failure or environmental factors);
- testing is conducted as soon as possible;
- only individuals who are identified as having been involved in the chain of acts or omissions leading up to the event are tested;
- once the decision is made to test, those to be tested must remain under constant supervision until escorted by an Escort to the sample collection site;
- the need for a test is documented [7] as soon as is practicable after the decision to test has been made; and
- should there be a delay in testing (e.g., because of the need for medical attention), those to be tested must not consume alcohol, drugs, or any other substance or product that would impact testing results until after the test has been completed or they are

advised that a test is not required. Exceptions are made for previously prescribed medications (which must be declared during the testing process prior to consumption), and medication administered in the treatment of an acute injury resulting from the incident.

6.6.2.4 Return-To-Duty Testing

Return-To-Duty alcohol and drug testing is required prior to the return to duties after confirmation of a substance use disorder by a duly qualified health professional. For this purpose, a negative drug test and an alcohol test with an alcohol concentration below 20 mg/100mL is required before returning to a Safety-Sensitive or Safety-Critical Position.

6.6.2.5 Follow-up Testing

Follow-up alcohol and drug testing is required after confirmation of a substance use disorder by a duly qualified health professional for those in Safety-Sensitive or Safety-Critical Positions. Follow-Up Testing is done in an unannounced and random fashion at a minimum of every 3 months for a minimum period of 2 years. Where appropriate, additional testing beyond these minimum requirements may be conducted to ensure abstinence.

6.6.2.6 Random Testing

Unannounced and random alcohol and drug testing for those occupying Safety Critical Positions includes the following features:

- all individuals in the population subject to testing are subject to random testing, each having an equal probability of being selected for testing;
- those in the population subject to testing who are offsite when selected for testing, or who are onsite and are not reasonably available for testing when selected, are tested at the earliest reasonable opportunity when both the individual subject to testing and collectors are available to collect specimen(s) for testing and without prior notification to the individual that they have been selected for testing;
- the number of Random tests performed at least every 12 months is equal to at least 25% of the population subject to testing;
- testing is conducted on a random and unpredictable schedule, including weekends, night shifts and holidays, and at various times during a shift;
- once tested, an individual in the population subject to testing is immediately eligible for another unannounced test; and
- individuals who are selected for random testing are required to report to the collection site as soon as reasonably practicable after notification and, in any event, within a prescribed time-frame.

6.7 Testing Standards

The following are the standards for positive alcohol and drug tests. Testing standards and methodologies are subject to change at CNL's discretion.

- A **positive alcohol test** is one that yields a result of 40mg/100mL or greater Blood Alcohol Content (BAC). An alcohol test result of 20 to 39mg/100mL BAC is considered an action level and will result in the Worker being removed from duty until it is determined that the Worker is fit for duty.
- A **positive urine drug test** is one that yields a result that is confirmed positive after exceeding the screening and confirmation thresholds for one or more of the following substances:

Table 2 Urine Analysis Drug Panel and Associated Cut-offs Used for Immunoassay Screening

Drug / Drug Class / Metabolite	Cut-off (ng/mL)
Cocaine metabolite (benzoylecgonine)	150
Opiates:	
Morphine, codeine	2,000
Hydromorphone and hydrocodone	300
Oxymorphone and oxycodone	100
6-acetylmorphine	10
Amphetamines	500
Cannabinoids	50
Benzodiazepines	100
Methadone metabolite (EDDP)	100

Table 3 Urine Analysis Drug Panel and Associated Cut-offs Used for GC-MS and LC-MS/MS Confirmation

Drug / Drug Class / Metabolite	Cut-off (ng/mL)
Amphetamines (amphetamine, methamphetamine, MDMA, MDA)	250
Cannabinoids (as 11-nor-Δ-9 THC COOH)	15
Cocaine metabolite (benzoylecgonine)	100
Methadone metabolite (EDDP)	100
Opiates:	
Morphine, codeine	2,000
Hydromorphone, hydrocodone, oxymorphone and oxycodone	100
6-monoacetyl morphine (6-AM, heroin metabolite)	10
Benzodiazepines (LC-MS/MS):	
Oxazepam, temazepam, diazepam, nordiazepam	50
Alprazolam, lorazepam, triazolam, clonazepam	50
Bromazepam, flurazepam	50

- A **positive oral fluid Drug test** is one that yields a result that is confirmed positive after exceeding the screening and confirmation thresholds for one or more of the following substances:

Table 4 Oral Fluid Analysis Drug Panel and Associated Cut-offs Used for Immunoassay Screening

Drug / Drug Class / Metabolite	Cut-off (ng/mL)
Amphetamines	50
Cannabinoids	10
Cocaine	20
Opiates:	
Morphine, codeine	30
Hydromorphone and hydrocodone	30
Oxymorphone and oxycodone	30
6-acetylmorphine	4
Benzodiazepines	10
Methadone	20

Table 5 Oral Fluid Analysis Drug Panel and Associated Cut-offs Used for GC-MS and LC-MS/MS

Drug / Drug Class / Metabolite	Cut-off (ng/mL)
Amphetamines (amphetamine, methamphetamine)	25
Cannabinoids (THC)	5
Cocaine and its metabolite (benzoylecgonine)	8
Opiates:	
Morphine, codeine	15
Hydromorphone, hydrocodone, oxymorphone and oxycodone	15
6-monoacetyl morphine	2
Benzodiazepines (LC-MS/MS)	3
Methadone and its metabolite (EDDP)	15

6.8 Refusal to Test

It is a violation of this Policy for Workers to refuse to submit to an alcohol or drug test administered under this Policy. Such refusal is deemed to be a positive test for the purposes of this Policy.

Refusal to submit to an alcohol or drug test includes:

- failure of a Worker to report as required for a test;
- refusal to submit to a test;
- failure to provide a valid specimen unless acceptable proof of a relevant medical condition is provided by the Worker;
- tampering or a confirmed attempt to tamper with a test sample;
- refusal to agree to disclosure of a test result to CNL's Fitness for Duty Program Administrator;
- evading a test by failing to report involvement in an incident which may require testing or by evading management following involvement in an incident;
- failure to advise of release from a medical center or hospital if testing is delayed for medical reasons; and
- disrupting or any attempt to disrupt the testing process set out in this Policy.

6.9 Characteristics of Alcohol and Drug Testing Procedures

Alcohol and drug testing processes are based on rigorous collection, analysis and reporting procedures designed to ensure the accuracy and integrity of the results. Characteristics of the testing process are highlighted below.

6.10 Third Party Provider

CNL has engaged a third-party provider of workplace medical testing and assessments who will follow appropriate testing procedures.

6.10.1 Sample Collection

- Following a decision to test by CNL, the Worker to be tested is accompanied at all relevant times until the sample collection is completed.
- Collection of samples for alcohol and drug testing is performed by trained collection agents. Appropriate chain of custody and specimen integrity protocols is followed.
- In Post-Incident and For-Cause Reasonable Grounds testing, samples are collected as soon as possible after the Company's decision to test, but collection attempts end after eight (8) hours for an alcohol test and twenty-four (24) hours for a drug test.
- Processes and procedures are established by the third-party provider to address shy lung, shy bladder, dry mouth and collection errors.

6.10.2 Alcohol Testing

- Where an alcohol test is 20 mg/100 mL BAC or greater a confirmatory test for alcohol is performed.
- Alcohol tests are administered using a calibrated evidential breath analyzer.

6.10.3 Point of Collection Testing

In Random or Post-Incident testing circumstances Point of Collection Test (POCT) devices may be used as a screening tool and/or to assess the risk of having a Worker return to duties pending the MRO's report on the urine or oral-fluid-based laboratory test. Where a POCT screening is non-negative, the Worker is subject to regular lab testing protocols. POCT devices are not used in pre-placement, reasonable grounds, follow-up or return to duty testing circumstances.

6.10.4 Drug Testing (other than for THC)

Drug tests (other than for the presence of THC) are administered in accordance with applicable procedures employed by the third-party provider which include the following:

- the Worker provides a urine sample and/or an oral fluid sample as determined by CNL;
- if applicable, a POCT is conducted on the sample; where samples are collected for transfer to the laboratory,
    - for urine:
        - the sample is split into an A sample and B sample for transfer to the laboratory;
        - at the laboratory, an initial immunoassay test is performed on the A sample;
    - for oral fluid:
        - a primary and secondary sample of oral fluid is collected for transfer to the laboratory;
        - at the laboratory, an initial immunoassay test is performed on the primary sample;

- Where the immunoassay test is non-negative, a confirmation analysis is performed by gas chromatography/mass spectrometry (GC/MS) or liquid chromatography-tandem mass spectrometry (LC/MS).

6.10.5 Drug Testing for THC

Drug tests for testing of the presence of THC are administered in accordance with applicable procedures employed by the third-party provider which include the following:

- in Random and Post-Incident testing the Worker may be required to provide an appropriate sample for POCT testing;
- in the event of a non-negative POCT test result for cannabinoids or where no POCT test is conducted, a primary and secondary sample of oral fluid is collected for transfer to the laboratory;
- where samples are collected for transfer to the laboratory an initial immunoassay test is performed on the primary sample;
- where the immunoassay test is non-negative, a confirmation analysis is performed by GC/MS or LC/MS.

6.10.6 Results and the MRO

- For all drug testing other than THC, the urine sample will be used to determine a Policy violation. For THC, the oral fluid sample will be used to determine a Policy violation.
- Laboratory confirmed positive, adulterated, and/or invalid test results are forwarded to and reviewed by an MRO who will discuss the results with the tested Worker. The tested Worker is given an opportunity to provide an explanation for the results.
- The MRO determines the result to be reported to CNL's Fitness for Duty Program Administrator.
- Within seventy-two hours of receiving their results, any Worker who has a verified positive test result may request the MRO to direct the split sample/secondary sample to be tested by an accredited laboratory of the Worker's choice. If a second confirmed positive test is reported, the Worker is responsible for the associated costs of testing the split sample/secondary sample. If the second confirmed test is negative, this is the final test result that is used.

6.10.7 Quality Assurance

For a minimum of 5% of negative POCT tests, negative POCT results are anonymously compared with laboratory-based results on the same type of biological sample (urine or oral fluid), for quality assurance purposes.

7. Documented Information

Creation, Capture and Use of Information Assets [9] provides current information on the storage, preservation, turnover and retention requirements for records.

Administered test results will be maintained for workers holding safety-critical or safety-sensitive positions, within a dedicate file in the Health Centre.

8. References

[1] REGDOC-2.2.4, Fitness for Duty, Volume II: Managing Alcohol and Drug Use, Version 3, https://www.cnsc-ccsn.gc.ca/eng/acts-and-regulations/regulatory-documents/published/html/regdoc2-2-4-v2-version3/

[2] *Glossary of Controlled Terms and Acronyms*, https://cnllnc.sharepoint.com/sites/TermsandDefinitions

[3] *REGDOC-2.2.3 Volume III, Certification of Persons Working at Nuclear Power Plants,* Canadian Nuclear Safety Commission, 2019, https://www.nuclearsafety.gc.ca/eng/acts-and-regulations/regulatory-documents/published/html/regdoc2-2-3-v3/

[4] *REGDOC-2.12.1, High-Security Sites Volume I: Nuclear Response Force,* Canadian Nuclear Safety Commission, 2018, https://www.cnsc-ccsn.gc.ca/eng/acts-and-regulations/regulatory-documents/history/regdoc2-12-1/

[5] *Employee & Family Assistance Program (EFAP),* https://mycnl.corp.cnl.ca/employee-family-assistance-program-efap

[6] *Fitness for Duty Assessment*, https://mycnl.corp.cnl.ca/hsse/health-centre/management-system-and-other-documents

[7] *Fitness for Duty Assessment*, 900-510000-FM-008114, 71952246

[8] *Radiation Protection Regulations (SOR/2000-203),* dated 2026-02-18, https://laws-lois.justice.gc.ca/eng/regulations/sor-2000-203/index.html

[9] *Creation, Capture and Use of Information Assets,* 900-511300-STD-003, 50746207

Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

Corporate Policy

Safety and Health

1. Purpose

Canadian Nuclear Laboratories Ltd. (CNL) is committed to the prevention of work place injury and health events while working to continually improve our safety and health performance. The purpose of this Policy is to establish standards and expectations with respect to safety and health.

2. Roles and Responsibilities

It is the responsibility of all employees to understand and implement this Policy at CNL.

Executives, managers, and supervisors have key roles in leading by example and ensuring that standards relating to Safety and Health apply to all workers, regardless of title or position within CNL. Anyone who violates this Policy or any other safety rules, causes dangerous or hazardous situations, or who fails to report or remedy such situations may be subject to disciplinary action. All employees are ultimately accountable through their behaviours, attitudes and actions related to their safety and that of their coworkers.

The *Canadian Nuclear Laboratories Management System Manual* defines the organizational responsibilities, authorities, and accountabilities.

The establishment and annual review of this Policy is the responsibility of the President and Chief Executive Officer.

The President and Chief Executive Officer will ensure appropriate supervision of its Implementation by CNL's Executive Management team.

The Board of Directors is responsible for the authorization of this Policy.

3. Policy

CNL and all its workers are committed to provide a safe and healthy working environment for all its employees, contractors and other persons who access our sites in order to prevent accidents, occurrences of harassment and violence and physical or psychological injuries and occupational illnesses, in accordance with the *Canada Labour Code Part II* and its associated regulations.

CNL also recognizes the importance of psychological health and safety in the work place and promotes a positive working environment where executives, management and employees collaborate to achieve CNL’s goals while also supporting the mental health of all employees.

CNL's approach to Safety and Health is based on a 'safety management system' approach (e.g. *CSA ISO 45001:2018, Occupational health and safety management systems – Requirements with guidance for use.*) whereby emphasis is placed on continual improvement of its Safety and Health management and performance. To this end, CNL has established a clear vision of safety excellence which includes the core aspects of compliance, protection, and improvement.

While CNL's primary focus is prevention, we also provide and maintain robust processes for emergency response and mitigation.

CNL understands the value of consultation, collaboration and involvement with employees and employee representatives in identifying opportunities to improve all aspects of the health and safety of its employees and strive toward a world class health and safety program.

CNL expects all employees to be engaged and consulted in the work planning process, with open and transparent communication that includes sharing of new ideas that will contribute to a safer outcome. Every employee at CNL is both empowered and responsible to stop/pause work, including that of others, when they feel it is not safe to proceed. Employees have the authority to stop work without fear of reprisal.

Safety and Health is actively promoted through the provision of information, training, instruction, and supervision. Employees are required to participate, and to report concerns (e.g. unsafe conditions, non-compliances, or events) in order to identify hazards and ensure measures are put in place to prevent injury or illness.

Emphasis is placed on a systematic approach to the identification of hazards and the allocation of resources to control them. In order to deliver these responsibilities CNL undertakes to:

- Maintain a safe and healthy work place.
- Promote mental health and psychological well-being through appropriate polices, programs and services.
- Perform inspections and evaluations on an on-going basis to assist in the identification and assessment of hazards and the setting of prioritised objectives for elimination and reduction of risk.
- Provide sufficient information, instruction, training, and supervision to enable employees to recognize hazards, avoid injury and contribute to the health and safety of themselves and others at work.
- Consult with employees on issues relating to Safety and Health.
- Ensure access to competent advice relating to Safety and Health.
- Apply a 'hierarchy of controls' approach to minimize Safety and Health risk.
- Ensure compliance with legislative and other requirements.
- Arrange for the effective planning, organisation, control, monitoring, and review of preventative and protective measures.
- Commit to reporting Safety and Health performance within its annual report.

This Policy will be communicated to all persons working under the control of the organization and will be made available to interested parties on request.

Jack Craig

President and Chief Executive Officer

2025 November 19

Authorized by the CNL Board of Directors as of 2025 November 19.

Revision History

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
4.3	2025/11/19	Issued as "Approved for Use". *The content in this document was reviewed for accuracy and applicability at the 2025 November 19th CNL Board of Director's meeting.*	E. Broughton	M. Proctor	J. Craig
4.3D1	2025/10/09	Issued for "Review and Comment" Minor Change: • Updated to new template to be endorsed by the President and Chief Executive Officer. • No changes to content	E. Broughton	M. Proctor CNL Policy Committee	J. Craig
4.2	2024/11/20	Issued as "Approved for Use". *The content in this document was reviewed at the 2024 November CNL Board of Director's meeting.*	E. Broughton	K. Whitham T. Wieclawek	J. Craig
4.2D1	2024/08/26	Issued for "Review and Comment" Minor Change: • Updated to new template to be endorsed by the New President and Chief Executive Officer. • Section 2. Roles and Responsibilities to align with other CNL Corporate Policies. • Section 3 aligned sentence with the Canada Labour Code language.	E. Broughton	E. Broughton T. Wieclawek CNL Policy Committee	
4.1	2023/11/15	Issued as "Approved for Use". *The content in this document was reviewed at the 2023 November CNL Board of Director's meeting.*	E. Broughton	E. Broughton J. Willman	J. McBrearty
4.1D1	2023/09/15	Issued for "Review and Comment" Minor Change: • Minor administrative update to new template to be endorsed by the President and Chief Executive Officer. • No changes to content.	E. Broughton	E. Broughton L. Schryer J. Willman CNL Policy Committee	
4	2022/11/16	Issued as "Approved for Use". *The content in this document was reviewed at the 2022 November CNL Board of Director's meeting.*		E. Broughton J. Willman	J. McBrearty

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
4D1	2022/09/01	Issued for "Review and Comment" The Safety and Health Policy has been updated to: • clarify roles and responsibilities of employees and set expectations for leaders • expand CNL's wellness program to incorporate psychological health and safety in the workplace • incorporate CNL's vision of safety excellence and • Align with the detailed requirements of CSA ISO 45001:2018.		E. Broughton J. Willman	
3	2021/11/10	Issued as "Approved for Use". *The content in this document was reviewed at the 2021 November CNL Board of Director's meeting.*		L. Nel J. Willman	J. McBrearty
3D1	2021/09/28	Issued for Review and Comment". • Minor administrative update to new template to be endorsed by the President and Chief Executive Officer. • No changes to content.		L. Nel J. Willman	
2	2020/11/11	Issued for "Approved for Use". *The content in this document was reviewed at the 2012 November CNL Board of Director's meeting.*		L. Nel	J. McBrearty
2D1	2020/09/23	Issued for Review and Comment". Minor administrative update to new template to be endorsed by the new President and Chief Executive Officer. No changes to content.		L. Nel	
1	2018/11/29	Issued for "Approved for Use". Minor administrative updates. *The content in this document was reviewed at the 2018 November CNL Board of Director's meeting.*		J. Gibb SSHC	M. Lesinski
0	2017/11/09	Issued for "Approved for Use".		K. Daniels D. Murphy	M. Lesinski

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
		Removed from 900-510400-PDD-001 as a stand-alone document.			

Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

Corporate Policy

Environment

1. Purpose

Canadian Nuclear Laboratories Ltd. (CNL) is committed to environmental protection and sustainable development. The purpose of this Policy is to contribute to CNL's commitment to corporate social responsibility.

CNL includes protection of the environment and sustainable development as an integral component of our decision-making in all phases of our business activities and processes. We also focus our environmental efforts on minimizing nuclear legacy obligations for future generations. The Environment Policy applies to all aspects of CNL's activities.

2. Roles and Responsibilities

It is the responsibility of all CNL employees to understand and implement this Policy at CNL.

Employees shall conduct their work such that all reasonable precautions are implemented to ensure the protection of the environment and that sustainable development practices are followed.

Executives, managers, and supervisors have key roles in leading by example and ensuring that standards related to the environment apply to all employees, regardless of title or position within CNL. This includes ensuring that potential environmental impacts associated with their operations, activities, products, and services are assessed and managed to be as low as reasonably achievable. In addition, they shall ensure that employees under their authority comply with the requirements set out by this Policy, as well as environmental protection program procedures.

The *Canadian Nuclear Laboratories Management System Manual* defines the organizational responsibilities, authorities, and accountabilities.

The establishment and annual review of this Policy is the responsibility of the President and Chief Executive Officer.

The President and Chief Executive Officer will ensure appropriate supervision of its implementation by CNL's Executive Management team.

The Board of Directors is responsible for the authorization of this Policy.

3. Policy

CNL and all its workers are committed to the protection of the Environment and continual improvement of environmental performance through the effective and efficient application of CNL's management system.

CNL commits to the following:

- We practice responsible environmental management.
- We are committed to pollution prevention[1].
- We set environmental sustainability objectives and targets to address climate change, energy management, waste management and conservation of resources to support continual improvement and enhance our performance.
- We fulfill compliance obligations (including federal and provincial requirements) applicable to our activities and processes.
- We review, monitor, and manage the impacts of our activities, facilities, projects, services, and products on the environment.
- We seek to develop and improve technologies to advance environmental protection and clean air solutions.
- We engage with the public and Indigenous communities and promote awareness of this policy and our environmental performance.



Jack Craig

President and Chief Executive Officer

2025 November 19

Authorized by the CNL Board of Directors as of 2025 November 19.

[1] Pollution prevention is defined as the use of processes, practices, materials, products, substances, or energy that avoid or minimize the creation of pollutants and waste and reduce the overall risk to the environment or human health

Revision History

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
3.3	2025/11/19	Issued as "Approved for Use." *The content in this document was reviewed for accuracy and applicability at the 2025 November 19th CNL Board of Director's meeting.*	C. De Waele	M. Proctor	J. Craig
3.3D1	2025/10/17	Issued for "Review and Comment." Minor Revision: • Updated to new template to be endorsed by the new President and Chief Executive Officer. • Reviewed for accuracy and applicability. • Updated third bullet in Section 3 Policy to demonstrate alignment with the Sustainability Strategy.	C. De Waele	M. Proctor L. Theil T. Wieclawek CNL Policy Committee	
3.2	2024/11/20	Issued as "Approved for Use." *The content in this document was reviewed at the 2024 November CNL Board of Director's meeting.*	G. Dolinar	K. Whitham T. Wieclawek	J. Craig
3.2D1	2024/08/26	Issued for "Review and Comment." Minor Change: Updated to new template to be endorsed by the new President and Chief Executive Officer. • Section 2 Roles and Responsibilities to align with other CNL Corporate Policies.	G. Dolinar	C. De Waele G. Dolinar L. Theil Acting VP T. Wieclawek CNL Policy Committee	

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
		• Administrative changes to align all Corporate Policies. • No content change.			
3.1	2023/11/15	Issued as "Approved for Use." *The content in this document was reviewed at the 2023 November CNL Board of Director's meeting.*	G. Dolinar	J. Willman	J. McBrearty
3.1D1	2023/09/15	Issued for "Review and Comment." Minor Change: • Updated to new template to be endorsed by the President and Chief Executive Officer. • No changes to content.	G. Dolinar	C. De Waele G. Dolinar J. Willman CNL Policy Committee	
3	2022/11/16	Issued as "Approved for Use." *The content in this document was reviewed at the 2022 November CNL Board of Director's meeting.*	L. Theil	G. Dolinar J. Willman	J. McBrearty
3D1	2022/09/01	Issued for "Review and Comment." • Updated to new template to be endorsed by the President and Chief Executive Officer. • Addressed changes in CSA ISO 14001:2015, and • The expectations around sustainability and indigenous engagement.	L. Theil	G. Dolinar J. Willman	

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
2	2021/11/10	Issued as "Approved for Use." *The content in this document was reviewed at the 2021 November CNL Board of Director's meeting.*		G. Dolinar J. Willman	J. McBrearty
2D1	2021/09/28	Issued for "Review and Comment." • Updated to new template to be endorsed by the President and Chief Executive Officer. • No changes to content.		G. Dolinar J. Willman	
1	2020/11/11	Issued as "Approved for Use." *The content in this document was reviewed at the 2020 November CNL Board of Director's meeting.*		G. Dolinar J. Willman	J. McBrearty
1D1	2020/10/08	Issued for "Review and Comment." • Updated to new template to be endorsed by the new President and Chief Executive Officer. • No changes to content.		G. Dolinar	
0	2017/06/29	Issued as "Approved for Use." Minor changes to introduce energy efficiency. This document cancels and superseded *Environmental Policy* found in 900-509200-PDD-001.		G. Dolinar	K. Daniels

Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

Whiteshell Laboratories Effluent Verification Monitoring Plan

WL-509200-PLA-001

Revision 2.0

REDACTED

Approved by:	Carla De Waele	2026/03/24
	Manager, Monitoring Programs &	Date

Effective Date: 2026/05/04

Mandatory Review by Date: 2031/05/04

Refer to ATOM for current version. Printed copies should not be considered current without first consulting ATOM.

[redacted] This Information Asset (IA) and the elements of information contained within it are the property of Atomic Energy of Canada Limited (AECL) and must be safeguarded in accordance with AECL, Canadian Nuclear Laboratories (CNL), and Treasury Board of Canada requirements. These requirements include but may not be limited to keeping the IA in a locked room or cabinet when not in use, limiting access to personnel who have a need to know, and special handling, storage and destruction measures.

This page is for Content Controls that apply to this document. If no Content Controls apply, none will be listed.

REDACTED

Revision History

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
2	2026/03/31	Issued for Approval	L. Steinke	R. Bilinsky	C. De Waele
2D1	2025/12/08	Issued for "Review and Comment". Major Changes: Update table "Information required and how collected data will be used to achieve EVMP objectives" to include more questions on how data will be used to achieve the objectives. Remove Table "Laboratory method detection limits for liquid effluent and their comparison to WL non-radiological monitoring limits" as it is a duplication of values listed in other tables and documents. Removed CNL Guideline Limits. Removed parameters which are no longer tracked. Add and remove applicable facility data in Appendix C, D, and E. Update Appendix H2 for lagoon sampling requirements pertaining to WSER. Minor Changes: Update table "Laboratory method detection limits for effluent ditches and their comparison to WL radiological monitoring limits" and table "Background (intake) values and MDLs for liquid effluents" 5-year averaged data. Updated Appendix I laboratories and their methods. Updated references.	L. Steinke	R. Bilinsky P. Vilks L. Steinke	
1.1	2025/03/31	Issued as "Approved for Use".	R. Bilinsky	L. Steinke	G. Dolinar

REDACTED

1.1D1	2025/03/11	Issued for "Review and Comment". Updated to include a background monitoring location for liquid effluent at the bridge on Highway #211	R. Bilinsky	L. Steinke	
1	2023/05/08	Issued as "Approved for Use"	K. Ross	R. Bilinsky	G. Dolinar
1D1	2021/05/03	Issued for "Review and Comment". Updated to include QA requirements for reporting of smallest reportable increments (SRI) and Critical Levels (Lc) as performed during data processing of effluent data and to reflect current practises and correct errors discovered during use.	K. Ross	R. Bilinsky C. De Waele P. Vilks	
0	2019/01/08	Issued as "Approved for Use".	K. Ross	R. Bilinsky	G. Dolinar
D1	2018/10/16	Issued for "Review and Comment".	K. Ross	B. Bilinsky C. De Waele K. Lambert	

REDACTED

Table of Contents

Section **Page**

1. Purpose and Scope 8
2. Definitions 9
2.1 Terms and Acronyms 9
3. Review of Environmental Risk Assessments 9
4. Whiteshell Laboratories Facilities and Operations 10
5. Monitoring Assessment Overview 13
5.1 Two Sets of Monitoring Criteria 13
5.2 Need for a Site Wide Effluent Verification Monitoring Program 13
5.3 Determination of Effluent Streams and Parameters Requiring Monitoring 14
6. Systematic Informed Planning Process (Six Step Process Used During Program Development) 17
6.1 Step 1: Defining the Objectives of the EVMP 18
6.2 Step 2: Identifying the Information Required to Meet the Defined Objectives 20
6.2.1 Nuclear Facilities 22
6.2.1.1 Methodology: Radiological Air Emissions 22
6.2.2 Nuclear Facilities in Storage with Surveillance State 24
6.2.2.1 Methodology: Radiological Air Emissions 24
6.2.3 Auxiliary Operating Facilities and Radioisotope Laboratories (Class A, B, C) 25
6.2.3.1 Methodology: Radiological Emissions 25
6.2.4 Non-Nuclear Facilities 29
6.2.5 Facilities Undergoing Decommissioning 30
6.2.5.1 Methodology 30
6.2.6 Non-Radiological Emissions from WL Site 31
6.2.6.1 Methodology: Non-Radiological Emissions 31
6.2.7 Waterborne Effluents 32
6.2.7.1 Methodology 32

REDACTED

6.2.8 Additional Monitoring Details 33
6.2.8.1 Frequency of Monitoring 33
6.2.8.2 Duration of Monitoring 35
6.2.8.3 Type of Data to be Collected 35
6.2.8.4 Quality Assurance (QA) and Quality Control (QC) 36
6.2.8.5 Measurement Sensitivity Levels and Non-Detects 37
6.2.9 Sampling and Analysis 37
6.2.10 Analytical Results Evaluation 38
6.3 Step 3: Perform Detailed Effluent/Emission Stream Characterization 39
6.4 Step 4: Determine How the Data Collected Will be Used to Achieve the Defined Objectives 39
6.4.1 Effluent Data 39
6.5 Step 5: Specify Performance and Acceptance Criteria 45
6.5.1 Acceptance Criteria 46
6.5.1.1 Quality Verification (QV) Limits 46
6.5.1.2 Sample Unavailability 46
6.5.2 Performance Criteria 46
6.5.2.1 Laboratory Method Detection Limits 46
6.6 Step 6: Develop the Detailed Design of the EVMP that will be Implemented to Obtain the Required Data 57
7. Continual Improvement of the EVMP 57
7.1 Decreasing Parameter Monitoring Frequency 57
7.2 Increasing Parameter Monitoring Frequency or Addition of a New Parameter 60
7.3 Core Parameters for New Effluent Monitoring Locations 60
8. References 61
8.1 References in Appendices 65
Appendix A Assessment Tables: Nuclear Facilities 67
A.1 WL Shielded Facilities 67
A.2 Waste Management Areas (WMAs) 73
A.3 Concrete Canister Storage Facility 93

REDACTED

Appendix B Assessment Table: Nuclear Facilities in Storage with Surveillance – WR-1 Reactor 95

Appendix C Assessment Tables: Auxiliary Operating Facilities 97

Appendix D Assessment Tables: Facilities Undergoing Decommissioning 103

Appendix E Assessment Tables: Non-Radiological Emissions 105

Appendix F Assessment Table: Waterborne Effluents 122

Appendix G Calculation of Maximum α and β-γ Emission Rates for Various Effluent Streams Based on Radiological Safety Contamination Zoning of Vented Areas 133

Appendix H Effluent Verification Monitoring Program History 134

H.1 Description and Monitoring History for OFS and Intake 135

H.2 Description and Monitoring History for Lagoon 139

H.3 Description and Monitoring History for Tanks and Ditches 143

Appendix I Analysis Methods 146

Figures

Figure 1: Whiteshell Laboratories and surrounding area. 11

Figure 2: Air emission monitoring locations: Rad 12

Figure 3: Liquid effluent monitoring locations. 12

Figure 4: Three-step process used to determine whether a decrease monitoring frequency is acceptable. 59

Tables

Table 1: Applicability of the monitoring criteria to the effluent verification monitoring program 15

Table 2: Objectives of the WL Facility EVMP 18

Table 3: Summary of residual effects from WL decommissioning activities. 20

Table 4: Radiological safety zones: Re-suspension of surface contamination. 23

Table 5: Possible event scenarios: Severity and frequency. 24

Table 6: Measured transfer coefficients and decontamination factors during the burning of

REDACTED

TBP-kerosene solvent [53] [54] 27
Table 7: Operating summary of non-nuclear facilities. 29
Table 8: Radiological Air Emission Monitoring Schedule 34
Table 9: Radiological Liquid Effluent Monitoring Schedule 34
Table 10: Field QV frequency recommended by MISA. 36
Table 11: Information required and how collected data will be used to achieve EVMP objectives. 40
Table 12: Laboratory method detection limits (LMDL) for air effluent. 47
Table 13: Laboratory method detection limits (LMDL) for liquid effluent and their comparison to radiological monitoring limits. 49
Table 14: Laboratory method detection limits (LMDL) for effluent ditches and their comparison to WL radiological monitoring limits. 52
Table 15: Background (intake and upstream at HWY# 211 bridge) values and MDLs for liquid effluents. 53
Table 16: Background (control ditch) values and MDLs for ditches [redacted] and [redacted] 55
Table 17: Core parameters to be monitored for new WL effluents. 60
Table 18: Non-radiological effluent monitoring history and justification for OFS and Intake. .. 135
Table 19: Non-radiological effluent monitoring history and justification for lagoon. 139
Table 20: Non-radiological effluent monitoring history and justification for tanks and ditches. 143

REDACTED

1. Purpose and Scope

This monitoring plan documents details on Whiteshell Laboratories (WL) Radioactive and Non-Radioactive Effluent Verification Monitoring Program (EVMP) including the decision for the need and development of the program, as well as identifying the reasoning behind the current monitoring schedule. It also provides WL-specific details on the execution of the program. These details are not common among all of the monitoring components comprising WL's Integrated Environmental Monitoring Program. Such commonalities are instead included in *Whiteshell Laboratories Integrated Environmental Monitoring Program Framework* [1]. These details are not necessarily common among all of the company's monitoring programs either. Details which would be applicable to each of these are instead covered in the procedure *Management and Monitoring of Emissions* [2]. In order to understand how the WL's EVMP aligns with the rest of the monitoring taking place at WL, the reader should refer to *Whiteshell Laboratories Integrated Environmental Monitoring Program Framework* [1]. As described in *Whiteshell Laboratories Integrated Environmental Monitoring Program Framewor*k [1], the EVMP is dynamic in nature and is therefore continually evolving.

This plan also provides justification for the individual monitoring activities that are part of this EVMP.

The decision for the need of an EVMP and the individual monitoring activities was made in such a way as to comply with:

1. Conditions in the WL Decommissioning Licence and Licence Conditions Handbook [3], [4];
2. *Whiteshell Laboratories Integrated Environmental Monitoring Program Framework* [1];
3. *Management and Monitoring of Emissions* [2];
4. *Effluent Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills* CSA N288.5-11 [5];
5. Other applicable regulations and standards; and
6. CNL policies.

The plan was developed and is executed in such a way as to conform with the Municipal/Industrial Strategy for Abatement (MISA) program [6].

This plan addresses radioactive airborne and waterborne effluent verification monitoring as well as effluent verification monitoring of non-radioactive contaminant and physical stressors. It does not address:

- **Environmental Monitoring (EM):** The plan for monitoring of surface waters, river sediments, soil, fish, wildlife and vegetation is documented in the *WL Environmental Monitoring Plan* [7]. Note that a subset of these surface waters discharge directly to the Winnipeg River and these are considered 'waterborne effluent' and as such are assessed within this document.
- **Groundwater Monitoring (GM):** The plan for monitoring of groundwater is documented in the *WL Groundwater Monitoring Plan* [8]; and,

REDACTED

- **Operational Control Monitoring (OCM):** Some OCM is covered in this document and additional information is included in facility-specific documentation.

This document is primarily intended for use by groups or laboratories which are directly involved in the WL's EVMP.

Note that the EVMP is dynamic in nature and is continually evolving. As a result, this plan is current as of its issuance but does not necessarily completely reflect the program after this date. The most current monitoring schedule should always be consulted [9].

Working level operational procedures describing sample collection, analytical methods and quality verification tests associated with this monitoring are contained in the work group or laboratory specific manuals [1], [10].

Any questions regarding the content or application of this document can be directed to the WL Environmental Specialists.

2. Definitions

2.1 Terms and Acronyms

Refer to Appendices A and B in *Environmental Protection, Program Description Document* [11] and *Management and Monitoring of Emissions* [2] for definitions and acronyms pertaining to this document. The current *Glossary of Controlled Terms and Acronyms* [12] contains specific meanings for those words that require further clarification.

3. Review of Environmental Risk Assessments

A number of documents assess environmental risks or provide information pertinent to potential environmental risks at the WL site. These documented assessments provide an understanding of the risks to both ecological and human receptors on and around the site. The information contained within these documents was closely considered in the evaluation of the need to perform effluent monitoring for the site, and in the design details of any warranted monitoring. As such, they are referenced throughout this document:

a. The site operates under CNL's Environmental Management System. As part of this management system, the WL Facility site's *Comprehensive Study Report* [13] and the *Whiteshell Laboratories Site-Wide Environmental Risk Assessment* [14] provides a snapshot of the various elements on the site that can interact with the environment along with a potential and actual environmental impact rating for each element.
b. The site's Derived Release Limit (DRL) report, *Derived Release Limits for CNL's Whiteshell Laboratories Site* [15], provides a conceptual model (pathways analysis) for human (public) exposure to radioactive contaminants potentially emitted by the site and generates a DRL for each pertinent radionuclide based on the *Nuclear Safety and Control Act* (NSCA) public dose limit of 1 mSv/year [16]. The report identifies the critical groups, or locations of representative persons for this human radiological dose assessment.

REDACTED

c. The site facilities Safety Analysis Reports are listed in [17], and assess possible event scenarios considering a source term [18], environmental conditions, etc., and identify a frequency for each and a severity rating which is based on a human radiological dose assessment (dose to public).
d. The site's series of annual compliance reports provide an annual assessment of site conditions, hazards, and monitoring results. The 2024 versions of these reports are found in references [19], [20], [21].
e. The site's series of detailed decommissioning plans, work plan and end state reports have descriptions of each facility's current state and, where applicable, end state.
f. Information on groundwater quality around the site is summarized each year in the Environmental Monitoring report [20] and in the annual Environmental Assessment Follow-up Program (EAFP) progress report [21]; and
g. Over the duration of work completed on the WL site, there have been many environmental studies completed in addition to that in the routine monitoring program. This available monitoring information has been taken into account in the development of the site's *Comprehensive Study Report* [13] and the detailed decommissioning plans developed from which their results feed back into the decision making process as to what should be monitored under the routine EVMP.

4. Whiteshell Laboratories Facilities and Operations

The 4375-hectare WL site (Figure 1) is owned by Atomic Energy of Canada Ltd. (AECL) and operated by CNL under a licence [3] issued by the CNSC. It is located about 100 km east-northeast of Winnipeg, along the east bank of the Winnipeg River. It is downstream from the towns of Pinawa and Seven Sisters Falls, and upstream of the communities of Lac du Bonnet and Pine Falls.

The Whiteshell Reactor-1 (WR-1) organic-cooled experimental test reactor was shut down in 1985. AECL made a business decision in 1997 to discontinue most of the research programs and operations at WL. Subsequently, AECL received government concurrence in 1998 to proceed with actions to achieve closure of WL. Activities are now underway to complete the orderly decommissioning of the WL site, following the general plan laid out in the Comprehensive Study Report supporting the approval of the Comprehensive Study Report (Environmental Assessment) [13] of the WL Decommissioning Project.

The major operating facilities are the Shielded Facilities, and the WMA. The Shielded Facilities includes the Hot Cell Facility and the Immobilized Fuel Test Facility area which includes a decontamination center and waste processing/handling area. Areas undergoing sampling and characterization activities include WR-1 Reactor Building and Active Liquid Waste Treatment Center (ALWTC). The ALWTC was shut down near the end of 2017, and is now fully decommissioned. In total, these facilities are the major sources of radiological airborne effluent releases from the site. The primary source of liquid effluent releases at WL is the process water outfall (Outfall), which discharges continuously to the Winnipeg River. The secondary source of liquid effluent is the sewage lagoon (Lagoon), which is normally discharged semi-annually to the Winnipeg River.

REDACTED

Figure 1 is a regional map showing the location of the WL site, major geographical features including the Winnipeg River, the local roads network, and the nearby communities. Figure 2 and Figure 3 show the primary air emissions and liquid effluent points at WL.

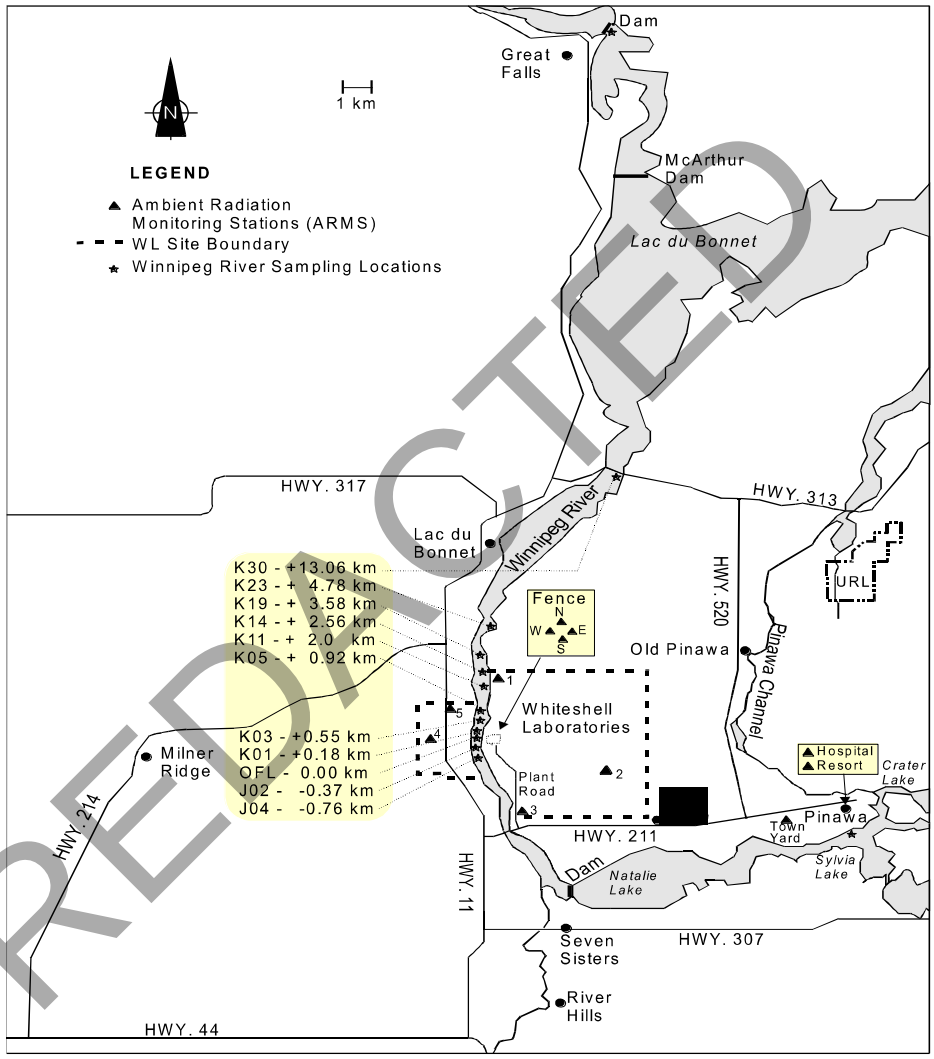


Figure 1: Whiteshell Laboratories and surrounding area.

REDACTED

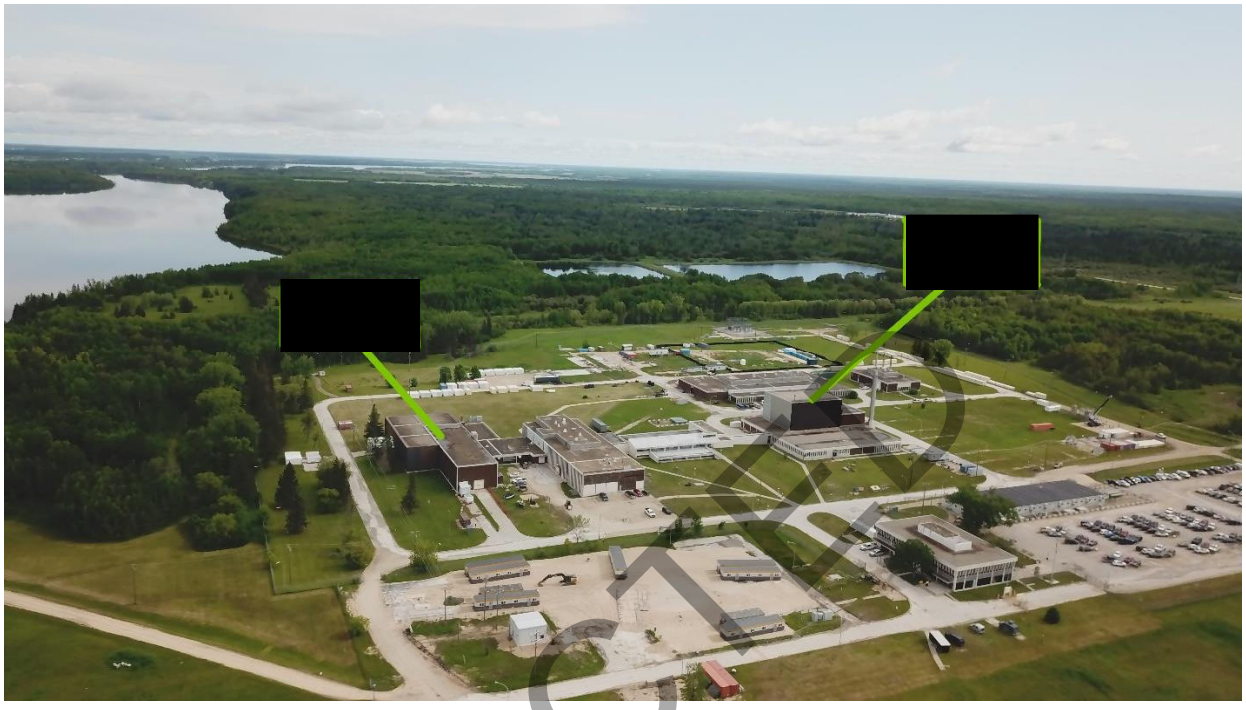


Figure 2: Air emission monitoring locations: Rad

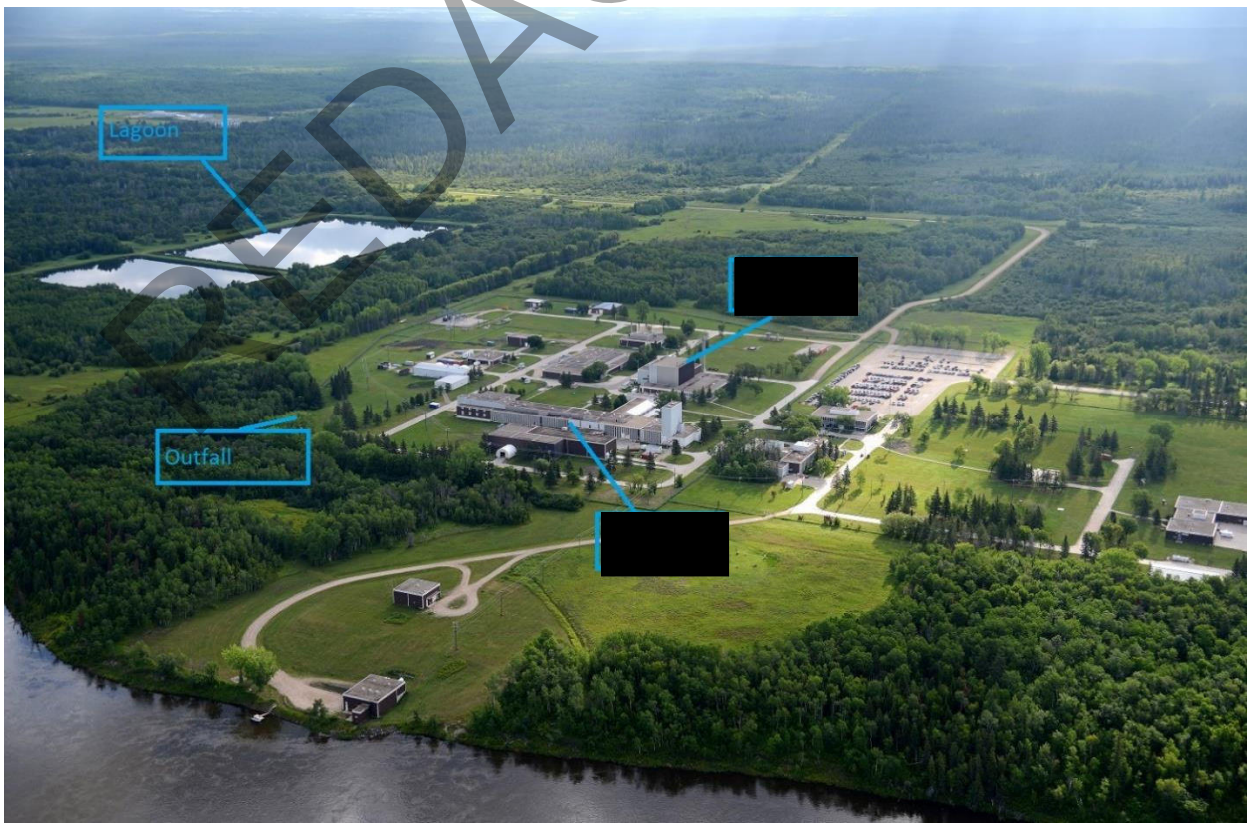


Figure 3: Liquid effluent monitoring locations.

REDACTED

5. Monitoring Assessment Overview

5.1 Two Sets of Monitoring Criteria

There are two sets of monitoring criteria as outlined in *Management and Monitoring of Emissions* [2]. One set is used to determine whether or not a site-wide EVMP is required. If it is determined that a site-wide EVMP is required, the second set of monitoring criteria is used to determine which effluent streams to monitor and what contaminants to monitor for.

5.2 Need for a Site Wide Effluent Verification Monitoring Program

In this section, the WL site is evaluated against the first set of monitoring criteria. An EVMP is needed if one or more of the criteria is met. The following criteria are met at the WL site:

"(a) A governing statute, regulation, licence, or permit requires it"

The WL Operating Licence [3] requires CNL to implement and maintain an Environmental Protection Program. As part of this Environmental Protection Program, CNL is required to control, monitor, and record release of radioactive nuclear and hazardous substances from WL such that the releases do not exceed the limits specified in [15] and [22]. This is accomplished through the Effluent Verification Monitoring Program (EVMP). Furthermore, CNL is required to prepare and submit to the Canadian Nuclear Safety Commission (CNSC) a written report that covers the results of effluent verification monitoring for nuclear substances at the WL site [4].

As mentioned previously, in 1997, the federal government and AECL decided to discontinue research programs and decommission WL. Clean up and operational activities associated with the decommissioning of the site have been underway since 2003 January.

The follow-up monitoring commitments as specified in the Comprehensive Study Report (CSR) are summarized in the Environmental Assessment Follow-Up Program [23].

The WL Operating Licence [3] requires that the CNL WL implement and report on the progress of the Environmental Assessment Follow-Up Program.

The WL Site Lagoon emissions must comply with the Federal *Wastewater System Effluent Regulations* [24].

The air emissions must comply with the *Federal Halocarbon Regulations* [25] and reporting requirements to Environment Canada for the purposes of the *National Pollutant Release Inventory* [26] and *Greenhouse Gas Reporting* [27] must be completed.

The WL EVMP was developed and is executed in such a way as to conform to the Municipal/Industrial Strategy for Abatement (MISA) program [6].

"(b) The results of an Environmental Risk Assessment (ERA) (or equivalent) indicate potential concern"

The Environmental Assessment [13] conducted identified the need for increased air emissions monitoring during decontamination and demolition activities. The need for additional surface

REDACTED

and groundwater monitoring were also identified. These monitoring activities are reported on as part of the Environmental Assessment Follow-Up Program [23].

"(c) There is a need for having the capability of identifying an unplanned emission"

Although the WL site has extensive OCM programs managed by the various facilities, the EVMP parallels a defense-in-depth approach by providing a redundant and independent means of identifying unplanned emissions.

"(d) The EVMP would support a radiation dose assessment or assessment of potential exposure to hazardous substances"

An annual assessment of public dose resulting from WL operations is performed as part of the integrated EMP. The results of the EVMP serve in part to support this public dose assessment by providing an independently calculated dose assessment for comparison. The EVMP serves to verify that the site's effluents at end of pipe are not hazardous to the environment.

5.3 Determination of Effluent Streams and Parameters Requiring Monitoring

In the remaining sections of this document (Section 6.2.1 to Section 6.2.6), effluent streams are evaluated against the second set of monitoring criteria to determine which effluent streams to monitor and what contaminants to monitor for. Note that applying this second set of monitoring criteria ensures that the objectives of the monitoring program are met (the objectives of the WL EVMP are defined in *Management and Monitoring of Emissions* [2]).

Airborne effluent streams stemming from the nuclear and support facilities at WL as reported in [17], be they fugitive emission streams or designed emission streams are assessed:

a. Section 6.2.1 addresses radiological emissions from Nuclear Facilities;
b. Section 6.2.2 addresses radiological emissions from Nuclear Facilities in Storage-with-Surveillance;
c. Section 6.2.3 addresses radiological emissions from Auxiliary Operating Facilities;
d. Section 6.2.4 addresses radiological emissions from Non-Nuclear Facilities;
e. Section 6.2.5 addresses radiological emissions from Facilities Undergoing Decommissioning; and
f. Section 6.2.6 addresses Non-Radiological Emissions from the WL Site.

Waterborne effluent streams originating from the nuclear and support facilities listed above and the rest of the site, are assessed collectively against the monitoring criteria in Section 6.2.7, through a discussion of the various final discharge points from the site.

The applicability of effluent stream and contaminant monitoring criteria identified in [2], to WL's EVMP (airborne and waterborne effluents) is shown in Table 1 below. Reasons for not citing some of the monitoring criteria in the assessment sections that follow are provided.

REDACTED

Table 1: Applicability of the monitoring criteria to the effluent verification monitoring program.

Monitoring Criteria [2]		Applicability	Reason for Not Citing in Assessment Sections
Effluent Stream			
(a)	(shall) If monitoring of the effluent stream is designated for monitoring in-, or is required to demonstrate compliance with-, a site or facility operating/decommissioning licence, statute, regulation, or permit, then that effluent stream shall be monitored.	Applicable	—
(b)	(shall) In the case of effluent streams not subject to Derived Release Limits (DRL), if the total Maximum Probable Emission Rate (MPER) for an effluent stream may exceed 1% of the applicable limits specified by the CNSC, then that effluent stream shall be monitored.	Not Applicable	All effluent streams at the WL site are subject to Derived Release Limits (DRLs) such that criterion (b) is not applicable.
(c)	(should) If the total MPER for an effluent stream exceeds 0.0005 mSv per year to a member of an off-site critical group, then that effluent stream should be monitored. Normal emission rates, instead of MPER, may be used if the effluent stream has an OCMP in place. **Note:** The dose as a result of MPER emissions may be expressed as a fraction of the applicable Derived Release Limit (DRL) times the annual dose limit from which the DRL was derived.	Applicable	—
(d)	(should) If the effluent stream has potential to contribute to biological effects (as determined in an ERA or equivalent risk assessment), based on its constituent radioactive or non-radioactive contaminants, then that effluent stream should be monitored.	Applicable	
(e)	(should) If the effluent stream contributes significantly to the dose/exposure for a receptor that has been identified as needing a dose/exposure assessment in an ERA or equivalent risk assessment, then that effluent stream should be monitored. **Note:** An effluent stream that contributes more than 10% of the relevant dose/exposure for the identified receptor can be considered to make a significant contribution.	Not Applicable	The WL CSR [13] does not identify any airborne radioactive contaminants generated by WL with a potential to contribute to biological effects.
(f)	(should) If monitoring of the effluent stream is triggered under the Municipal/Industrial Strategy for Abatement (MISA) Program, then that effluent stream should be monitored.	Applicable	—

REDACTED

Monitoring Criteria [2]		Applicability	Reason for Not Citing in Assessment Sections
(g)	(should) In addition to the effluent streams mentioned above, locations with similar environmental conditions but without potential for facility-related effects (i.e., representative of natural background) should be included in the EVMP as reference.	Applicable	—
Contaminant			
(h)	(shall) If effluent monitoring of a contaminant or physical stressor is explicitly specified by a site or facility operating/decommissioning licence or required by a statute, regulation or permit to discharge, then that contaminant or physical stressor shall be monitored.	Applicable	—
(i)	(shall) If the results of an ERA or equivalent risk assessment indicate potential concern with the release of a contaminant, or with a physical stressor, then that contaminant or physical stressor shall be monitored.	Applicable	—
(j)	(shall) If effluent monitoring of a contaminant supports a radiation dose assessment or assessment of potential exposure, then that contaminant shall be monitored.	Applicable	—
(k)	(shall) If there is an operational need to identify an unplanned or uncontrolled emission (reasonably foreseeable upset event) of a contaminant into the environment, then that contaminant shall be monitored.	Applicable	—
(l)	(should) If the site-wide MPER for a radioactive contaminant exceeds 0.0001 mSv per year to a member of an off-site critical group, then that radioactive contaminant should be monitored. **70% Rule:** The choice of effluent streams to monitor for this particular radioactive contaminant should be such that at least 70% of site emissions are monitored, e.g., monitor the top most significant effluent streams plus a sufficient number of other streams to ensure that at least 70% of site emissions of that radioactive contaminant are monitored. If this is not possible, then the need for monitoring for that radioactive contaminant should be assessed by an Environmental Specialist based on professional judgment. **Note:** The dose as a result of MPER emissions may be expressed as a fraction of the applicable DRL times the annual dose limit from which the DRL was derived.	Applicable	—

REDACTED

Monitoring Criteria [2]		Applicability	Reason for Not Citing in Assessment Sections
(m)	(should) In the case of a waterborne effluent stream, and when no ERA (or equivalent risk assessment) exists that can provide more specific guidance on the parameter(s) to be monitored, if annual average contaminant concentrations at a point of discharge from CNL site property or to a permanent surface water body on site may exceed Guidelines for Canadian Drinking Water Quality (or equivalent) for a radioactive contaminant, then that contaminant should be monitored.	Applicable	—
(n)	(should) If a contaminant is likely to approach or has the potential to exceed regulatory emission limits or internal emission limits, then that contaminant should be monitored.	Applicable	—
(o)	(should) If a non-radioactive contaminant is a reportable substance under the National Pollutant Release Inventory (NPRI) and is released in an effluent stream at greater than 10% of the mass or concentration threshold for that contaminant, then it should be monitored.	Applicable	—
(p)	(should) If effluent monitoring of a non-radioactive contaminant is triggered under the MISA Protocol, then that contaminant should be monitored.	Applicable to liquid effluent	—
(q)	(should) If monitoring is required for other business reasons (e.g., stakeholder concerns, due diligence, etc.).	Applicable	—

REDACTED

6. Systematic Informed Planning Process (Six Step Process Used During Program Development)

As a result of the identified need to develop a WL EVMP as outlined in Section 5 this monitoring plan was developed following a *Systematic, Informed Planning Process* [2], as defined by the following six steps:

Step 1: Define the objectives of the EVMP (Section 6.1).

Step 2: Identify the information required to meet the defined objectives (Section 6.2).

Step 3: Perform detailed stream characterizations (Section 6.3).

Step 4: Determine how the data collected will be used to achieve the defined objectives (Section 6.4).

Step 5: Specify performance and acceptance criteria (Section 6.5).

Step 6: Develop the detailed design of the EVMP that will be implemented to obtain the required data (Section 6.6).

Sections 6.1 through Section 6.6 of this document provide details on each of these six steps with respect to the current EVMP.

Note: Guidance to consider during the continual improvement of the monitoring program over time is outlined in Section 7.

6.1 Step 1: Defining the Objectives of the EVMP

The objectives of the WL EVMP are shared among all of the company's EVMPs and are therefore defined in the company-wide procedure *Management and Monitoring of Emissions* [2]. The objectives are repeated below with statements outlining the relevance of each objective to the WL EVMP.

Table 2: Objectives of the WL Facility EVMP

Objective to be Considered [2]	WL EVMP Objective
EVMP Primary Objective:	
a) To demonstrate compliance with regulatory emission limits and any other regulatory requirements (e.g., Action Levels) concerning the emission of nuclear/hazardous substances from the source;	An objective of the WL EVMP is to demonstrate compliance with: • The site's Derived Release Limits (DRLs) [15], which are used to ensure that the dose to public as a result of operation of the site is below the Nuclear Safety and Control Act public dose limit of 1 milliSievert/year [16]; • *Federal Wastewater System Effluent Regulations* [24]; • The *National Pollutant Release Inventory* (NPRI) reporting requirements of Environment Canada [26]; • The Greenhouse Gases (GHG) emissions reporting requirements of Environment Canada [27]; and • The reporting requirements of the *Federal Halocarbon Regulations* [25].
b) To demonstrate adherence to internal levels set on emission amounts (e.g., Administrative Levels or Internal Investigation Levels), for purposes of effluent control;	An objective of the WL EVMP is to demonstrate compliance with: • WL's Non-radioactive Effluent Limits [22]; • WL's Administrative and Action Levels for Non-radiological Liquid Effluents [22]; • *Administrative Levels and Action Levels for WL Air and Liquid Radioactive Effluents* [28]; and • Health Canada, *Objectives and Guidelines for Various Air Pollutants: Ambient Air Quality Criteria* [29].
c) To confirm the adequacy of controls on emissions from the source;	An objective of the WL EVMP is to confirm adequacy of controls on emissions from the source through: • Implementation of the *WL Waste Management and Effluent Control* procedure [30]; • Implementation of Facility Monitoring and Surveillance plans [31] and adhering to the conditions in the Facility Authorization reports [32], [33] and/or Safety Analysis [34], [35], [36], [37], [38] reports which include operational control testing; and • Pre-pump out testing of the [redacted] and [redacted] Low Level Liquid Waste tank effluent [39].

REDACTED

Objective to be Considered [2]	WL EVMP Objective
d) *To provide an indication of unusual or unforeseen conditions that might require corrective action or additional monitoring;*	An objective of the WL EVMP is to allow for detection of unusual or unforeseen conditions through implementation of Environmental Protection program [1], including effluent and operational control monitoring. An example of an unusual or unforeseen condition would be a spill of hydrocarbon to one of the facilities process drains which would be detected in the site low level waste tanks.
e) *To provide data to assess the level of risk on human health and safety, and the potential biological effects in the environment of the nuclear/hazardous substances of concern released from the facility; and*	An objective of the WL EVMP is to support an annual assessment of the level of risk through the comparison of monitoring results to DRLs and to the objectives in the Environmental Assessment Follow-up Program.
f) *To confirm predictions in environmental assessments.*	An objective of the EVMP is to provide data to verify the accuracy of the Environmental Assessment/CSR [13] and assist in determining of the effectiveness of any mitigation measures that have been implemented.
EVMP Secondary Objective:	
a) *To provide data for trend analysis;*	An objective of the WL EVMP is to provide data for trend analysis summarized in its series of annual reports.
b) *To provide assurance to employees and the public on the effectiveness of effluent control;*	An objective of the WL EVMP is to provide assurance to employees and the public on the effectiveness of effluent control as summarized in its series of annual reports.
c) *To provide data which, when combined with the results of environmental monitoring and modelling, can be used to test or refine the models of the environment used in the ERA or dose/exposure assessments;*	An objective of the WL EVMP is to provide data which when combined with the results of environmental monitoring and results from activities conducted as part of the EAFP can be used to test or refine the models of the environment used in the CSR [13].
d) *To provide baseline data and capability for monitoring and assessment in emergency conditions*	An objective of the WL EVMP is to provide baseline data and capability for monitoring and assessment in emergency conditions. This data is also used to assess the impact of decommissioning activities on the environment.
e) *Other business purposes (e.g., demonstrating due diligence, meeting a stakeholder commitment, etc.)*	An objective of the WL EVMP is to fulfill the commitments detailed in the CSR [13].

REDACTED

6.2 Step 2: Identifying the Information Required to Meet the Defined Objectives

To aid in determining what monitoring needs to take place to meet the objectives set for the program, a set of company-wide *Need for Monitoring Criteria* has been established and is documented in the *Management and Monitoring of Emissions* procedure [2]. These criteria determine what effluent streams and parameters require monitoring in order that the program fulfills its objectives. In addition to these criteria, further monitoring details, including such things as frequency and duration of monitoring, are defined based on guidance provided in [2] and further define the program ensuring it meets its objectives.

Section 6.2.1 to Section 6.2.7 detail what monitoring meets each of these "Need for Monitoring Criteria" and therefore is part of the current EVMP. Section 6.2.8 outlines the additional monitoring details, as discussed above, which further define the current program's monitoring.

In addition, over the duration of work completed on the WL site, there have been many environmental studies completed in addition to that in the routine monitoring program. This available monitoring information has been taken into account in the development of the site's *Comprehensive Study Report* [13] and the detailed decommissioning plans developed from which their results feed back into the decision making process as to what should be monitored under the routine EVMP. The CSR (WL EA) describes the stressors and possible residual effects arising from WL decommissioning and is summarized in Table 3.

Table 3: Summary of residual effects from WL decommissioning activities.

Category	Description of Residual Effect	Potential Spatial Effect	Facility/Source
Air Quality and Noise	Release of airborne radioactive particulates during disconnecting of services, decontamination retrieval and repackaging of materials and remediation	On-site	WR-1, [redacted], Decontamination Centre, [redacted] WMA, Buried Services, Affected Lands, North Ditch, River Sediments
	Release of airborne radioactive particulates during demolition of canisters	On-site	Concrete Canisters
	Nuisance dust and fine particulates from building demolition, and site restoration and rehabilitation	On-site	All Building Demolition
	Production of methane gases from landfill	On-site	Inactive Landfill
	Noise during demolition and site restoration	On-site	All Building Demolition

REDACTED

Category	Description of Residual Effect	Potential Spatial Effect	Facility/Source
Surface Water (Hydrology)	Surface water contamination associated with migration of decontamination process water, the removal of drains and other buried services and remediation	Off-site Winnipeg River	Buried Services, WMA, Affected Lands, North Ditch
	Discharge of treated water flows into Winnipeg River (active and inactive)	Off-site Winnipeg River	[redacted] LLLWTS, [redacted] LLLWTS, Sewage Lagoon
	Leaks into surface water from in-situ trenches	Off-site Winnipeg River	WMA
Soil and Groundwater (Geology and Hydrology)	Soil and Groundwater contamination during operations	Off-site Winnipeg River	WMA, Sewage Lagoons
	Contamination from leaks around existing facilities or contamination during remediation	Off-site Winnipeg River	Off-site Contaminated Lands, Sewage Lagoons, Buried Services, Affected Lands, North Ditch
	Leachate from in-situ trenches	Off-site Winnipeg River	WMA
	Leachate from remediated facilities	Off-site Winnipeg River	Inactive Landfill
Terrestrial Biota	No residual effects identified		
Aquatic Biota	No residual effects identified		
Worker Health and Safety	No residual effects identified		
Socio-economics	No residual effects identified		
Public Health	No residual effects identified		
Physical and Cultural Heritage	Potential to disrupt traditional uses of the Winnipeg River	Off-site Winnipeg River Shoreline	Shoreline
Land and Resource Use	Land-use restriction associated with in-situ disposal of radioactive waste	On-site	WMA
	Land-use restrictions associated with in-situ disposal of non-radioactive waste	On-site	Inactive Landfill
Archaeology	Artifact loss during excavation near shorelines of the Winnipeg River	On-site Shoreline	Sewage Lagoon, Outfall shoreline
Aboriginal Interests	General interest in the project especially as it affects the Winnipeg River. Artifact loss during excavations near the shores of the Winnipeg River.	On-site shoreline	Sewage Lagoon, Outfall shoreline

REDACTED

The exercise of identifying information to be obtained was completed both during the initial setup of the program and again over time as the program develops.

6.2.1 Nuclear Facilities

6.2.1.1 Methodology: Radiological Air Emissions

All airborne emission streams stemming from Class I Nuclear Facilities on the WL site, be they fugitive emission streams or designed emission streams are assessed against the emission stream and contaminant monitoring criteria outlined in Table 1 of *Management and Monitoring of Emissions* [2].

To allow for an assessment against criterion (c), MPERs for each emission stream were calculated. The calculation method varies depending on whether or not radioactivity in the effluent is expected, and on the type of input data available:

1. Emission Streams Expected to Contain Minimal or No Radioactive Contaminants:

   For emission streams expected to contain minimal or no radioactive contaminants, justification for not monitoring is based on:

   a. The lack of a source term;
   b. The designated radiological safety zoning of the vented area(s) contributing to those emission streams. In general terms:
      i. A zone 1 area is expected to be free from contamination;
      ii. A zone 2 area is normally free of contamination but may be subject to cross-contamination from higher zones; and
      iii. A zone 3 area is expected to generate loose surface contamination for short periods of time.
   c. Ambient air pressure differentials within the facility affording contamination control. *Nuclear Facility Ventilation System Design* [40] requires that "the contamination control zone depressions shall be progressively greater in the direction of increasing airborne contamination potential" providing assurance for example that a zone 1 area remains a zone 1.

Radiological Areas and Zones [41] describes radiological safety zones 1, 2, and 3 classification based on levels of removable surface contamination (zones 4 and 5 are also defined but not relevant here since the emission streams stemming from these areas are normally monitored). According to Cember [42], one can reasonably apply a resuspension factor of 10^{-6} to loose surface contamination in order to estimate ambient air concentrations:

> "The quantitative relationship between the concentration of loose surface contamination and consequent atmospheric concentration above the contaminated surface due to stirring up the surface is called the *resuspension factor*, f_r, and is defined by
>
> $$f_r = \frac{\text{atmospheric concentration,Bq/m3}}{\text{surface concentration Bq/m2}}$$

REDACTED

Experimental investigation of the resuspension of loose surface contamination shows that the resuspension factor varies from about 10^{-4} to 10^{-8}, depending on the conditions under which the studies were conducted. A value of 10^{-6} is reasonable for the purpose of estimating the [inhalation] hazard from surface contamination."

By multiplying the maximum removable surface contamination levels [41] by Cember's 10^{-6} resuspension factor, one can derive the maximum ambient air concentrations of various radionuclides (or emitter types) that can be expected within each radiological safety zone. These maximum ambient air concentrations are shown in Table 4 below for radiological safety zones 1, 2, and 3.

Table 4: Radiological safety zones: Re-suspension of surface contamination.

Radionuclide	Removable Surface Contamination (Bq/m^2) [41]		Ambient Air Concentration (Bq/m^3) Derived from Multiplication by a 10^{-6} (m^{-1}) Resuspension Factor [42]	
	Zones 1 & 2	Zone 3	Zones 1 & 2	Zone 3
α emitters	$< 0.01 \times 10^4$	$\leq 0.01 \times 10^5$	$< 0.01 \times 10^{-2}$	$\leq 0.01 \times 10^{-1}$
U-nat, depleted U, LEU	$< 0.2 \times 10^4$	$\leq 0.2 \times 10^5$	$< 0.2 \times 10^{-2}$	$\leq 0.2 \times 10^{-1}$
Sr-90, radioiodines	$< 0.05 \times 10^4$	$\leq 0.05 \times 10^5$	$< 0.05 \times 10^{-2}$	$\leq 0.05 \times 10^{-1}$
β-γ emitters	$< 0.2 \times 10^4$	$\leq 0.2 \times 10^5$	$< 0.2 \times 10^{-2}$	$\leq 0.2 \times 10^{-1}$

The maximum ambient air concentrations from Table 4 above can be used to derive conservative MPERs for effluent streams that are expected to contain minimal or no radioactive contaminants. The MPERs can be calculated by multiplying zone-specific maximum ambient air concentrations from Table 4 (Bq/m^3) by exhaust fan rates (m^3/s), yielding release rates (e.g., Bq/s). The release rates could then be converted to an equivalent dose to public in units of mSv by applying the appropriate DRL. This provides a conservative estimate of emissions because the starting point of the calculation is a maximum level of removable surface contamination present within the exhausted area(s). An example of this can be demonstrated in Appendix A for Building [redacted] as the emission rates for this facility were estimated using contamination zoning designations.

The Radiation Protection Program periodically confirms zoning designations within buildings by empirical surface checks as per [43].

2. Effluent Streams Expected to Contain Radioactive Contaminants:

   For all effluent streams that are expected to contain radioactive contaminants based on the described source term, an MPER was calculated to allow for comparison to criterion (c) by one or a combination of the following methods:

   a. Possible event scenarios were pulled from respective facility Safety Analysis Reports (SARs). Most of these reports identify both a frequency and severity for each event as per the categories (Table 5) in the tables below. For MPER calculations, and as per the MPER definition, events with a frequency rating of 0.03/a or greater were considered. All severity categories were considered, even

REDACTED

"Negligible" defined at < 0.2 mSv, unless severity was further quantified in the report as less than 0.0005 mSv in which case criterion (c) is not triggered. Note that for most of these events, all safety and mitigating systems are assumed to perform at their minimum standards unless the combination of an initiating event and failure of mitigating system is within design basis, i.e., probability of occurrence > 10^{-6}/a. The term 'bounding events' is used in SARs and adopted herein to mean those postulated events within design-basis (i.e., probability of occurrence > 10^{-6}/a) with the highest Frequency times (x) Severity ratings (or highest Risk).

Table 5: Possible event scenarios: Severity and frequency.

Frequency Category		Event/year	Severity Category		Dose to Public (mSv)
F0	Extremely Rare	0.0001 to 0.000001	S0	Negligible	< 0.2
F1	Rare	0.03 to 0.0001	S1	Low	0.2 to 2
F2	Occasional	0.3 to 0.03	S2	Moderate	2 to 20
F3	Frequent	> 0.3	S3	High	< 0.2

b. For cases when no postulated events have been identified at frequencies greater than 0.03/a, the MPER calculation is an estimate of routine emissions. If the effluent stream is currently monitored, then the monitoring results are used in the MPER calculation. If the effluent stream is not currently monitored, an estimate is calculated in various ways. Other estimations performed as part of this assessment are detailed in the assessment tables in Section Appendix A.

If the effluent stream is filtered by a HEPA filter and/or charcoal adsorber, as per the requirements of *Nuclear Facility Ventilation System Design* [40] or the original facility design requirements, then in most cases, this effluent stream is deemed to require monitoring for the relevant contaminants, i.e., particulates, respectively. This monitoring then conservatively serves as a redundant but independent verification of filtration operation ('redundant' because some facilities have OCM programs involving the use of a pressure differential gauge to monitor resistance to air flow, and by Radiation Protection Program requirements, HEPA filters and charcoal adsorbers are to be tested either annually, semi-annually, or quarterly).

The assessment tables for the Nuclear Facilities at the WL site are in Appendix A.

6.2.2 Nuclear Facilities in Storage with Surveillance State

6.2.2.1 Methodology: Radiological Air Emissions

Airborne effluents streams stemming from the facilities in Storage-with-Surveillance state are assessed against the applicable effluent stream and contaminant monitoring criteria outlined in Table 1 of *Management and Monitoring of Emissions* [2].

For an assessment against criterion (c), MPERs were calculated based on routine emissions only. No event-based emissions were included in the MPER since no documented postulated events are available.

REDACTED

It should be noted that for certain facilities, the source term is not well defined, and an estimation of routine releases is not feasible at this time. Where airborne effluent monitoring is conducted, the normal, measured emission rates are compared with the monitoring criteria. Where no airborne effluent monitoring is conducted, the risk of re-suspension is evaluated by assessing the radiological safety contamination zones. If a building includes areas designated as Radiological Safety Contamination Zone 4 and/or if the effluent stream is filtered by a HEPA filter system, then monitoring criterion (k) is triggered.

The contribution of the emission streams to site-wide emissions of radioactive contaminants is assessed by applying the 70% rule as presented in the tables in Criterion (l).

For buildings where there is no operational ventilation system available, fugitive emissions may need to be evaluated/estimated at the time of physical decommissioning.

The assessment table for Nuclear Facilities with surveillance is in Appendix B.

6.2.3 Auxiliary Operating Facilities and Radioisotope Laboratories (Class A, B, C)

6.2.3.1 Methodology: Radiological Emissions

For auxiliary operating facilities that are not radioisotope laboratories, the assessment of need to monitor is based on Radiological Contamination Zone designations.

For radioisotope laboratories, since there are no Safety Analysis Reports for Class A, B, C Radioisotope Laboratories, these laboratories are instead subject to an assessment [44] via Radioisotope Laboratories Protocols (RLP) that are reviewed and approved by the CNL Radiation Protection Program.

Since these RLPs do not provide a frequency of postulated events that can be used for an MPER calculation, a fire event at the respective laboratories is used to estimate worst-case airborne emissions. In SARs, this type of fire is normally rated as a low probability event with a severity rating of high. Airborne emissions from this postulated fire event were assessed in order to justify the need for radiological effluent monitoring for the WL Radioisotope Laboratories.

Controlled List document [17] includes a listing of the radioisotope laboratories found at the WL site. The majority of these radioisotope labs have an authorized radioisotope laboratory protocol (RLP) document. The RLP provides information such as: Laboratory class, requirements, processes, and sets the limits and restrictions on the type and quantity of radionuclides used, stored or in operations in the lab.

In general, information regarding the type and quantity of radionuclides found in the lab is gathered from the RLP but in some occasions information was obtained from the lab staff.

As mentioned above, the non-routine event chosen for this assessment, which could lead to airborne emissions, is a fire that will destroy completely the lab and the building. A very high level of conservatism was applied initially in the assessment by assuming that the entire radiological inventory will become released to the atmosphere and lead to offsite population radiological exposure. The offsite dose is calculated and then compared with the monitoring criteria. If the monitoring criteria were exceeded, the level of conservatism applied

REDACTED

initially (when the entire inventory release was assumed) was reduced further by applying airborne release fractions that were available in the literature.

To summarize it, the justification for monitoring for the WL Radioisotope Laboratories listed in the *WL-508200-LST-006864* [45] and *900-514300-LST-001* [17] is based on the following assumptions:

3. Information regarding the lab inventory is gathered from the Radioisotope Laboratories Protocols (RLP) [46], [47], [48]. When the information was not sufficient/clear, more information was requested from the lab staff such as: Maximum number of samples used, typical activity, radionuclides found in the lab, etc. The radiological inventory is grouped by the Toxicity Groups and, in general, the inventory is allocated to the most restrictive radionuclide from each group. This adds conservatism. There were situations where no DRLs were developed for certain radionuclides, in which case the most restrictive available DRL was used.
4. In the event of a fire that will destroy the whole laboratory and building, the only pathway of exposure for an off-site person is assumed to be via airborne releases. Given that during a fire, not all the radionuclide inventory will be completely released, airborne release fractions can be used (that were available in the literature). The literature provides the results from a number of tests conducted by different groups. Some of those results are presented as follows.

   The CNL *Safety Analysis Report for the Nuclear Fuel Fabrication Facilities Building* [redacted] *and* [redacted] [49] presents the results of a number of tests conducted at Oak Ridge on uranium fires extinguishing agents [50]. The results imply that less than 0.01% (or 1E-4) of the material (uranium) becomes airborne in a fire.

   The J. Mishima report [51] mentions that: “A fire in uranium chips or powders would result in only a very small fraction of the material becoming airborne. Qualitative observations by CRL personnel having experience with fires in uranium turnings or fines indicate these materials burn very slowly, essentially smoldering, with no significant loss of material”.

   Other tests conducted at the Pacific Northwest Laboratories involving burning pieces of plutonium metal concluded that the maximum observed airborne release would be 0.03% (3E-4). It is believed that uranium and plutonium behave in a similar manner during a fire [51], [52]).

   The ANSI/ANS-5.10 standard [53] presents the release fractions for volatile compounds, liquids and solids found under thermal stress and other stressors (e.g. explosive forces, aerodynamic entrainment/resuspension). Airborne release fractions for thermal stress were provided more specifically for tritium, Pu and U. The values used for Pu and U range between: (3E-5) for Solid Reactive Metal (Pu-less than ignition temperature of oxide formed) to (1E+0) for Solid Reactive Metal (U-explosive dispersal of thin sheets of metal). The ANSI standard is more specific in terms of particle generation mechanisms.

REDACTED

Since the probability of a fire that will completely destroy the lab and building is very small, the 1E-4 factor was used in this assessment for Pu and U. No credit was given to the HEPA and charcoal filters.

Reference [54], presents the airborne releases of Cs, Th, and Ce measured in tests using a kerosene combustion process. The study presents the fraction reaching filters and the transfer coefficients for Cs, Th, and Ce. Other studies indicate that the airborne release fraction should be smaller than the transfer coefficient[1] but greater than the fraction reaching filters (Table 6). Based on the assumption that the airborne release fraction should be greater than the fraction reaching the filter (Table 6), the following airborne release fractions were considered conservative:

- Cs: Release fraction 1E-2
- Th: Release fraction 1E-2
- Ce: Release fraction 1E-2

Table 6: Measured transfer coefficients and decontamination factors during the burning of TBP-kerosene solvent [53] [54].

Trace Element	Transfer Coefficient	Decontamination Factor	Fraction Reaching Filter
(Small Scale Experiments)			
Cs	0.47	1310	3.6E-4
	0.32	>5270	<6.0E-5
	0.27	>4890	<5.5E-5
	0.49	>3760	<1.3E-4
Th	0.45	112	4.0E-3
	0.23	159	1.4E-3
	0.12	137	8.8E-4
(Large Scale Experiments)			
Ce	0.23	4260	5.4E-5
	0.42	1110	3.8E-4
	0.92	-----	-----
	0.89	-----	-----
	0.47	5620	5.4E-5

REDACTED

In general, from a radiological point of view, Cs-137, tritium and I-131 are the most important radionuclides that are responsible for general population radiological exposure via airborne releases [54].

It is important to note that the WL labs involve a wide variety of operations/materials, and it is not simple to characterize it accurately and choose the airborne release fractions. The assessment is not intended to focus on a complete understanding of all the mechanisms involved in the airborne releases because of the complexity of mechanisms involved in a fire

[1] The transfer coefficient in air was determined by: [initial mass element] - [final mass element]/initial mass element. The decontamination factor was determined by: [initial concentration element] × [volume]/mass collected on filter.

and the complexity of each lab. A complete understanding of the intrinsic mechanisms is not commensurate with the level of details required in this need for monitoring assessment.

The following process was used to derive MPERs:

5. In order to calculate the offsite dose, the activity of a specific radionuclide (from the inventory) (Bq) is divided by the Derived Released Limit (DRL) (Bq/wk) for that radionuclide. The release is assumed to be a onetime event and not a routine weekly release. The DRLs used are those for airborne Effluents Released from WL Roof Vents [15]. The value is divided further by 52 weeks (number of weeks in a year) since the event is not assumed to occur every week of the year[2]. The onetime release will occur over one week duration. The offsite dose is compared further to the monitoring criteria.
6. Two values were used for the monitoring criteria:
   a. 1E-4 mSv/y if only one radionuclide is found in the lab, or
   b. 5E-4 mSv/y if more than one radionuclide is found in the lab.
7. Since there have not been DRLs developed for all the radionuclides found in the labs inventory, for those missing, the inventory is allocated to the most restrictive radionuclide from a Toxicity group. This adds conservatism.
8. For some of those labs the inventory used in the calculation is based on the most highly radioactive reactor artefact coupon/sample.
9. The methodology did not account for any modifying factors[3] applied because of the large variation in the type of activities conducted in certain labs.
10. For certain labs where different forms of iodine are used (e.g., volatile, semi-volatile, non-volatile) only the semi-volatile and volatile inventory was used. Iodine is very adherent to surfaces and as a result, not all the inventory would be released in the event of a fire. Assuming a 100% release of all forms of iodine would have been overly conservative.
11. When a radiation source was found in the inventory (e.g., [redacted] Irradiator, [redacted] Beta Calibrator) that source (Cs-137, Sr-90) was not included in the total inventory. It was assumed that a release would not be possible from the source in the event of a fire for the following reasons: Adequate shielding to the source, non-combustible lab walls, lack of combustible load in the room, and incombustible source.
12. Initially a 100% release is assumed. If the monitoring criteria were exceeded, airborne release fractions were included in the calculation to reduce the level of conservatism initially applied.
13. Occasionally, when the inventory was not clear, the Class inventory limits were applied. This adds conservatism since, in general, the inventory in the labs are below the maximum allowable inventory for the Class lab.

REDACTED

[2] 100% DRL for every week of the year corresponds to 1 mSv/y dose.

[3] Modifying factors are applied to the inventory in certain labs to account for resuspension risk (e.g., storage of unsealed sources, complex wet, dry and dusty operations, etc).

The main source of uncertainty in this assessment is the variation of the lab inventory. This variation is attributable in general to the modifying factors that are applied under different circumstances.

The assessment is very conservative since the whole inventory was assumed to be released in a fire. Airborne release fractions were applied only for certain radionuclides. As mentioned earlier, no credit was given to the HEPA filters since it was initially assumed that the building will be completely destroyed by the fire. At the same time, the loaded HEPA[4] filters could become potential radiation sources during a fire event. The DOE Handbook on Airborne Release Fractions [54] estimates that, the airborne release fraction from the heat-induced damage to a HEPA filter is very small. The bounding airborne release fraction value is assessed to be 1E-4.

Furthermore, the WL fire response will be prompt to extinguish a fire which will reduce the risk for prolonged airborne releases.

It is considered that sufficient conservatism was applied in the assessment to balance the associated inventory uncertainty.

The assessment tables for Auxiliary Operating Facilities are in Appendix C.

6.2.4 Non-Nuclear Facilities

The Non-Nuclear Facilities include:

1. Containment Test Facilities,
2. Fire Department Services,
3. Powerhouse,
4. Storage Areas, and
5. Office and lunch area.

These facilities have no known sources of radioactive materials, and as a result, no monitoring is required.

Table 7: Operating summary of non-nuclear facilities.

Building Number	Building Function	Operating Status	Comments
[redacted]	Security, Reception, Fire hall and Security Monitoring Room	Operational	
[redacted]	Lunchroom/Offices (formerly the Library)	Cold and Dark	
[redacted]	Offices/Machine Shop	Operational	
[redacted]	Quonset: Cold Storage	Operational	
[redacted]	Cold Garage	Operational	

[4] HEPA filters are tested and replaced periodically as part of the maintenance activities.

REDACTED

Building Number	Building Function	Operating Status	Comments
[redacted]	Outfall Sampling Station	Operational	Some residual radioactivity may be present in the systems from site effluent
[redacted]	Quonset: Cold Storage	Operational	
[redacted]	Quonset: Cold Storage	Operational	
[redacted]	Asbestos/PCB Storage	Operational	
[redacted]	Hazardous Chemical Storage	Operational	Building relocated beside [redacted]
[redacted]	Portable Boiler Building [redacted]	Operational	
[redacted]	Portable Boiler Building [redacted]	Operational	
[redacted]	Pump House	Operational	
[redacted]	Water Filtration Plant	Operational	
[redacted]	Fire Protection Water System	Operational	
[redacted]	Process Water System	Operational	
[redacted]	Storm Drainage System	Operational	
[redacted]	Sewage Lift Station and Lagoons	Operational	
[redacted]	Powerhouse	Operational	
[redacted]	Main Substation (Owned by MB Hydro)	Operational	
[redacted]	Main Power Distribution	Operational	
[redacted]	Communications System	Operational	
[redacted]	Supervisory Control and Alarm	Operational	
[redacted]	Clarified Water System	Shut Down Mid-1980s	
[redacted]	Access Tunnel	Cold and Dark	

REDACTED

6.2.5 Facilities Undergoing Decommissioning

6.2.5.1 Methodology

Airborne emission streams stemming from the facilities undergoing decommissioning are assessed against the applicable emission streams and contaminant monitoring criteria outlined in Table 1 of *Management and Monitoring of Emissions* [2].

The methodology applied to justify monitoring requirements for Facilities Undergoing Decommissioning is similar to the methodology used for the Storage-with-Surveillance Facilities. However, when information on the radiological inventory is available, a fire event is used as a worst-case scenario that can lead to airborne emissions. The resulting dose from such an event is included in the calculation of an MPER and compared with the monitoring criteria.

For some of these facilities the ventilation system and other systems are shut down or physically removed. In this case, fugitive emissions may need to be evaluated/estimated at the time of physical decommissioning when an increase in radioactive airborne releases is expected.

Environmental Assessment Follow-Up Program [23]recommendations and information from Detailed Decommissioning Plans is used when available. As part of the EAFP, a commitment was made to evaluate the impact that decommissioning activities might have on ambient air quality. Of specific concern was the possible generation of fine dusts that operations such as building demolition might produce. The demolition methods employed should release very little material to air and remain below the level of concern set out by Health Canada to protect the health of the general public [29].

The follow-up monitoring for air[5] during active demolition calls for collection and measurement of Total Suspended Particulates (TSP), as well as, radioactivity (gross alpha, gross beta and gamma spectrometry) [13] during building demolition activities, using standard environmental air sampling equipment. Over a fixed time, the samplers collect suspended particles of all sizes, filtering ambient air at a known rate. The amount collected is then determined gravimetrically.

The assessment tables for facilities undergoing decommissioning are in Appendix D.

6.2.6 Non-Radiological Emissions from WL Site

6.2.6.1 Methodology: Non-Radiological Emissions

The results of the exercise of comparing WL's airborne effluents to the *Need for Monitoring Criteria* (both effluent stream and parameter) are detailed in Appendix E.

Note: Air effluents were identified from the facilities listed in [17] and are listed in this form in Appendix E, followed by key additional facilities performing activities which release non-radioactive contaminants.

In general, the non-radiological airborne releases are reviewed routinely and revised as necessary through EnvP's Environmental Aspect Assessment process [55]. During this review, emissions are scored for environmental significance. A score under 2 is given for those emissions which are expected to have negligible impact on the environment based on the severity and the quantities of chemicals being released. A scoring of 2 or above is given for an emission where some degree of impact is noted.

Any source on site which is not facility-specific, such as the use of site emergency generators or propane used for building heating, etc., are summarized under "General Site Activities" instead of under each applicable facility.

As mentioned in Section 6.2.5.1, the follow-up monitoring for air[6] during active demolition calls for collection and measurement of Total Suspended Particulates (TSP), as well as,

[5] Section 9.5.1 of the CSR provides suggested parameters for air monitoring.

[6] Section 9.5.1 of the CSR provides suggested parameters for air monitoring.

REDACTED

radioactivity (gross alpha, gross beta and gamma spectrometry) [13] during building demolition activities, using standard environmental air sampling equipment. Over a fixed time, the samplers collect suspended particles of all sizes, filtering ambient air at a known rate. The amount collected is then determined gravimetrically.

6.2.7 Waterborne Effluents

6.2.7.1 Methodology

The results of the exercise of comparing WL's liquid effluents which enter the environment to the "Need for Monitoring Criteria" are detailed in Appendix F includes a summary of the brief history of any past monitoring and a listing of the current non-rad parameters in the program. As discussed further in Section 6.3, a full assessment of the Outfall and Lagoon effluent for non-radiological parameters has been completed and will include additional analysis as per Table 17.

The waterborne effluents streams stemming from the WL site that are assessed against the effluent stream and contaminant monitoring criteria outlined in Table 1 of *Management and Monitoring of Emissions* [2] include:

f) All final discharges to the Winnipeg River. The need to monitor surface waters is assessed as part of the WL Environmental Monitoring Program and not the EVMP. A subset of these surface waters discharge directly to the Winnipeg River, i.e., Ditch Locations [redacted] and [redacted] and these *are* considered part of the EVMP.
g) On-site system waters.

Note that a measure of conservatism is applied to waterborne effluent streams that discharge directly to the Winnipeg River. Because of the diverse nature of the activities that take place at the WL site and the resulting physical complexity of the site, all process effluents, stormwater effluents, WMA-related final effluents, and Inactive Landfill related final effluents are monitored, regardless of whether or not their MPERs are significant. Further conservatism is afforded in that all of these effluents are monitored for at least gross alpha particulates and gross beta particulates, and tritium in effluent from the WMA. This ensures that the majority of contaminants are accounted for.

For those effluent streams that are expected to contain beta-gamma emitting radioactive contaminants, a periodic gamma spectrometry and strontium-90 analysis is also performed allowing for speciation of contaminants. A periodic uranium analysis and/or plutonium analysis is performed for those effluent streams that are expected to contain alpha emitting radioactive contaminants and known to contain Am-241. These periodic speciation activities serve to confirm the gross analyses and also serve as an investigation tool in the case of an observed rise in gross analysis results. In an effort to streamline our operational environmental monitoring process, WL only initially performs gross beta and gross alpha analysis on the samples.

The beta emitter with the most restrictive Maximum Acceptable Concentration (MAC) in the potential contaminants of concern and likely to be present at detectable levels is Sr-90 (MAC 5 Bq/L, assuming equilibrium with Y-90), and it is used as the basis for the screening

REDACTED

criteria (10 Bq/L). If the sample result is above 10 Bq/L, the samples are submitted for gamma spec and Sr-90 analysis. Gamma spec analysis provides individual results for (Co-60, Nb-94, Sb-125, Cs-134, Cs-137 (Ba-137m), Pm-147, and Am-241). If all of the gross beta is accounted for then the effort is complete. If not, WL staff evaluate the data against the most restrictive isotope not already detected and assume that is what it is (most likely Tc-99). If the value is above the MAC for Tc-99 (200 Bq/L), WL staff confirm that it is present. If it is not that particular isotope, staff continue the search (Cl-36, Ni-63).

The alpha emitter with the most restrictive MAC is Pu-239/240 and Pu-238, while the most likely alpha is uranium (0.5 Bq/L/20 ppb). If alpha activity is detected at this level or above, the sample is submitted for gamma spec and uranium analysis. Since the groundwater in the WL area contains natural uranium (approximately 2 to 200 ppb) it is the most likely alpha present. The rock surrounding the WL site is slightly enriched in uranium and its decay products including Ra-226. If uranium does not account for the alpha activity present (1 ppb uranium is approximately 0.025 Bq/L gross alpha), staff review the gamma spec analysis to see if Am-241 is present as it is an indicator of the presence of plutonium isotopes. If the value is above the MAC for Am-241 and/or plutonium, the samples are sent for plutonium analysis. If the value is still above the MAC for that isotope, staff continue the search.

The assessment tables for need for monitoring waterborne effluents are in Appendix F.

6.2.8 Additional Monitoring Details

6.2.8.1 Frequency of Monitoring

All effluent samples requiring radiological analysis are sampled at frequencies following the recommendations and requirements in Section 6.3.3 of *Management and Monitoring of Emissions* [2]. Frequency of sampling for non-radiological parameters generally follows the recommendations set by MISA and/or detailed in Safety Analysis and Facility Authorization documentation. Appropriate customization to each effluent are determined over the course of the program's history (e.g., based on known sources, effluent performance, etc.). Justification for each non-radiological parameter is detailed in Appendix H.

For radiological air emissions the monitoring schedule is captured in Table 8, for radiological liquid effluent the monitoring schedule is captured in Table 9.

Storm sewers are currently being monitored through the processed outfall and the site has a well-established spill response (both notification and clean-up).

REDACTED

Table 8: Radiological Air Emission Monitoring Schedule

Sample Location	Sample Collection		Analytical Method and/or Parameter			
	Frequency	Method	Gross Beta	Gross Alpha	Tritium	Gamma Spec
[redacted] Stack	Cont	GFA Filter	W	W	N/A	W
	Cont	Charcoal Filter (Cartridge)	N/A	N/A	N/A	W
	Cont	Bubbler	N/A	N/A	W	N/A
[redacted] HCF	Cont	GFA Filter	W	N/A	N/A	W
	Cont	Charcoal Filter (Cartridge)	N/A	N/A	N/A	W
	Cont	Millipore Filter	N/A	W	N/A	N/A
[redacted] IFTF	Cont	GFA Filter	W	N/A	N/A	W
	Cont	Charcoal Filter (Cartridge)	N/A	N/A	N/A	W
	Cont	Millipore Filter	N/A	W	N/A	N/A

Cont The air effluent is measured by passing a continuous sample of the exhaust through a filter. The GFA filter is normally used for beta gamma, the Millipore filter is normally used for alpha, and a water bubbler for Tritium.

W Weekly Frequency

N/A Not applicable

Table 9: Radiological Liquid Effluent Monitoring Schedule

Sample Location	Sample Collection		Analytical Methods and Parameters								
Location Name	Frequency	Method	Beta Screen	Gross Beta	Gross Alpha	Tritium	Gamma Spec (Liquid)	Gamma Spec (Ash)	Sr-90	U-238 Pu-239/240 Pu-238	C-14
WL Site											
Site Outfall	Continuous	Auto-Sampler	Wc	Mc	Mc	Mc	Wc	Mc	Mc	Qc	Mc
Lagoon	Continuous During Discharge	Auto-sampler	N/A	Disch	Disch	N/A	N/A	Disch	Disch	Disch	N/A
Ditch N of WMA (8)	We	Grab	N/A	We	We	We	N/A	A/R	A/R	N/A	N/A

REDACTED

Sample Location	Sample Collection		Analytical Methods and Parameters								
Location Name	Frequency	Method	Beta Screen	Gross Beta	Gross Alpha	Tritium	Gamma Spec (Liquid)	Gamma Spec (Ash)	Sr-90	U-238 Pu-239/240 Pu-238	C-14
Ditch W of WMA (9)	We	Grab	N/A	We	We	We	N/A	A/R	A/R	N/A	N/A
[redacted] and [redacted]											
[redacted] LAW-[redacted] [redacted]	Discharge	Grab	N/A	Disch	Disch	N/A	Disch	N/A	Disch	N/A	N/A
[redacted] LAW-[redacted] [redacted]	Discharge	Grab	N/A	Disch	Disch	N/A	Disch	N/A	Disch	N/A	N/A

Disch	Per Discharge, up to twice a year for the Lagoon.
Wc	Weekly Composite, composite of samples collected during the week.
Mc	Monthly Composite, composite of samples collected during the month
We	Weekly, when Ditches have following water, usually after a rain or snow melt.
Qc	Quarterly composite of samples collected during a 3-month period
A/R	As Required
N/A	Not applicable

6.2.8.2 Duration of Monitoring

Monitoring outlined in this monitoring schedule is *routine* meaning it is to continue indefinitely unless a change to it or its removal is triggered.

6.2.8.3 Type of Data to be Collected

Concentrations (air or liquid) is the primary type of data monitored (measured or estimated) under this program. This data serves the purpose of the objectives of the program, however from it, further information can and is calculated (e.g., loading). Additional types of data include flow, temperature and pH.

Toxicity testing is required by specific legislation and is therefore also completed under the routine EVMP.

Note: Toxicity testing may be required to serve as biological effects monitoring in the future.

REDACTED

6.2.8.4 Quality Assurance (QA) and Quality Control (QC)

In order to ensure that the data collected through the program is valid, the laboratories performing monitoring for the program have strong Quality Assurance/Quality Control (QA/QC) programs as required by the *EnvP Program Radiological and Non-Radiological Monitoring Services Quality Assurance Plan* [56].

Note: This QA plan is in line with the requirements of N288.5 [5].

Analysis is conducted in accordance with laboratory-specific environmental monitoring quality assurance manuals [56] and [57]. The manuals include detailed working procedures [10] for field operations, laboratory operations, laboratory administration, equipment performance, and quality verification of analytical results. The manuals were written in an effort to conform to the Standards Council of Canada CAN-P-4E (ISO/IEC 17025) [58] for analytical laboratories.

These procedures include field Quality Verification (QV) monitoring. This QV monitoring is designed to cover the requirements of both the EVMP and the Environmental Monitoring Program (EMP) with the frequency set to accommodate both of the programs. MISA requires that sampling take place annually on one effluent stream but recommends that all parameters be part of the field QV program. The recommended frequencies are outlined in Table 10.

Table 10: Field QV frequency recommended by MISA.

Sampling Frequency	Field QV Frequency
Daily	Monthly
Weekly	Quarterly
Monthly	Semi-annual
Quarterly	Semi-annual
Semi-annual	Annual

A review of WL field QV monitoring against the recommended MISA frequency is underway.

More specifically, the majority of the field QV will be completed at the OFS monitoring location as this is the most frequently and widely monitored of all of the monitoring points. However, for those parameters which are not monitored at the OFS, but are monitored elsewhere, one of the locations with the most frequent monitoring of that parameter was chosen for the collection of field QV samples.

It should be noted that the field samples collected on a daily, weekly and monthly frequency will be taken on the same day as the semi-annual monitoring under the EVMP (i.e., whether frequency is daily, weekly, monthly or semi-annual, all will be taken on the same day as the monitoring sample for that parameter under the EVMP).

The type of field QV sampling applicable for each of the parameters is outlined in the *Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater* [6]. These include the following types of samples serving different purposes and are recommended in different combinations depending on the parameter.

REDACTED

- Types and Purposes:
  - Duplicate - Precision
  - Travelling Blank - Contamination
  - Spiked Blank - Accuracy

6.2.8.5 Measurement Sensitivity Levels and Non-Detects

By definition in CSA standards, a non-detect level (also called the detection limit, critical level, or MDA for radiological parameters) is the smallest value (relative to instrument background) that a parameter can confidently be measured. Technically, a parameter can exist below the non-detect level, but the reliability of that concentration comes into question. Detection limits should be provided by each laboratory and non-detect levels for each method or analysis system shall be defined and documented [2].

Note: For non-radioactive emissions monitoring, the MISA Protocol [6] terminology and derivation of measurement sensitivity levels should be used; the LC is analogous to the Smallest Reporting Increment (SRI), whereas the LD is analogous to the Laboratory Method Detection Limit (LMDL).

Each instrument has specific capabilities, and those limits are to be determined and provided with the analyses. At CNL, the detection limit (L_D) is the primary non-detect level. The critical level (L_C) may be used as a secondary non-detect level where the lower threshold L_C is required to meet effluent verification monitoring objectives [2]. Non-detect levels are also expected to be below regulatory and internal release limits (e.g., AdLs, ALs, DRLs, CNL Guidelines or other benchmark values the results are compared to. If they are not below an evaluation criterion, a clear indication as to why this is acceptable must be presented.

Calculations for the non-detect level (decision threshold) are located in Annex C of N288.4-19 [59].

6.2.9 Sampling and Analysis

All effluent samples requiring radiological analysis are sampled and analyzed following the recommendations and requirements in Section 6.3.3 of *Management and Monitoring of Emissions* [2]. With minor modification, the protocols for liquid effluent sample collection, and result reporting, are adopted from the Ontario Ministry of Environment publication *Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater* [6]. The protocols are used under Ontario's industry-specific effluent monitoring and limits regulations. The system provides a defensible set of methods to ensure that the final reported result is representative of the effluent sampled. Guidance is given on sampling of wastewater streams, sample handling including pre-treatment, and acceptable analytical techniques. Some of these are common to more than one parameter, so they are grouped into ATGs. It should be noted that the Manitoba government has no such comprehensive protocols for sample collection, preservation, analyses and result reporting.

REDACTED

The most current monitoring schedule should always be consulted [9]. The analysis methods used for each parameter are outlined in Appendix H, and Appendix I, along with the MISA recommended methods. The only analytical method used by the program which does not meet the recommended MISA method is that for Total Residual Chlorine (TRCl). MISA recommends the use of amperometry. Colorimetry is instead used as it is the recommended method for Canadian Drinking Water Quality as set by Health Canada [60].

6.2.10 Analytical Results Evaluation

WL staff use the following procedures in applying Remark Codes to maintain optimum non-radiological data quality as per MISA Data Entry System (MIDES) [6]. Under MIDES, some measurement results are also coded according to size. Those providing an analytical signal below one third of the Laboratory Method Detection Limit (LMDL), rounded downward to the nearest 1, 2, or 5, are assigned the Remark Code "<W". This code represents "no measurable response (zero)". Any data with this Remark Code were set to zero when determining the average, or when calculating loads. Measurement results that are slightly larger, but still below the LMDL, are flagged with Remark Code "<DL" (below detection limit). These results were retained as measured. Although they are inherently more uncertain than larger values, they are still considered to be valid measurements.

There are many acceptable ways to incorporate non-detect data. At WL, the following key points are adhered to:

1. The non-detect levels (L_D and L_C – if used) should be placed into any tables that provide analytical results so references to each can easily be made.
2. Contaminant concentrations measured below the non-detect level should be included in the dataset at each monitoring location but reported with a stipulation that the data is an estimated concentration. Some laboratory results are reported as "less than" detection limits or "not detected" and may prove to be a challenge to obtain from the laboratory. The parameters should be considered on a case-by-case basis using best practices as they apply to ecological health based groundwater benchmarks, or the capabilities or reporting structure of the laboratory itself.
3. When reporting and performing calculations on results below LC and LD, for summation or averaging purposes, if the summed or averaged data set includes one or more measurement results carrying a '<LC' or '<LD' remark code, then the sum or average calculation should be performed using all data points (including '<LC' or '<LD') and the reported sum or average should carry a 'V' remark code.

For all operands other than summation or averaging, the '<LC' or '<LD' remark codes should be carried when performing calculations

Caution should be exercised in the treatment of outliers when calculating average concentrations. Statistical tests that can be used for identifying outliers are described in Section 4.4 of EPA QA/G-95 [61]. The process for determining significant figures is described in Section 6.10 of *Estimating Measurement Uncertainty Arising from Measurement and Sampling* [62].

REDACTED

Estimating measurement uncertainty arising from measurement and sampling is described in *Estimating Measurement Uncertainty Arising from Measurement and Sampling* [62].

Graphical analysis can be used to detect any trends in data or other statistical techniques. Guidance on statistical techniques can be found in EPA QA/G-9S [61].

6.3 Step 3: Perform Detailed Effluent/Emission Stream Characterization

Characterization of air emissions determined to require radiological monitoring were characterized by monitoring for a series of parameters expected to be present in that effluent stream based on the nature of the emission e.g., [redacted] (WR1), [redacted] (Shielded Facilities), and [redacted] (ALWTC).

Characterization of air emissions determined to require non-radiological monitoring are done through estimation and are based on the source of the contamination and the design of the associated equipment and/or facility. One exception to this is monitoring for total suspended particulate (TSP), which is performed during building demolition and other dusty type operations.

Those liquid effluent streams determined to require monitoring were characterized by monitoring for a series of parameters which were expected to be present in that effluent based on the nature of the effluent (e.g., storm water, OFS, SL2, etc.), the nature of the operations of the MISA sector (electrical power generation) and any known inputs into that effluent. The majority of this work was done when the program was initially set up based on the MISA requirements [6], as required by the CNSC and/or detailed in Safety Analysis and Facility Authorization documentation. The monitoring program has then been tailored over time based on the monitoring results and routine review of contaminant contributions.

6.4 Step 4: Determine How the Data Collected Will be Used to Achieve the Defined Objectives

With the type of data which is needed to meet the program objectives being identified in Section 6.2, this Section outlines how this data will be handled and used. The process for the interpretation and reporting of the EVMP results is outlined in the EnvP Program company-wide procedure, *Management and Monitoring of Emissions* [2].

6.4.1 Effluent Data

The EVMP is designed primarily to: Demonstrate compliance with the WL Site Licence Limits [3] imposed by the CNSC, and for reporting under the National Pollutant Release Inventory (NPRI) [26] and Greenhouse Gases annual notices as published in the Canada Gazette [27]; and to confirm the adequacy of controls on emission from the source (i.e., controls are incorporated into emission estimates). CNL has set internal emission controls referred to as Administrative levels and Action levels [22], [28] to demonstrate compliance and the control data is used to: Detect abnormal conditions resulting in varied emissions; or confirm estimations made in environmental assessments and/or determine if further operational controls need to be in place.

REDACTED

Liquid effluent data is: (1) Collected and maintained, and (2) compared to a number of different limits in order to meet all of the objectives of the program. These limits include: *Federal Wastewater System Effluent Regulation* Limits [24], Derived Release Limits [15], CNL Guideline Limit Values [22]; and Administrative Levels (AdL) and Action Levels (AL) [22], [28]. CNL staff have also established Trigger Levels for some parameters and facility emissions as an early warning of the potential to reach or exceed Administrative and/or Action Levels.

This association is outlined in Table 11 below.

Table 11: Information required and how collected data will be used to achieve EVMP objectives.

WL EVMP Objective (from Table 2)	Information Required to Meet Objective	How Collected Data will be Used to Achieve Objective
To demonstrate compliance with regulatory emission limits and any other regulatory requirements (e.g., Action Levels) concerning the emission of nuclear/hazardous substances from the source. To demonstrate compliance with:		
• The site's Derived Release Limits (DRLs) [15], which are used to ensure that the dose to public as a result of operation of the site is below the Nuclear Safety and Control Act public dose limit of 1 milliSievert/year [16];	For each significant[7] airborne and waterborne effluent stream, need to calculate a loading to the environment that can be compared to the applicable DRL(s). Hence, need routine knowledge of: – Radiological contaminant concentrations – Flow rates or discharge rates to the environment	*Are the total airborne and total waterborne releases less than the applicable, most restrictive airborne and waterborne DRLs?* *Did emissions reach trigger levels?* Calculate a site total %DRL by summing individual contaminant loadings from each significant[7] airborne and waterborne effluent stream.
• Federal *Wastewater System Effluent Regulations* [24];	Need to collect samples as prescribed in the regulation and analyze for parameters listed in the regulation WL's lagoon effluent discharge.	*Are any results above the limits in the regulation?* Compare effluent sample results, to regulatory requirements to determine whether the lagoon effluent is suitable for release to the environment.

[7] An effluent stream that contributes more than 10% of the relevant dose/exposure for the identified receptor can be considered to make a significant contribution. The relevant dose/exposure may be the benchmark value or a target value selected by the facility. If the streams individually accounting for 10% of the relevant dose/exposure do not collectively account for most of the dose/exposure, additional streams should be included in the program to do so [5].

REDACTED

WL EVMP Objective (from Table 2)	Information Required to Meet Objective	How Collected Data will be Used to Achieve Objective
• The *National Pollutant Release Inventory* (NPRI) reporting requirements of Environment Canada [26];	Need knowledge of the site's use (quantities) of any substances in Parts 1 to 5 of the NPRI.	*Are any NPRI substances reportable for the site?* Compare site's use (quantities) of any substances in Parts 1 to 5 of the NPRI to NPRI reporting thresholds. Report on the site's activities focusing on the use of substance exceeding the NPRI reporting thresholds.
• The Greenhouse Gases (GHG) emissions reporting requirements of Environment Canada; and	Need knowledge of the site's GHG emissions (quantities).	*Are the site's GHG emissions reportable?* Compare site's GHG emissions to Environment Canada yearly reporting threshold (10,000 tonnes). Calculate portion (%) of GHGs that are due to methane emissions from the Landfill (EAFP requirement)
• The reporting requirements of the *Federal Halocarbon Regulations*.	Need knowledge of any halocarbon releases greater than 10 kg from refrigeration systems, air-conditioning systems, and fire-extinguishing systems.	*Were there any reportable halocarbon release events?* Compare each individual event (halocarbon release quantity) to FHR reporting threshold of 10 kg or more. For all releases of 10 to 100 kg, report these collectively on a semi-annual basis. For each individual release greater than 100 kg, report immediately.
• WL's Non-radioactive Effluent Limits [22]	Liquid effluent samples must be collected and analyzed for non-radiological parameters as defined in the EVMP.	*Are the levels of contaminants less than the limits?* Ecological Health: Compare results to CCME Water Quality Guidelines for the Protection of Aquatic Life for 2017. *Do any site effluents exceed internally set effluent levels?* Compare results to Administrative Levels, Action Levels and CNL Guidelines.
• Health Canada, *Objectives and Guidelines for Various Air*	Collection and measurement of air samples for Total Suspended Particulate (TSP) during building	*Are the levels of TSP less than the Air Quality Objectives?*

REDACTED

WL EVMP Objective (from Table 2)	Information Required to Meet Objective	How Collected Data will be Used to Achieve Objective
Pollutants: Ambient Air Quality Criteria [29]	demolition and other dust generating decommissioning activities.	
To confirm the adequacy of controls on emissions from the source.	A change in contaminant concentrations over time could be indicative of a change in the level of controls on emissions. Hence, to meet this objective, need routine knowledge of: – Routine emissions data, – Non-routine emissions data, and – Selected contaminant concentrations in WMA ditches, periodic testing of manhole water and water in excavations, and [redacted] and [redacted] Low Level Liquid wastewater tanks prior to discharge.	*Are the levels of contaminants released to the environment as anticipated?* Periodically, trend contaminant concentrations (or loadings) for each significant[7] final discharge point. Data will be used to develop *Administrative Levels and Action Levels for WL Air and Liquid Radioactive Effluents* [28] and *Administrative Levels and Action Levels for WL Non-Radioactive Effluents* [22] and determine if the contaminates being observed in waste streams are less than the operational limits put in place. *Are there any abnormally high releases in any of the significant emission or effluent streams?* Routinely trend monitoring results for the various radiological emissions and effluent streams. Any upward trend, if not coincident with planned work, may suggest a need for increased control.
To provide an indication of unusual or unforeseen conditions that might require corrective action or additional monitoring.	Need routine knowledge of: – Routine emissions data from the airborne and liquid effluent release locations, and – Operational control data (e.g., selected contaminant concentrations in WMA ditches, periodic testing of manhole water and water in excavations, and [redacted] and [redacted] Low Level Liquid wastewater tanks prior to discharge).	*Are the levels of contaminants released to the environment as per normal?* Periodically, trend contaminant concentrations (or loadings) for each significant[7] final discharge point. *For abnormally high releases in any significant airborne emission or waterborne effluent stream, is corrective action or additional monitoring needed?* Investigate source of abnormal monitoring results and raise remedial or corrective actions or put in additional monitoring, as required.

REDACTED

WL EVMP Objective (from Table 2)	Information Required to Meet Objective	How Collected Data will be Used to Achieve Objective
To provide data to assess the level of risk on human health and safety, and the potential biological effects in the environment of the nuclear/hazardous substances of concern released from the facility.	For each significant[78] airborne and waterborne effluent stream, need to calculate a loading to the environment that can be compared to the applicable limits. Hence need: – Contaminant concentrations – Flow rates or discharge rates to the environment	*What fraction of the applicable DRLs are the site's releases?* *Were trigger levels reached?* Calculate a site total %DRL by summing individual contaminant loadings from each significant[7] airborne and waterborne effluent stream. Ecological Health: The predicted average air concentrations for Radiological Emissions are compared to the radiation screening criteria (tritium 8.84E+04 Bq/m^3, gross alpha 0.0147 Bq/m^3, gross beta 0.0249 Bq/m^3 for COPECs [63]) to ensure the releases would not result in doses that exceed the benchmark values of 100 µGy/h (2.4 mGy/d) (UNSCEAR 2008) [64] to terrestrial biota. The predicted average Liquid effluent concentrations are compared to the radiation screening criteria (Gross Beta 666 Bq/L, Gross Alpha 16.2 Bq/L) used for identifying COPECs and to ensure doses do not exceed benchmark values of 400 µGy/h (9.6 mGy/d) (UNSCEAR 2008) [64] for dose to aquatic biota. *Are WL's radiological releases of concern to public health and safety?* Compare emission/effluent results to the DRLs calculated for the WL site to determine the resulting dose to an off-site member of the public. *Are WL's non-radiological effluents or emissions of concern to the environment?* Compare effluent and emission results to ecological benchmark values making sure to take into

REDACTED

WL EVMP Objective (from Table 2)	Information Required to Meet Objective	How Collected Data will be Used to Achieve Objective
		consideration dilution factors for each effluent stream.
To confirm predictions in environmental assessments. • Verify the accuracy of the EA, and • Determine the effectiveness of any mitigation measures that have been implemented.	Knowledge of routine, operational, non-routine and environmental monitoring data as per EVMP, EMP, and EAFP. Facility Endstate reports.	Collect and assess results of any monitoring performed against EAFP objectives. Ensure contaminants (specifically tritium) in WMA ditches are below predicted levels in CSR. Initial modelling (CSR Appendix C) proposed that tritium would be present in the ditches (including the Locations [redacted] through [redacted] and [redacted]) and possibly reach levels as high as 37 kBq/L. These levels are also below the radiation screening criteria for tritium (1.26e7 Bq/L) as a COPECs [63] and therefore would not result in doses to terrestrial biota that exceed the benchmark values of 100 µGy/h (2.4 mGy/d) [64].
To provide data for trend analysis.	Routine, operation, non-routine and environmental monitoring data as per EVMP and EMP.	*Are there any trends being observed in releases in any of the site's emission or effluent streams?* Trend analysis of data from routine, non-routine and operational monitoring performed. Any concerning trend, if not coincident with planned work, may suggest a need for increased control and should be investigated.
To provide assurance to employees and the public on the effectiveness of effluent control.	Routine, operation, non-routine and environmental monitoring data as per EVMP and EMP.	Regular and timely analysis of data from routine, non-routine and operational monitoring performed.
To provide data which when combined with the results of environmental monitoring and results from activities conducted as part of the EAFP can be used to test or refine the models of the environment used in the CSR.	Routine, operation, non-routine and environmental monitoring data as per EVMP, EMP, and EAFP.	Regular and timely analysis of data from routine, non-routine, environmental, operational monitoring performed.

REDACTED

WL EVMP Objective (from Table 2)	Information Required to Meet Objective	How Collected Data will be Used to Achieve Objective
To provide baseline data and capability for monitoring and assessment in emergency conditions. This data is also used to assess the impact of decommissioning activities on the environment.	Routine, operation, non-routine and environmental monitoring data as per EVMP, EMP, and EAFP. Data collected from areas unaffected by WL operations and decommissioning activities.	*In an emergency situation, can any of the routine sampling we complete serve as a baseline and evidence of the extent of the event?* Regular and timely analysis of routine, operation, non-routine and environmental monitoring data as per EVMP, EMP, and EAFP, as well as, data collected from areas unaffected by WL operations and decommissioning activities. If the routine monitoring can serve as both baseline and evidence of anemergency condition, compare thepre-event results to the post-eventresult to aid in the determination ofthe extent of the event.
To fulfill the commitments detailed in the CSR [13].	Detailed Decommissioning Plans and Workplans and subsequent Endstate reports from decommissioned facilities. Routine, operation, non-routine and environmental monitoring data as per EVMP, EMP, and EAFP.	Comparison of data to EAFP objectives.

REDACTED

Table 12 provides a summary of the locations and parameters measured for air effluent locations and the associated laboratory method detection limits for each of these locations.

Table 13 and Table 14 provides a summary of the locations and parameters measured at liquid effluent locations and the associated radiological laboratory method detection limits for each of these locations.

The evaluation process also includes consideration of background locations un-impacted from WL operations. Table 15 and Table 16 provide a summary of background values and MDLs for liquid effluents.

6.5 Step 5: Specify Performance and Acceptance Criteria

The performance and acceptance criteria which the program's effluent monitoring data are required to achieve in order to ensure that they are adequate for their intended purpose(s) are outlined in this Section.

The Environmental Management group conducts frequent internal checks of their technical capabilities as they perform their measurements. These are referred to as Quality Verification tests, and are grouped as follows according to purpose:

- Contamination Tests, such as measurement of the reagent blank, establish the level of analyte present resulting from contamination of the analysis system or system components. Acceptance criteria for these performance tests are related to each analyte's method detection limit.
- Reproducibility Tests, such as measurement of sample replicates, establish the relative precision of the method(s). To be acceptable, replicate measurements must agree within limits established by long-term method performance.
- Accuracy Tests, such as blanks or samples, each spiked with known amounts of the analyte(s), establish the presence or absence of any biases due to sample matrix, sample preparation, or instrument function. To meet acceptance criteria, the spike quantity must be recovered within limits established by long-term method performance.

These internal quality verification tests are summarized and reported on each year and assessed against acceptance criteria.

In addition, Environmental Management group participates in semi-annual proficiency testing programs and the results of these tests are summarized and included in the Environmental Monitoring report.

Certificates of analysis are reviewed, and results of all the analyses are verified to be within acceptance criteria.

6.5.1 Acceptance Criteria

6.5.1.1 Quality Verification (QV) Limits

The acceptance criteria in place on Quality Verification (QV) measurements for WL are established and documented in the lab level quality verification procedures as listed in [57]:

- The handling of sample data for those samples is included in the program's *Management and Monitoring of Emissions* procedure [2].

6.5.1.2 Sample Unavailability

Sample unavailability for the EVMP could be the result of a number of circumstances; for example, sampling according to the monitoring schedule was missed, the collected sample was contaminated or lost, an automatic sampler failure, etc. Acceptance Criteria for such events are shared company-wide and therefore are outlined in *Management and Monitoring of Emissions* [2], along with steps which need be taken to compensate for the missed data.

6.5.2 Performance Criteria

6.5.2.1 Laboratory Method Detection Limits

Table 12, Table 13, and Table 14 outline the programs current LMDLs for each parameter. The program's LMDLs are all well below the effluent limits therefore ensuring that the monitoring results can be used to demonstrate compliance with these limits. It is always good practise to ensure you are using the most recent limits [15][22][28].

REDACTED

Table 12: Laboratory method detection limits (LMDL) for air effluent.

Air Effluent			
Parameter	**Unit**	**LMDL**	**Other Reporting Limits**
WR-1 Stack			
Gross Alpha	Bq/week	2.6E+02	
Americium-241[8]	Bq/week	2.3+03	
Gross Beta	Bq/week	2.6E+02	
Cesium-137	Bq/week	1.67E03	
Tritium	Bq/week	3E+06	
Tritium	Bq/L	2	
HCF Stack [redacted]			
Gross Alpha	Bq/week	6.00E+02	
Americium-241	Bq/week	4.9E+03	
Gross Beta	Bq/week	6.00E+02	
Cesium-137	Bq/week	7.2E+03	
IFTF Stack [redacted]			
Gross Alpha	Bq/week	5.78E+02	
Americium-241	Bq/week	7.3E+03	
Gross Beta	Bq/week	5.78E+02	
Cesium-137	Bq/week	6.99E+03	
			Trigger Value
Stack TLD (IFTF, HCF)	mrad	2.5	436 (monthly), 5236 (annual)
Total Site Air Emissions			
			Ecological Effects Screening Level
Gross Alpha	Bq/filter	1.6	
	Bq/m^3	0.001	0.0147
Gross Beta	Bq/filter	1.6	
	Bq/m^3	0.001	0.0249
Canisters			
			Trigger Value
Gross Alpha	Bq/filter	0.02	> 0.02 persistent increasing trend may be an indication of leakage from a fuel basket [65].
Gross Beta	Bq/filter	0.02	
Cesium-137	Bq/filter	0.30	Any detectable would indicate a potential leak from package
Iodine-131	Bq/filter	0.3	

[8] Gamma listing for air emissions filters includes: K-40, Mn-54, Co-60, Zn-65, Nb-94, Zr-95/Nb-95, Sb-125 (Te-125md), I-131, Cs-134, Cs-137 (Ba-137md), Ce-144, Eu-152, Eu-154, Tl-208, Pb-210, Bi-212, Pb-212, Bi-214, Pb-214, Ra-226, Th-227, Ac-228, Pa-233, Pa-234m, Th-234, U-235 (Th-231d), Am-241.

REDACTED

Air Effluent				
Parameter	**Unit**	**LMDL**	**Other Reporting Limits**	
Americium-241	Bq/filter	0.2		
Building Demolition (Dust Emission)				
Parameter	**Unit**	**LMDL**	**Ecological Effects Screening Level**	**Alert Level [9]**
Gross Alpha	Bq/filter	1.6		0.03
	Bq/m^3	0.001	0.0147	
Gross Beta	Bq/filter	1.6		10
	Bq/m^3	0.001	0.0249	
Cs-137	Bq/filter	0.3		100
	Bq/m3	0.002	0.0249	
			Air Quality Objective	
Total Suspended Particulate	$\mu g/m^3$ (for 24 hour period)	< 400	400 [29]	
$PM_{2.5}$	$\mu g/m^3$ (for 24 hour period)	< 30	30 [29]	
Site Air Emissions				
			Semi-Annual Reporting Limit	**Immediate Reporting**
Halocarbon Releases	kg	0.05	10-100	>100
			Reporting Threshold	
GHG CO_2e[10]	Tonnes	NA	10,000	
NPRI			**Reporting Threshold [26]**	
NO_x	Mg	NA	20	
SO_2	Mg	NA	20	
CO	Mg	NA	20	
TPM	Mg	NA	20	
PM_{10}	Mg	NA	0.5	
$PM_{2.5}$	Mg	NA	0.3	
VOCs	Mg	NA	10	

REDACTED

[9] The Alert Levels were set up using the Annual Limit on Intake for the most restrictive and likely to be present isotopes for alpha (Pu-239) and beta (Sr-90) and their associated DACs. Calculated using one tenth of a DAC for alpha (0.03 Bq/m^3) and the same for beta (10 Bq/m^3).

[10] A unit of measure used to compare between gases that have different Global Warming Potentials (GWP). For example, the GWP for methane is 25. This means that emissions of one metric ton of methane is equivalent to emissions of 25 metric tons of carbon dioxide.

Table 13: Laboratory method detection limits (LMDL) for liquid effluent and their comparison to radiological monitoring limits.

Parameter	Unit	LMDL[11]
Processed Outfall Effluent: Radiological		
Gross Alpha[12]	Bq/month	7E+06
	Bq/L	0.003
	Bq/g (ash)	0.1
Americium-241	Bq/month	3.0E+05
	Bq/g (ash)	0.1
	Bq/L	0.03
Total Uranium	Bq/month	2E+05
	µg/L	0.1
Plutonium-239/240	Bq/month	4E+06
	Bq/L	0.005
Plutonium-238	Bq/month	6E+06
	Bq/L	0.005
Gross Beta[13]	Bq/month	1.0E+05
	Bq/L	0.003
	Bq/g (ash)	0.1
Cesium-137 (Gamma[14])	Bq/month	3.0E+04
	Bq/L	0.003
	Bq/g (ash)	0.1
Strontium-90	Bq/month	2.0E+05
	Bq/g (ash)	0.1
Tritium	Bq/month	3E+08
	Bq/L	3
Carbon-14	Bq/month	2E+07
	Bq/L	0.2

REDACTED

11 LMDL is based on a 40 litre sample resulting in less than 1 g of ash and counted for 100 minutes for gross beta and 400 minutes for gross alpha and 800 minutes for gamma isotopes.

12 Gross alpha assumed to be Pu-238.

13 Gross beta assumed to be Sr-90.

14 The gamma listing includes: K-40, Mn-54, Co-60, Zn-65, Nb-94, Sb-125 (Te-125md), I-131, Cs-134, Cs-137 (Ba-137md), Ce-144, Eu-152, Eu-154, Pb-210, Bi-212, Pb-212, Bi-214, Pb-214, Ra-226, Th-227, Ac-228, Pa-233, Pa-234m, Th-234, U-235 (Th-231d), Am-241.

Parameter	Unit	LMDL[16]	Trigger Level	
Processed Outfall Effluent: Radiological				
Gross Beta Screening	Bq/L	3	5 [66]	Check and report on gross alpha result if at or above beta trigger level
Weekly Gamma Screen Cs-137	Bq/L	1.0	Any detected	
Weekly Gamma Screen Am-241	Bq/L	0.7	Any detected	
Tank Pre-Pump-Out: Radiological				
			Screening Level	
Gross Beta Screening	Bq/L	20	1250 [67]	
Gross Alpha Screening	Bq/L	20	40 [66]	
Parameter	**Unit**	**LMDL[16]**		
Tank Pump-Outs[15]: Radiological				
Gross Alpha	Bq/L	10		
	Bq/Discharge	2.7E+04		
Gross Beta	Bq/L	10		
	Bq/Discharge	2.7E+04		
Tritium[16]	Bq/L	8		
	Bq/Discharge	3		
Carbon-14[22]	Bq/L	20		
Potassium-40 (gamma[17])	Bq/L	5		
Manganese-54	Bq/L	1.5		
Cobalt-60	Bq/L	1		
Zinc-65	Bq/L	1		
Antimony-125	Bq/L	51		
Iodine-131	Bq/L	0.5		
Cesium-134	Bq/L	0.2		
Cesium-137	Bq/L	1		

REDACTED

15 LMDL for Bq/discharge based on a 3000 litre discharge

16 Tritium and carbon-14 analysis only required for [redacted] tanks [68].

17 Full gamma listing includes K-40, Mn-54, Co-60, Zn-65, Nb-94, Sb-125 (Te-125md), I-131, Cs-134, Cs-137 (Ba-137md), Ce-144, Eu-152, Eu-154, Pb-210, Bi-212, Pb-212, Bi-214, Pb-214, Ra-226, Th-227, Ac-228, Pa-233, Pa-234m, Th-234, U-235 (Th-231d), Am-241

Parameter	Unit	LMDL[16]
Cesium-137	Bq/L	1
Cerium-144	Bq/L	3
Europium-154	Bq/L	0.7
Thallium-208	Bq/L	0.5
Bismuth-212	Bq/L	1.5
Lead-212	Bq/L	0.7
Lead-214	Bq/L	0.8
Protactinium-234m	Bq/L	35
Thorium-234	Bq/L	7
Americium-241	Bq/L	1
Strontium-90[18]	Bq/L	5
Sewage Lagoon Effluent: Radiological		
Gross Alpha	Bq/month	4.6E+06
	Bq/g (ash)	2.3
	Bq/L	0.06
Amercium-241	Bq/month	1.0E+05
	Bq/g ash	0.10
	Bq/L	0.086
Total Uranium[19]	Bq/month	2.5E+05
	Bq/L	0.003
Plutonium-239/240	Bq/month	4E+05
	Bq/L	0.03
Plutonium-238	Bq/month	6E+06
	Bq/L	0.02
Gross Beta	Bq/month	1.0E+05
	Bq/g (ash)	4
	Bq/L	0.10
Cesium-137	Bq/month	3.0E+04
	Bq/g ash	3.4
	Bq/L	0.086
Potassium-40	Bq/g	2.4
	Bq/L	0.06

REDACTED

[18] Sr-90 is estimated on [redacted] releases (Gross Beta-Cs-137)/2, Sr-90 analysis is performed on [redacted] tank effluent.

[19] Based on the conversion factor of 0.025Bq/ppb of uranium.

Parameter	Unit	LMDL[16]
Strontium-90	Bq/month	2.0E+05
	Bq/g	3.4
	Bq/L	0.086
Tritium	Bq/month	5.6E+08
	Bq/L	7

Table 14: Laboratory method detection limits (LMDL) for effluent ditches and their comparison to WL radiological monitoring limits.

Parameter	Unit	LMDL[20]	Screening Level	MAC
Ditch Locations [redacted] and [redacted] Radiological				
Gross Alpha	Bq/L	0.3	0.5	0.5 (as uranium)
Gross Beta	Bq/L	0.3	1.0	5 (as Sr-90) 10 (as Cs-137)
Tritium	Bq/L	3	50	7000
Potassium-40 (Gamma)[21]	Bq/L	20	20	Indication of sediment in sample
Manganese-54	Bq/L	50	50	200
Iron-59	Bq/L	50	50	70
Cobalt-60	Bq/L	10	10	40
Zinc-65	Bq/L	10	10	40
Zirconium-95/Niobium-95	Bq/L	50	50	100
Antimony-125 (Tellurium-125md)	Bq/L	50	50	100
Iodine-131	Bq/L	1.0	1.0	6
Cesium-137 (Barium-137md)	Bq/L	2.0	10	10
Cerium-144	Bq/L	10	10	30
Lead-210	Bq/L	0.2	0.2	0.2
Americium-241	Bq/L	0.3	0.7	0.7
Strontium-90[22]	Bq/L	1	1.0	5.0
Plutonium-238[23]	Bq/L	0.3	0.3	0.6
Plutonium-239/240	Bq/L	0.3	0.3	0.6

REDACTED

20 Laboratory Detection Limit is dependent on volume of effluent discharged, sample volume and count time for radiological parameters. Current LMDLs established from GEL Laboratories.

21 The gamma listing includes K-40, Mn-54, Co-60, Zn-65, Nb-94, Zr-95/Nb-95, Sb-125 (Te-125md), I-131, Cs-134, Cs-137 (Ba-137md), Ce-144, Eu-152, Eu-154, Tl-208, Pb-210, Bi-212, Pb-212, Bi-214, Pb-214, Ra-226, Th-227, Ac-228, Pa-233, Pa-234m, Th-234, U-235 (Th-231d), Am-241

22 If gross beta is at or above 5 Bq/L, the samples are processed for Strontium-90 analysis.

23 If Am-241 is detected in sample, the sample is processed for Pu-238 and Pu-239/240 analysis. Pu-241 can be calculated using the Am-241 value.

Parameter	Unit	LMDL[20]	Screening Level	MAC

Note: Screening Level: Compliance with Guidelines for Canadian Drinking Water [60] may be inferred if the measurement for the gross alpha and gross beta are less than 0.5 Bq/L and 1.0 Bq/L, respectively. LLD is based on a 1 L sample resulting in less than 100 mg of sample ash and counted for 100 minutes for gross beta and 400 minutes for gross alpha.

Table 15: Background (intake and upstream at HWY# 211 bridge) values and MDLs for liquid effluents.

ATG	Parameter	Unit	LMDL	Five Year Average Results [24]
Non-Radiological Parameters				
3	pH	N/A	--	7.45
6	Phosphorus, Unfiltered Total	mg/L	0.003	0.019
7	Conductivity	µS/cm	2.0	102
8	Total Suspended Solids	mg/L	1.0	3.7
12	Total Mercury	µg/L	0.0019	0.001
14	Phenols (4-AAP)	mg/L	0.001	0.00002
25	Oil and Grease (Solvent Extractable)	mg/L	1.0	0.15
	Volatiles (VOC - STD) Bromodichloromethane	µg/L	0.50	0.887
	Chloroform	µg/L	0.5	39.8
	Chemical Oxygen Demand (COD)	mg/L	10	28
	Nitrate + Nitrite	mg/L	0.04	0.05
	Dissolved Chloride	mg/L	1.0	3.8
	Total Organic Carbon (TOC)	mg/L	0.5 (as Carbon)	8.6
9	Total Aluminum (Al)	µg/L	3.0	150
9	Total Antimony (Sb)	µg/L	0.50	< 0.5
9	Total Arsenic (As)	µg/L	0.10	0.85
9	Total Barium (Ba)	µg/L	1.0	10.1
9	Total Beryllium (Be)	µg/L	0.10	< 0.10
9	Total Bismuth (Bi)	µg/L	1.0	< 1.0
9	Total Boron (B)	µg/L	50	< 50
9	Total Cadmium (Cd)	µg/L	0.010	0.001
9	Total Chromium (Cr)	µg/L	1.0	0.26
9	Total Cobalt (Co)	µg/L	0.20	0.02
9	Total Copper (Cu)	µg/L	0.50	17
9	Total Iron (Fe)	µg/L	10	505

REDACTED

[24] Five-year average (2020-2024) or [68].

ATG	Parameter	Unit	LMDL	Five Year Average Results [24]
9	Total Lead (Pb)	µg/L	0.20	0.41
9	Total Lithium (Li)	µg/L	2.0	0.04
9	Total Manganese (Mn)	µg/L	1.0	30.7
9	Total Molybdenum (Mo)	µg/L	1.0	0.1
9	Total Nickel (Ni)	µg/L	1.0	0.76
9	Total Selenium (Se)	µg/L	0.10	0.05
9	Total Silicon (Si)	µg/L	100	1630
9	Total Silver (Ag)	µg/L	0.020	0.0007
9	Total Strontium (Sr)	µg/L	1.0	24.2
9	Total Thallium (Tl)	µg/L	0.010	0.004
9	Total Tin (Sn)	µg/L	5.0	< 5.0
9	Total Titanium (Ti)	µg/L	5.0	3.56
9	Total Uranium (U)	µg/L	0.10	0.03
9	Total Vanadium (V)	µg/L	5.0	< 5.0
9	Total Zinc (Zn)	µg/L	5.0	1.03
9	Total Zirconium (Zr)	µg/L	0.10	0.15
9	Total Calcium (Ca)	mg/L	0.050	12.7
9	Total Magnesium (Mg)	mg/L	0.050	3.77
9	Total Potassium (K)	µg/L	50	871
9	Total Sodium (Na)	mg/L	0.050	2.24
9	Total Sulphur (S)	mg/L	3.0	0.05
	Pesticides and Herbicides (PCB) Aroclor 1248	mg/L	0.00005	< 0.00005
Radiological Parameters				
	Gross Alpha	Bq/L	0.003	0.022
	Gross Beta	Bq/L	0.003	0.10
	Amercium-241	Bq/L	0.01	< 0.008
	Cesium-137	Bq/L	0.01	< 0.008
	Potassium-40	Bq/L	0.06	< 0.08
	Strontium-90	Bq/L	0.002	0.008
	Tritium	Bq/L	3	< 3.5
	Carbon-14	Bq/L	1.4	< 1.4

REDACTED

Table 16: Background (control ditch) values and MDLs for ditches [redacted] and [redacted].

ATG	Parameter	Unit	LMDL	Five Year Average [25]
Non-Radiological Parameters				
3	pH	pH units	Instrument	7.54
6	Phosphorus, Unfiltered Total	mg/L	0.003	0.075
7	Conductivity	µS/cm	2.0	417
8	Total Suspended Solids (Low-level)	mg/L	1.0	4.84
12	Mercury Unfiltered Total	µg/L	0.0019	0.012
14	Phenolics Unfiltered React	mg/L	0.001	0.002
25	Solvent Extractable (Oil and Grease)	mg/L	1.0	0.242
9	Total Aluminum (Al)	µg/L	19.3	178
9	Total Antimony (Sb)	µg/L	3.5	1.32
9	Total Arsenic (As)	µg/L	2.0	2.88
9	Total Barium (Ba)	µg/L	0.67	41.2
9	Total Beryllium (Be)	µg/L	2.0	0.0829
9	Total Boron (B)	µg/L	5.2	12.8
9	Total Cadmium (Cd)	µg/L	0.30	< 0.30
9	Total Chromium (Cr)	µg/L	3.0	0.0886
9	Total Cobalt (Co)	µg/L	0.30	0.898
9	Total Copper (Cu)	µg/L	0.30	1.43
9	Total Iron (Fe)	µg/L	33.0	865
9	Total Lead (Pb)	µg/L	0.50	0.0581
9	Total Lithium (Li)	µg/L	0.30	18.8
9	Total Manganese (Mn)	µg/L	0.10	548
9	Total Molybdenum (Mo)	µg/L	0.20	0.405
9	Total Nickel (Ni)	µg/L	0.60	2.66
9	Total Selenium (Se)	µg/L	1.50	23.7
9	Total Silicon (Si)	µg/L	25.0	4500
9	Total Silver (Ag)	µg/L	0.1	0.121
9	Total Strontium (Sr)	µg/L	2.0	616
9	Total Thallium (Tl)	µg/L	0.60	3.64
9	Total Tin (Sn)	µg/L	2.5	1.51
9	Total Titanium (Ti)	µg/L	2.0	3.55
9	Total Uranium (U)	µg/L	0.067	174
9	Total Vanadium (V)	µg/L	1.0	0.914

[25] Five-year average for non-radiological parameters (2020-2024); radiological parameters (2015-2020).

REDACTED

ATG	Parameter	Unit	LMDL	Five Year Average [25]
9	Total Zinc (Zn)	µg/L	3.3	3.52
9	Total Zirconium (Zr)	µg/L	3.3	107
9	Total Calcium (Ca)	mg/L	0.08	33.9
9	Total Magnesium (Mg)	mg/L	0.01	27.9
9	Total Potassium (K)	mg/L	0.08	6.89
9	Total Sodium (Na)	mg/L	0.08	14.8
9	Total Sulphur (S)	mg/L	0.012	16.6
Radiological Parameters				
	Gross Alpha	Bq/L	0.3	0.20
	Gross Beta	Bq/L	0.3	0.28
	Tritium	Bq/L	8	3.84
	Potassium-40(Gamma)[26]	Bq/L	20	0.12
	Manganese-54	Bq/L	50	< 0.13
	Cobalt-60	Bq/L	10	< 0.15
	Zinc-65	Bq/L	10	< 0.27
	Niobium-94	Bq/L	0.13	< 0.13
	Zirconium-95/Niobium-95	Bq/L	50	< 0.24
	Antimony-125 (Tellurium-125md)	Bq/L	50	< 0.33
	Iodine-131	Bq/L	2.0	NA
	Cesium-137 (Barium-137md)	Bq/L	2.0	< 0.14
	Cerium-144	Bq/L	10	< 0.76
	Europium-154	Bq/L	1.0	< 1.0
	Thallium-208	Bq/L	0.13	< 0.13
	Lead-210	Bq/L	0.2	< 24
	Bismuth-212	Bq/L	2.0	< 2
	Lead-212	Bq/L	0.28	< 0.28
	Bismuth-214	Bq/L	0.3	< 0.3
	Lead-214	Bq/L	0.33	< 0.33
	Thorium-227	Bq/L	1.0	NA
	Radium-226	Bq/L	2.9	< 2.9
	Actininium-228	Bq/L	0.65	< 0.65
	Protactinium-233	Bq/L	0.3	NA
	Protactinium-234m	Bq/L	10	NA

REDACTED

[26] The gamma listing includes: K-40, Mn-54, Co-60, Zn-65, Nb-94, Zr-95/Nb-95, Sb-125 (Te-125md), I-131, Cs-134, Cs-137 (Ba-137md), Ce-144, Eu-152, Eu-154, Tl-208, Pb-210, Bi-212, Pb-212, Bi-214, Pb-214, Ra-226, Th-227, Ac-228, Pa-233, Pa-234m, Th-234, U-235 (Th-231d), Am-241.

ATG	Parameter	Unit	LMDL	Five Year Average [25]
	Thorium-234	Bq/L	10	NA
	Uranium-235	Bq/L	0.84	< 0.85
	Americium-241	Bq/L	0.3	< 0.70
	Strontium-90[27]	Bq/L	1	NA
	Plutonium-238[28]	Bq/L	0.3	< 0.3
	Plutonium-239/240	Bq/L	0.3	< 0.3

6.6 Step 6: Develop the Detailed Design of the EVMP that will be Implemented to Obtain the Required Data

The current design of the WL EVMP is specified in the *Effluent Verification Monitoring Program sampling schedule for WL* [9] and can be acquired from ATOM and is based on the information in the Assessment Tables within this document. The process for Records and Data Management and Program Responsibilities, Qualification and Training is described in [1].

7. Continual Improvement of the EVMP

The majority of processes and requirements for the execution of WL's EVMP can be found in the *Management and Monitoring of Emissions* [2] procedure and the *WL Integrated Environmental Monitoring Program Framework* [1].

In addition to the information in these two documents, this section covers the information which is specific to the continual improvement of the WL EVMP.

As outlined in the *WL Integrated Environmental Monitoring Program Framework* [1] many of the required changes for the EVMP will be identified during the formal reviews which take place for the program. There are instances, however, where changes to the program need to take place in between these reviews. In either case, changes to the program are formally documented as per the requirement in *Management and Monitoring of Emissions* procedure [2].

This section describes processes which are followed by the program when changes to the schedule are required (either during routine reviews or between routine reviews).

7.1 Decreasing Parameter Monitoring Frequency

Reductions in monitoring are at times required in order to ensure that the monitoring program does not grow to a size that overwhelms monitoring staff and facilities and to refine the program to ensure only meaningful monitoring is taking place.

Despite meeting one or more of the "Need for Monitoring Criteria – Parameter" [2], in instances where the absence of anomalous results and/or the absence of results above the detection limit are observed over a period of time, the monitoring frequency may be reduced

[27] If gross beta is at or above 5 Bq/L, the samples are processed for Strontium-90 analysis.

[28] If Am-241 is detected in sample, the sample is processed for Pu-238 and Pu-239/240 analysis. Pu-241 can be calculated using the Am-241 value.

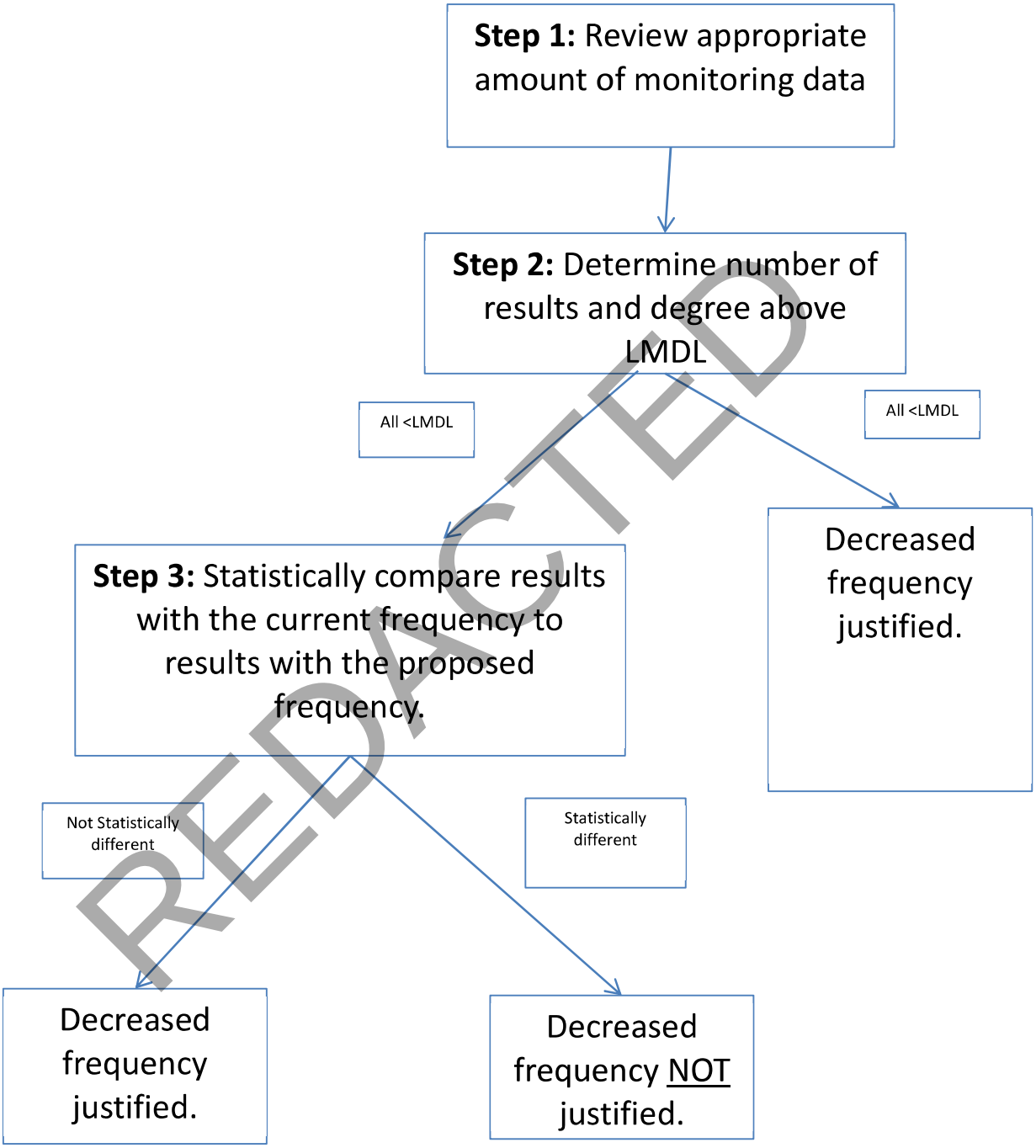
REDACTED

based on the professional judgment of EnvP Staff. Consideration should be given to the purpose and history of the monitoring of that parameter at that location.

For sample frequency to be decreased, the sample results at the decreased frequency (e.g., annual) are compared to the current sampling frequency (e.g., quarterly) using the appropriate statistical method and determined to not be significantly different. This three-step process is depicted in Figure 4.

A further reduction in frequency or elimination of monitoring should be considered where reduced frequency has taken place and the parameter continues to not be of concern in any area of the integrated monitoring program. Again, professional judgement of EVMP staff should be used and consideration given to the purpose and history of the monitoring of that parameter at that location when making this decision.

REDACTED



REDACTED

Figure 4: Three-step process used to determine whether a decrease monitoring frequency is acceptable.

7.2 Increasing Parameter Monitoring Frequency or Addition of a New Parameter

In the event that anomalous results are observed, and the monitoring objectives warrant a higher monitoring frequency, the frequency of monitoring may be increased in order to better determine the variability in the monitoring results. This is done through a special investigation (outside of the routine monitoring program) or within the routine monitoring program (added to the monitoring schedule) and again, is based on the professional judgement of EnvP staff.

Note: If this occurs in the instance where the frequency of the parameter monitoring was previously reduced due to the absence of anomalous result, the original monitoring frequency will be considered.

7.3 Core Parameters for New Effluent Monitoring Locations

Providing a location meets the "Need for Monitoring Criteria- Location" as outlined in *Management and Monitoring of Emissions* [2], the following list of core parameters is used to set up a new WL monitoring location. These parameters are based on the specific characteristics of WL as identified through the original characterization work of the MISA program as well as gross parameters designed to determine general effluent quality (e.g., pH, conductivity). When and where appropriate, monitoring should also be in line with MISA's *Protocol for Conducting a Storm Water Control Study* [69].

In addition to these core parameters, the "Need for Monitoring Criteria - Parameter" [2] should be reviewed adding additional parameters as required. Based on monitoring results, parameters can be altered as appropriate using professional judgement.

Table 17: Core parameters to be monitored for new WL effluents.

ATG	Parameter
1	COD
3	pH
4b	Nitrogen (as Nitrate and Nitrite)
5a	Dissolved Organic Carbon
5b	Total Organic Carbon
6	Phosphorus, Unfiltered Total
7	Conductivity, at 25˚C
8	Residue, Particulate (TSS)
9	Al, Cu and Zn only
9	All Metals in ATG 9, except Silver
9a	Iron, Unfiltered Total
12	Mercury, Unfiltered Total
14	Phenolics, Unfiltered React

REDACTED

ATG	Parameter
16	Volatile, Halogenated
17	Volatiles, Non-Halogenated
19	Extractables, Neutral
20	Extractables, Acid
23	Extractables, Chlorinated
25	Solvent Extractables
30	Chloride
31	Total Residual Chlorine
--	Temperature
--	Flow
--	Gross Alpha
--	Gross Beta
--	Gamma Spec
--	Tritium (if from WR1 or WMA)

REDACTED

8. References

[1] *Whiteshell Laboratories' Integrated Environmental Monitoring Program Framework*, WL-509200-OV-001, 53540176.

[2] *Management and Monitoring of Emissions*, 900-509200-STD-009, 40812070.

[3] Canadian Nuclear Safety Commission, *Nuclear Research and Test Establishment Decommissioning Licence, Whiteshell Laboratories*, NRTEDL-W5-8.00/2024, WLD-NOCN-19-0044-X, 53823005. https://www.cnl.ca/site/media/Parent/NRTEDL-W5-8.002024.pdf

[4] *Licence Conditions Handbook NRTEDL-LCH-08.000/2024 for Whiteshell Laboratories*, WL-508760-HBK-002, 51318057.

[5] *Effluent Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills*, CSA N288.5-11 (R2016), Canadian Standards Association, 2011.

[6] Province of Ontario, "*Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater, Version: 2.0*", (MISA) Ontario Ministry of the Environment and Climate Change, PIBS 2724e02, Jan.2016.

[7] *WL Environmental Monitoring Plan*, WL-509200-PLA-002, 53936960.

[8] *WL Groundwater Monitoring Plan*, WL-509200-PLA-003, 52717895.

[9] *Effluent Verification Monitoring Program Sampling Schedule for WL*, WL-509200-062-000, 70602016.

[10] *Whiteshell Laboratories Environmental Compliance Governing Documentation Index*, WL-514200-GDI-001, 17225052.

[11] *Environmental Protection,* 900-509200-PDD-001, 40788125.

[12] *Glossary of Controlled Terms and Acronyms*, https://cnllnc.sharepoint.com/sites/TermsandDefinitions

[13] *Whiteshell Laboratories Decommissioning Project, Comprehensive Study Report*, WLDP-03702-041-000-0008, 12007915, Volume 1: Main Report, WLDP-03702-041-000-0009, 12061937, Volume 2: Appendices, WLDP-03702-041-000-0010, 11900150, Volume 3: Addendum.

[14] *Whiteshell Laboratories Site-Wide Environmental Risk Assessment*, WLD-03710-ENA-002370, 60993271.

[15] *Derived Release Limits for CNL's Whiteshell Laboratories*, WL-509211-RRD-001, 53626314.

[16] *General Nuclear Safety and Control Regulations*, Statutory Orders and Regulations, SOR/2000-202, https://laws.justice.gc.ca/PDF/SOR-2000-202.pdf.

[17] *Designated Representatives of the Licensee, Site Licenses, Certificates and Permits*, 900-514300-LST-001, 49255143.

[18] *Whiteshell Laboratories Source Term,* WL-508770-REPT-002, 17203943.

[19] *Whiteshell Laboratories Annual Compliance Monitoring Report for 2024*, WL-514300-ACMR-008080, 71033923.

[20] *Environmental Monitoring in 2024 at Whiteshell Laboratories*, WL-509243-ACMR-008255, 72120165.

[21] *2024 Progress Report on the Environmental Assessment Follow-up Program for Whiteshell Laboratories*, WL-509246-ACMR-008256, 72121626.

[22] *Administrative and Action Levels for WL Non-Radiological Effluent,* WL-509200-STD-017, 54062241.

[23] *Environmental Assessment Follow-Up Program for Whiteshell Laboratories*, WLDP-03704-001-000, 11944206.

[24] The Canada Gazette, Part I, Volume 144, No. 12, *Federal Wastewater System Effluent Regulations*, 2012 June 29. https://www.gazette.gc.ca/rp-pr/p1/2010/2010-03-20/pdf/g1-14412.pdf
Wastewater Systems Effluent Regulations, Statutory Orders and Regulations, SOR/2012-139, [Online] https://laws-lois.justice.gc.ca/eng/regulations/sor-2012-139/index.html

[25] The Canada Gazette, Part II, Volume 137, No. 18, *Canadian Environmental Protection Act*, *Federal Halocarbon Regulations*, 2003 August 13.
Federal Halocarbon Regulations, 2003, Statutory Orders and Regulations, SOR/2003-289. [Online] https://laws-lois.justice.gc.ca/PDF/SOR-2003-289.pdf

REDACTED

[26] Environment Canada, "National Pollutant Release Inventory". [Online] https://www.canada.ca/en/services/environment/pollution-waste-management/national-pollutant-release-inventory.html

[27] Environment Canada, "Greenhouse Gas Reporting Program (GHGRP) - Facility Greenhouse Gas (FGHG) Data". [Online] https://open.canada.ca/data/en/dataset/a8ba14b7-7f23-462a-bdbb-83b0ef629823

[28] *Administrative Levels and Action Levels for WL Air and Liquid Radioactive Effluents*, 900-509200-STD-016, 53921424.

[29] Health Canada, "Objectives and Guidelines for Various Air Pollutants: Ambient Air Quality Criteria", 2005 July, http://www.gov.mb.ca/conservation/envprograms/airquality/pdf/criteria_table_update_july_2005.pdf

[30] *WL Waste Management and Effluent Control*, WL-508600-PRO-723, 17207123.

[31] *The Monitoring and Surveillance Plan for the WR-1 Deferment Period*, RC-1291, 14569912.

[32] *Facility Authorization for the Operation of the Shielded Facilities at Whiteshell Laboratories*, WLSF-00583-FA-001, 16651768.

[33] *Facility Authorization for the Operation of the Concrete Canister Storage Facility at the Whiteshell Laboratories*, AECL-FA-22, 22324895.

[34] *Whiteshell Laboratories Shielded Facilities*, *Safety Analysis Report* WLSF-03500-SAR-001, 17217185.

[35] *Safety Analysis Report for the Whiteshell Laboratories Waste Management Area*, WLWMA-508640-SAR-001, 16651068.

[36] *Safety and Hazards Analysis for the Shielded Modular Above-Ground Storage Facilities at Whiteshell Laboratories, Whiteshell Laboratories Decommissioning Project*. WLDP-36410-SAR-001, 11868386.

[37] *Whiteshell Laboratories Concrete Canister Storage Facility Safety Analysis Report*, RC-983, 14601536.

[38] *Whiteshell Laboratories Active Liquid Waste Treatment Centre Safety Analysis Report*, RC-1021, 14519313.

[39] *Replacement of LLLW Treatment System at WL*, WLDP-36810-CRD-002, 11958742.

[40] *Nuclear Facility Ventilation System Design*, 145-508120-DG-002, 35222201.

[41] *Radiological Areas and Zones*, 900-508740-MCP-027, 50931395.

[42] H. Cember, *Introduction to Health Physics*, 3rd ed., p. 474, McGraw-Hill Publishing, Jan 1996.

[43] *Radiation and Contamination Workplace Monitoring Routines*, 900-508740-MCP-040, 57136113.

[44] *Classification and Work Control in Radioisotope Laboratories*, 900-508740-MCP-013, 40828787.

REDACTED

[45] *Responsibility for Facilities and the Safety of Operations at the Whiteshell Laboratories,* WL-508200-LST-006864, 69119918.

[46] *RIS Instrument Shop Overview*, 191-508237-OP-009, 17217230.

[47] *Radioisotope Handling Protocol: WL Radiochemical Counting Lab [redacted] and SMO Sample Receiving Office ([redacted])*, WL-108360-RLP-003, 53268372.

[48] *Radioisotope Laboratory Protocol - WL Environmental Management Laboratory Complex[redacted]*, WL-108360-RLP-001, 53891425.

[49] *Safety Analysis Report for the Nuclear Fuel Fabrication Facilities [redacted] and 429*, NFFF-03500-SAR-001, 23494618.

[50] C.R. Schmitt, "Carbon microsphere, as extinguishing agents for fissionable materials fires", *Fire Technology*, vol. 11, pp. 95-98, 1975. [Online] https://doi.org/10.1007/BF02589939

[51] J. Mishima, "Plutonium Release Studies, I. Release from the Ignited Metal", BNWL-205, Battelle Pacific Northwest Laboratory, Richland, Washington, Dec. 1965. [Online] https://www.osti.gov/biblio/4577263-plutonium-release-studies-release-from-ignited-metal

[52] J. Mishima, "Plutonium Release Studies, II. Release from Ignited, Bulk Metallic Pieces", BNWL-357, Battelle Pacific Northwest Laboratory, Richland, Washington, Nov. 1966. [Online] https://www.osti.gov/biblio/4453507-plutonium-release-studies-ii-release-from-ignited-bulk-metallic-pieces

[53] *Airborne Release Fractions at Non-Reactor Nuclear Facilities*, ANSI/ANS-5.10-1998 (R2013), American National Standards Institute, Inc., Reaffirmed Jan. 2013).

[54] U.S. Department of Energy, DOE Handbook, "Airborne Release Fractions/Rates and Respirable Fractions for NonReactor Nuclear Facilities, Volume 1 - Analysis of Experimental Data", DOE-HDBK-3010-94, Dec. 1994, Reaffirmed 2013. [Online] https://www.standards.doe.gov/standards-documents/3000/3010-bhdbk-1994-v1
J.C. Malet, G. Duverger de Cuy, R. Gasteiger, and J. Janberg, "Solvent Pool Fire Testing", *Proceedings of the CSNI Specialist Meeting on Interaction of Fire and Explosion with Ventilation Systems in Nuclear Facilities*, LA-8911-C Vol. 2 (CSNI Report No. 83), Los Alamos National Laboratory, Los Alamos, NM, April 1983.

[55] *Environmental Review of Routine Work*, 900-509200-MCP-002, 12606149.

[56] *Environmental Protection Program Radiological and Non-radiological Monitoring Services Quality Assurance Plan*, ENVP-01913-QAP-001, 52863279.

[57] *Environmental Management Quality Assurance Plan*, WL-514200-QAP-001, 44168365.

[58] *General Requirements for the Competence of Testing and Calibration Laboratories*, (ISO/IEC 17025:2017) CAN P-4E, Standards Council of Canada, 2017.

REDACTED

[59] *Environmental Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills*, CSA-N288.4-19, Canadian Standards Association, 2019.

[60] Government of Canada, Health Canada, *Guidelines for Canadian Drinking Water Quality - Summary Table*, Sep 2020. [Online] https://www.canada.ca/en/health-canada/services/environmental-workplace-health/reports-publications/water-quality/guidelines-canadian-drinking-water-quality-summary-table.html

[61] *Data Quality Assessment: Statistical Methods for Practitioners*, EPA QA/G-9S, Environmental Protection Agency, 2006. [Online] https://www.epa.gov/sites/production/files/2015-08/documents/g9s-final.pdf

[62] *Estimating Measurement Uncertainty Arising from Measurement and Sampling*, WL-509253-PRO-001, 51052426.

[63] *Generic Environmental Concentrations Below Which No Effects are Expected on Non-Human Biota in Canada*, COG-05-3068, 14546485.

[64] United Nations, *"Sources and Effects of Ionizing Radiation, United Nations Scientific Committee on the Effects of Atomic Radiation, UNSCEAR 2008, Report to the General Assembly with Scientific Annexes, Volume II, Scientific Annexes C, D and E"*. [Online] https://www.unscear.org/docs/publications/2008/UNSCEAR_2008_Annex-E.pdf

[65] *Concrete Canister Storage Facility (CCSF) Air Sampling*, 191-508740-OP-035, 17078890.

[66] *Beta Trigger Level for OFS and Screening Levels for Tank Pump Outs*, WL-EM-2019-007, 191-508740-799-000, 48046140.

[67] [redacted]*Active Low Level Liquid Waste Treatment System - Normal Operations*, WLSF-106401-OP-001, 17195041.

[68] *Changes to Analysis of Liquid Effluent – Outfall (and Intake),* [redacted] *LLLW and* [redacted] *LLLW Tanks*, WL-EM-2019-019, 191-508740-799-000, 51205366.

[69] Government of Ontario, "Protocol for Conducting a Storm Water Control Study", Ministry of Environment and Energy, Aug 1994. [Online] https://www.ontario.ca/page/protocol-conducting-storm-water-control-study

8.1 References in Appendices

[70] *Independent Technical and Readiness Reviews*, 900-514300-MCP-002, 52058514.

[71] *Waste Management Area Description*, WLWMA-106000-PRO-003026, 62929651.

[72] *Whiteshell Laboratories Plan for Decommissioning of* [redacted] *with Active Liquid Waste Disposal Tanks at Waste Management Area*, WLD-508300-WP-001, 16644244.

[73] *Liquid Amine Transfer from HLLW-TK2 to Liquid Disposal Flask*, WLWMA-101700-OP-002, 17078868.

[74] *Post-Work ALARA Review Report*, Amine Transfer, WLDP-21040-PWAR-001, 11868388.

REDACTED

[75] *The WR-1 Reactor Phase I Decommissioning Interim Endstate Report - Facility Description*, RC-1290, 14569894.

[76] *Non-Radiological Laundry and Respirator Area – Respirator Laboratory*, 191-508740-PRO-002718, 64269795

[77] *Non-Radiological Laundry and Respirator Area - Laundry Area,* 191-508740-PRO-012, 57733456

[78] *Radioisotope Handling Protocol: WL Radiochemical Counting Lab [redacted] and SMO Sample Receiving Office [redacted]*, WL-108360-RLP-003, 53268372.

[79] *Radioisotope Laboratory Protocol - WL Environmental Management Laboratory Complex* [redacted] WL-108360-RLP-001, 53891425.

[80] *Whiteshell Laboratories Detailed Decommissioning Plan: Volume 6 – Whiteshell Reactor #1:* [redacted], WLDP-26400-DDP-001, 11905304.

[81] *End-State Decommissioning Report: Buildings 505 and Concrete Pads of* [redacted], WLDP-31030-ESDR-002, 11971832.

[82] *Radiological Decontamination Services*, 191-508740-PRO-002400, 64276274.

[83] Municipal/Industrial Strategy for Abatement (MISA), *Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater, Version 2.0 2016 January.* https://files.ontario.ca/protocol_for_the_sampling_and_analysis_of_industrial_municipal_wastewater.pdf

[84] Canada, Environmental Protection Service, "Guidelines for Effluent Quality and Wastewater Treatment at Federal Establishments", EPS 1-EC-76-1, 1976 April. https://openlibrary.org/works/OL5315562W/Guidelines_for_effluent_quality_and_wastewater_treatment_at_federal_establishments

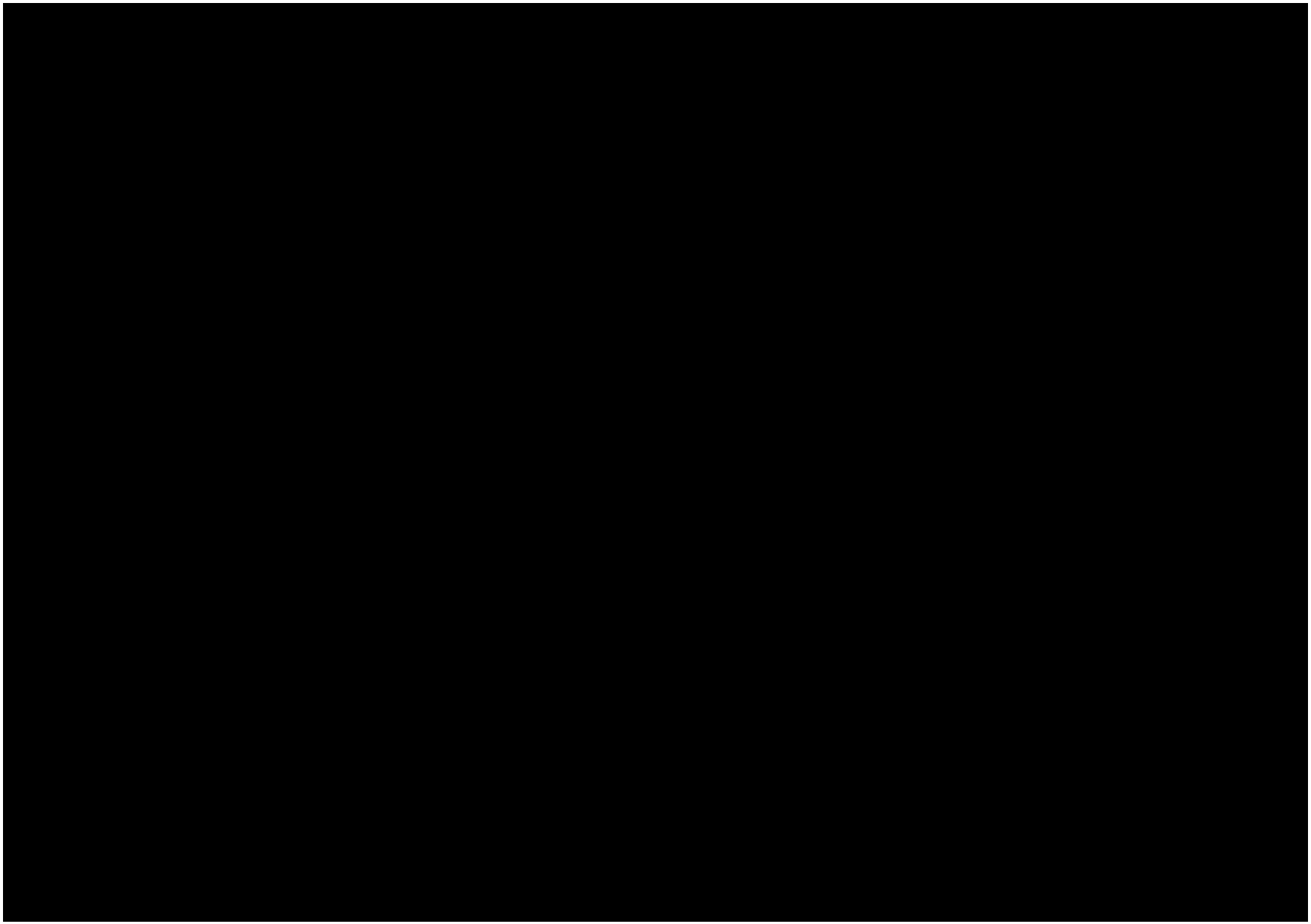
[85] *Levels for CRL's Non-Radioactive Effluents and Emissions*, 900-509200-STD-014, 51059932.

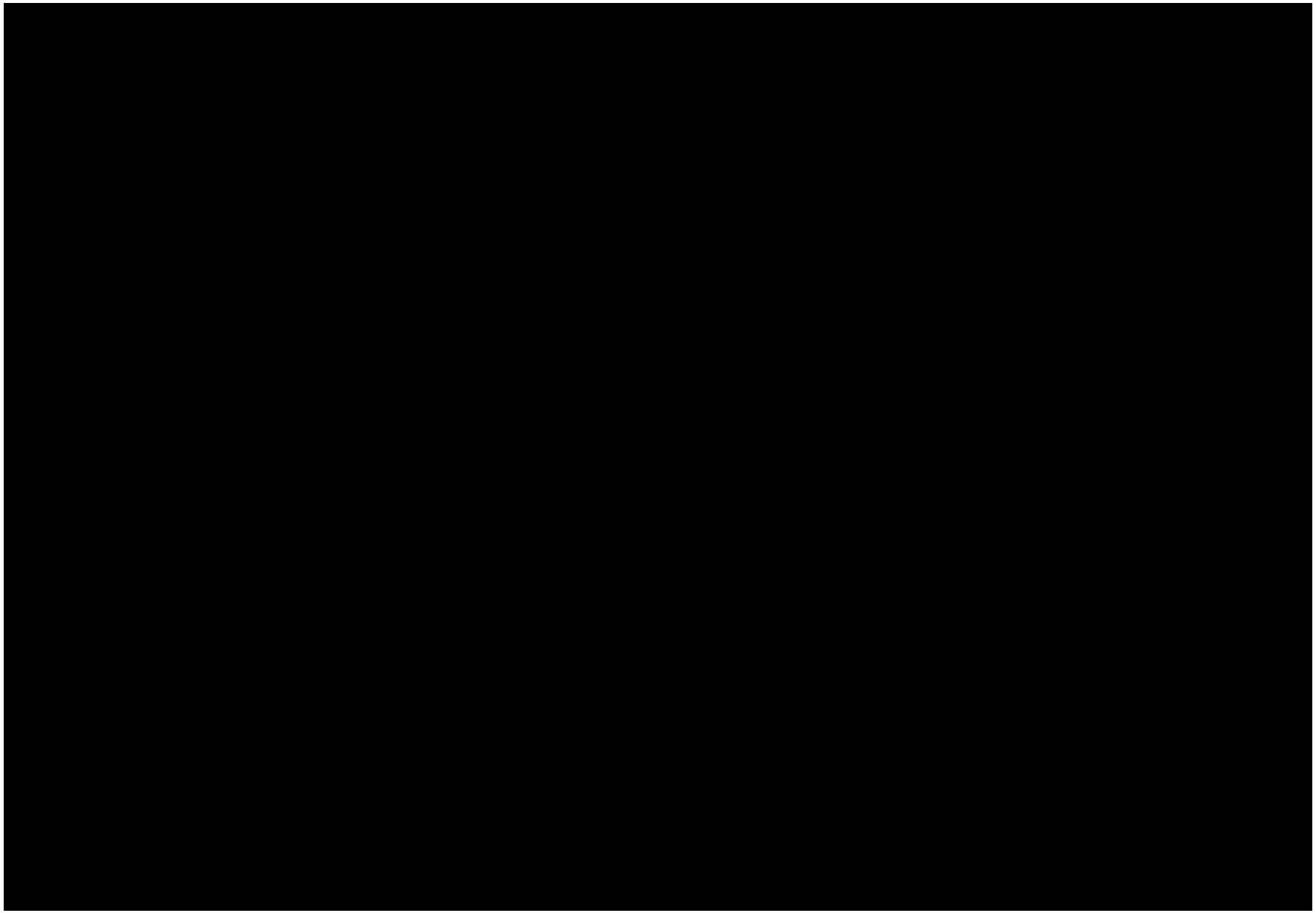
[86] *Environmental Protection: Environmental Principles, Assessments, and protection Measures, version 1,* CNSC, REGDOC-2.9.1. 2017 April

REDACTED

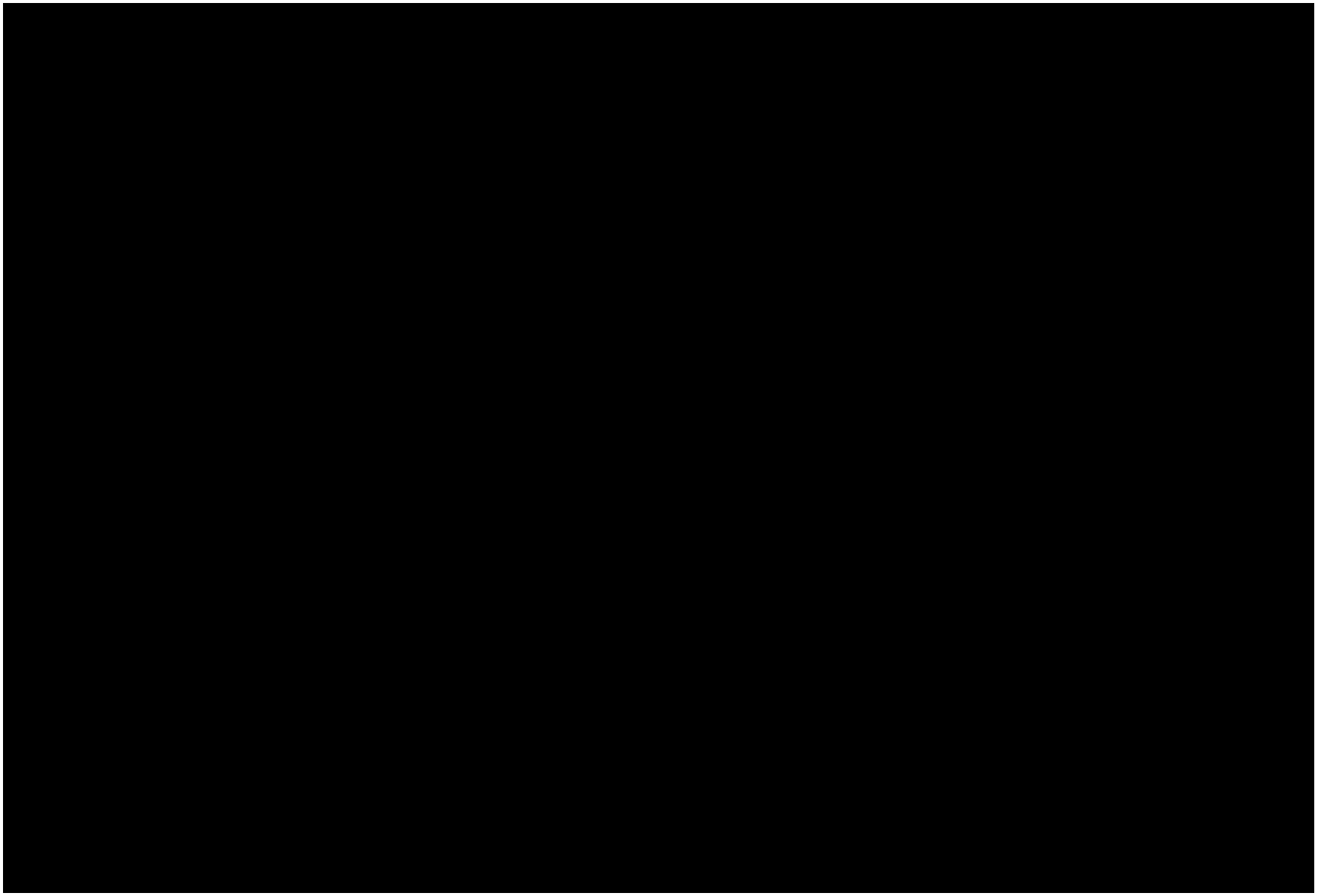
Appendix A Assessment Tables: Nuclear Facilities









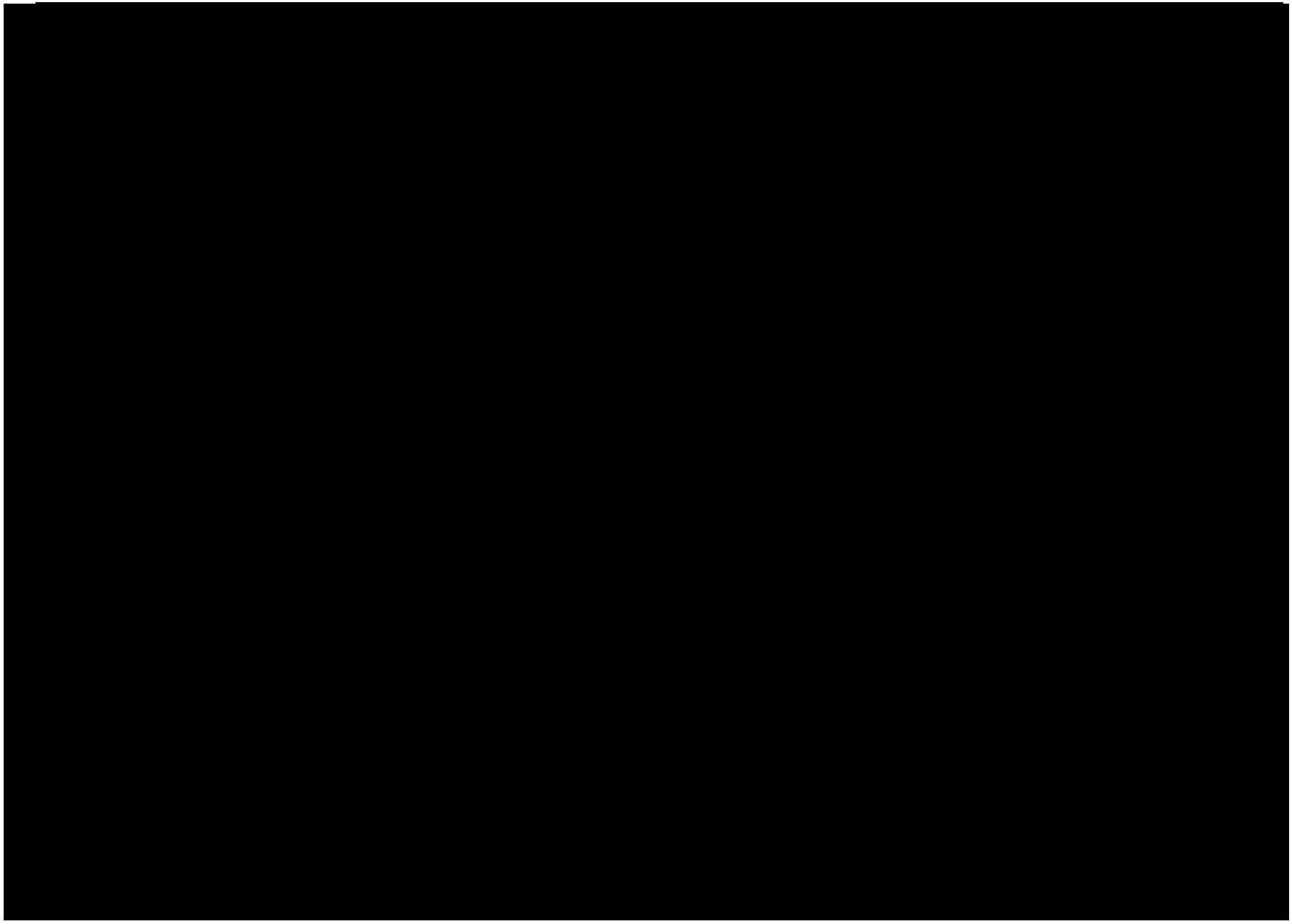


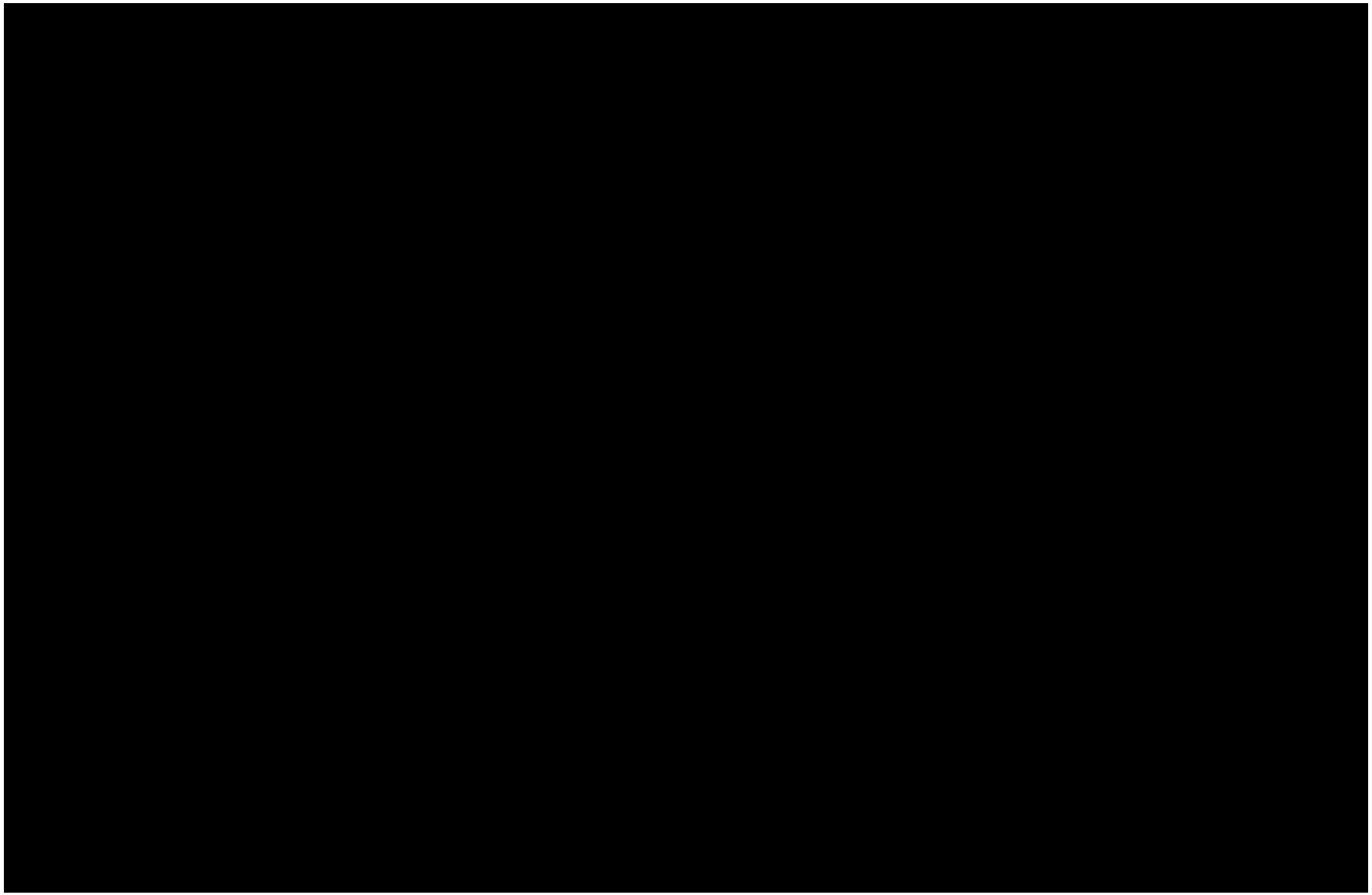


RE

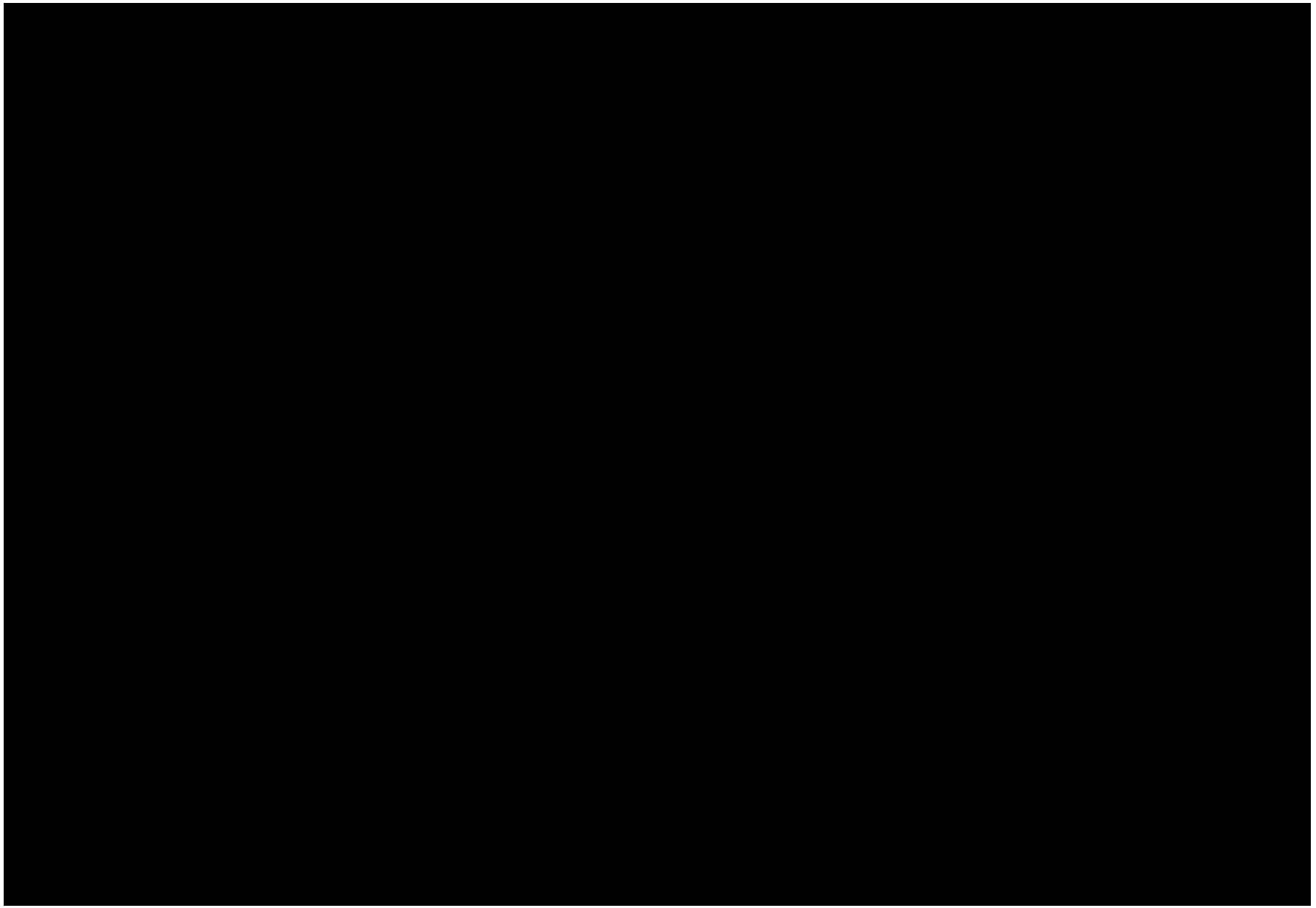
A.2 Waste Management Areas (WMAs)

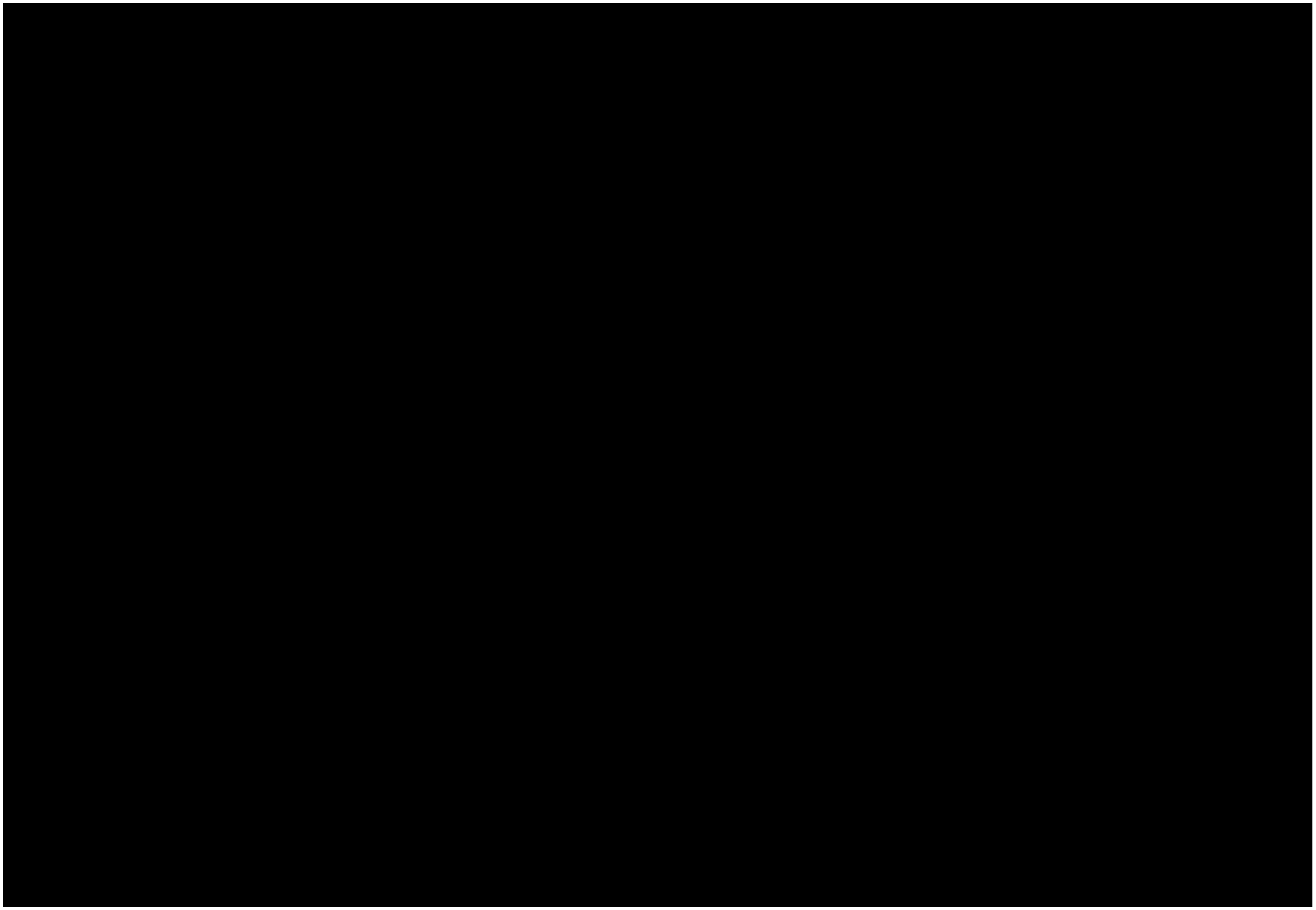


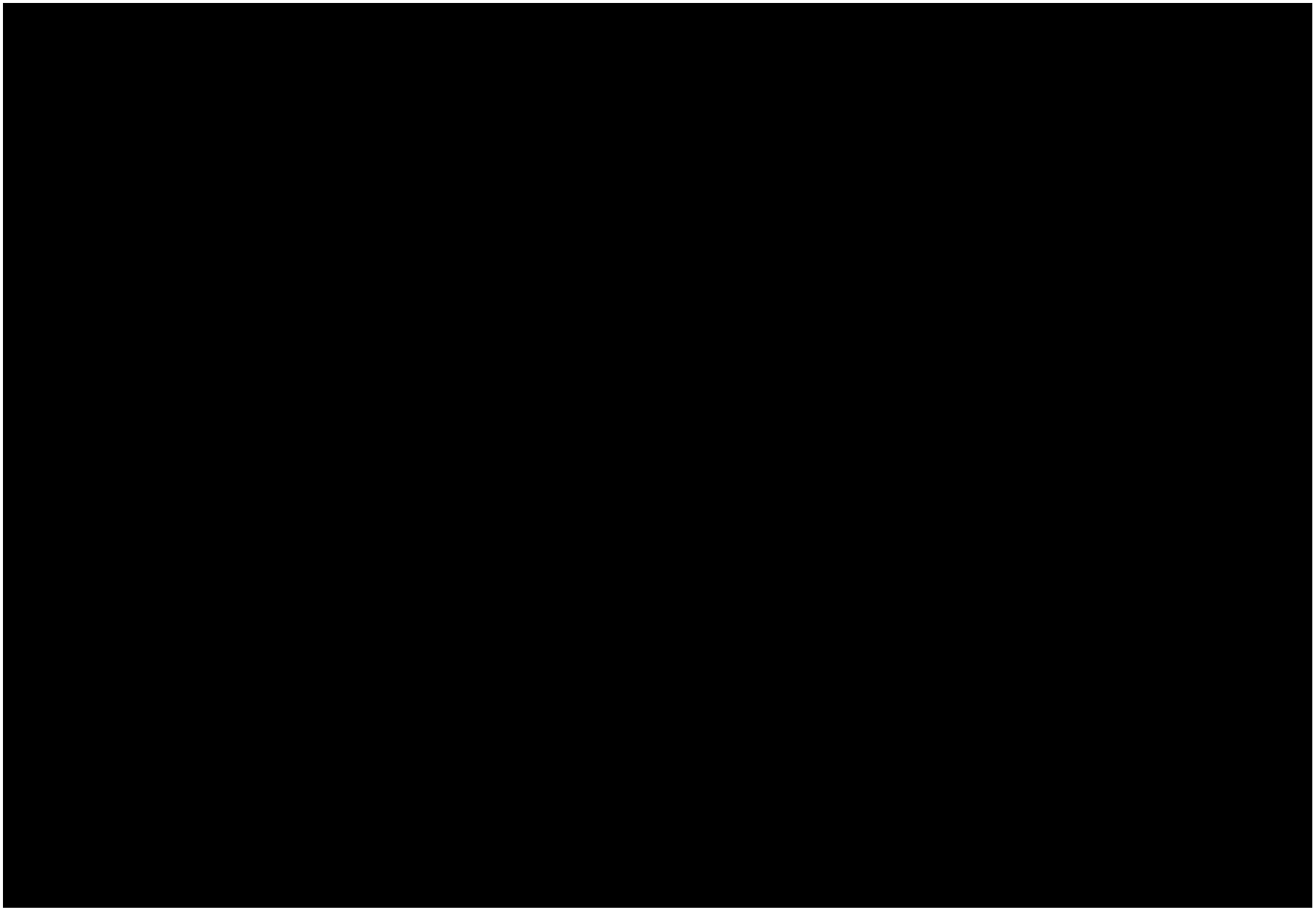


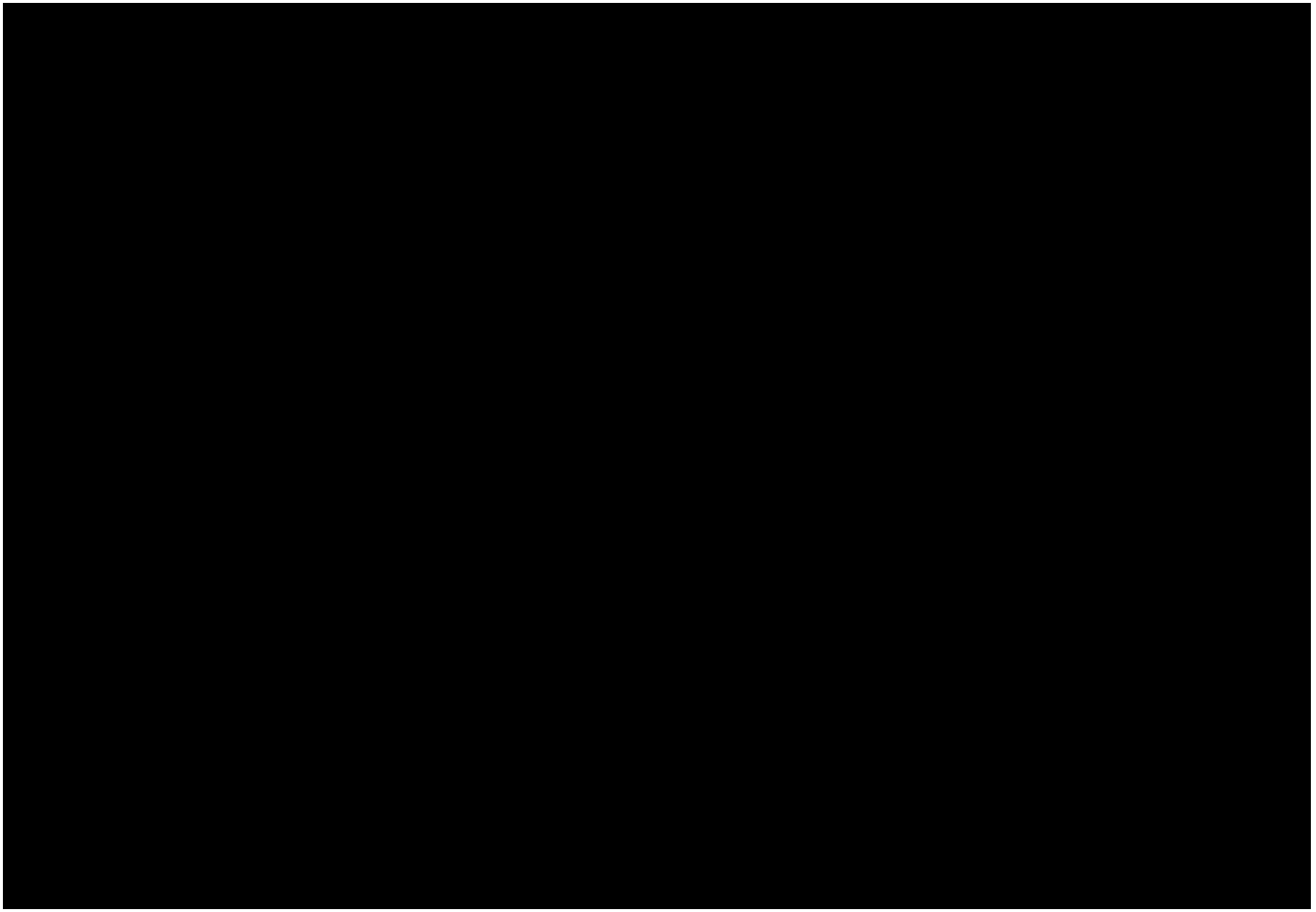










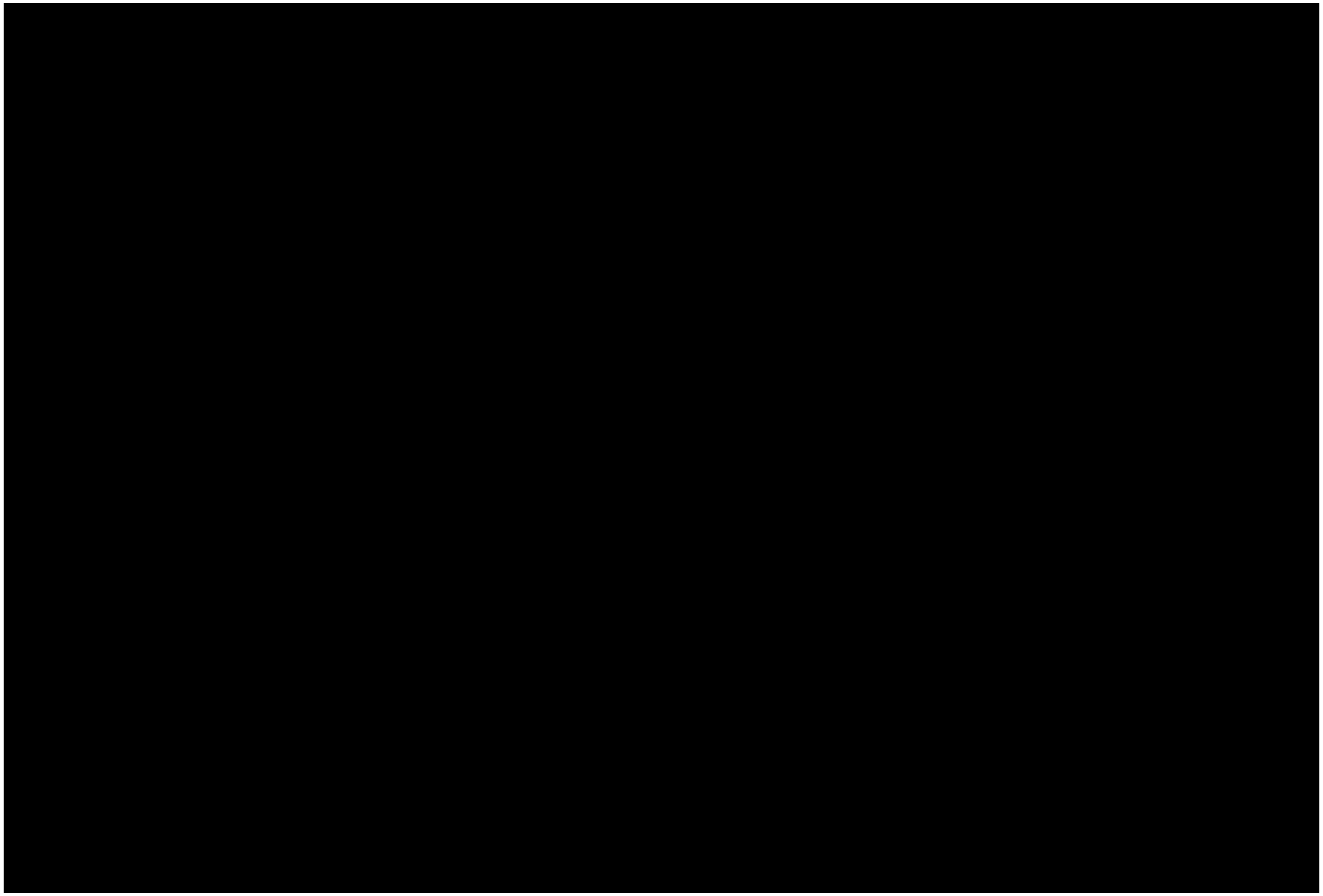


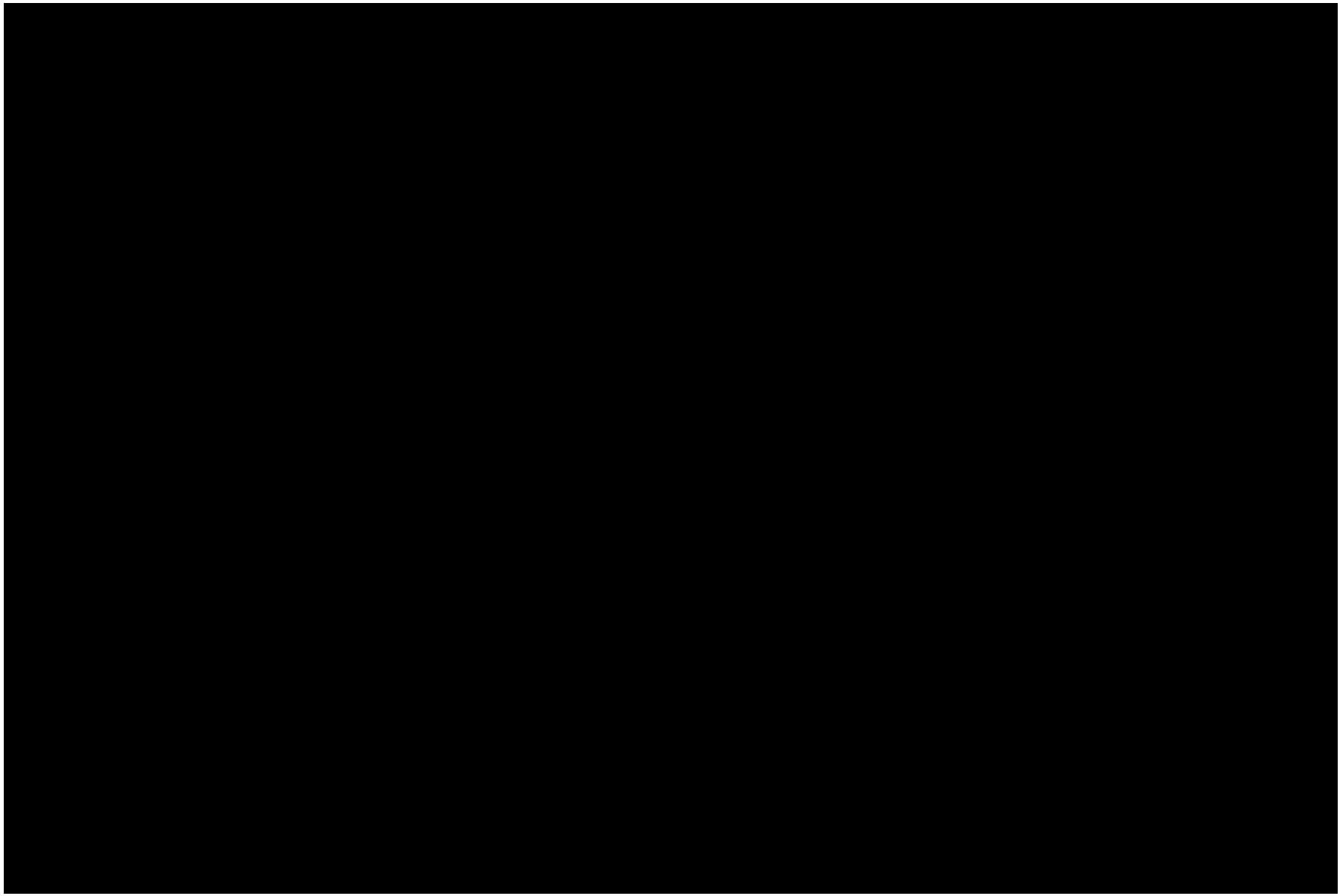


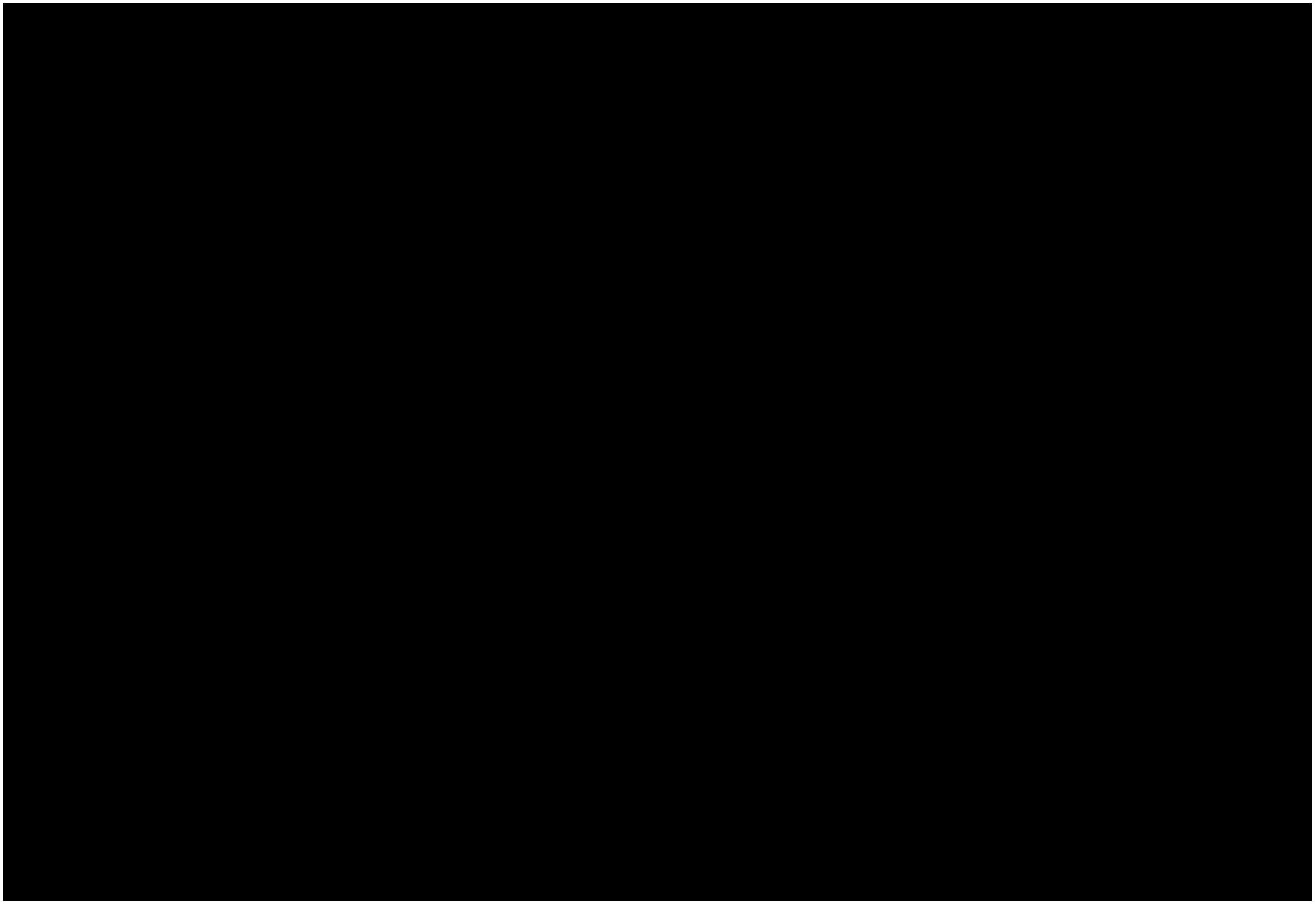
REDAC

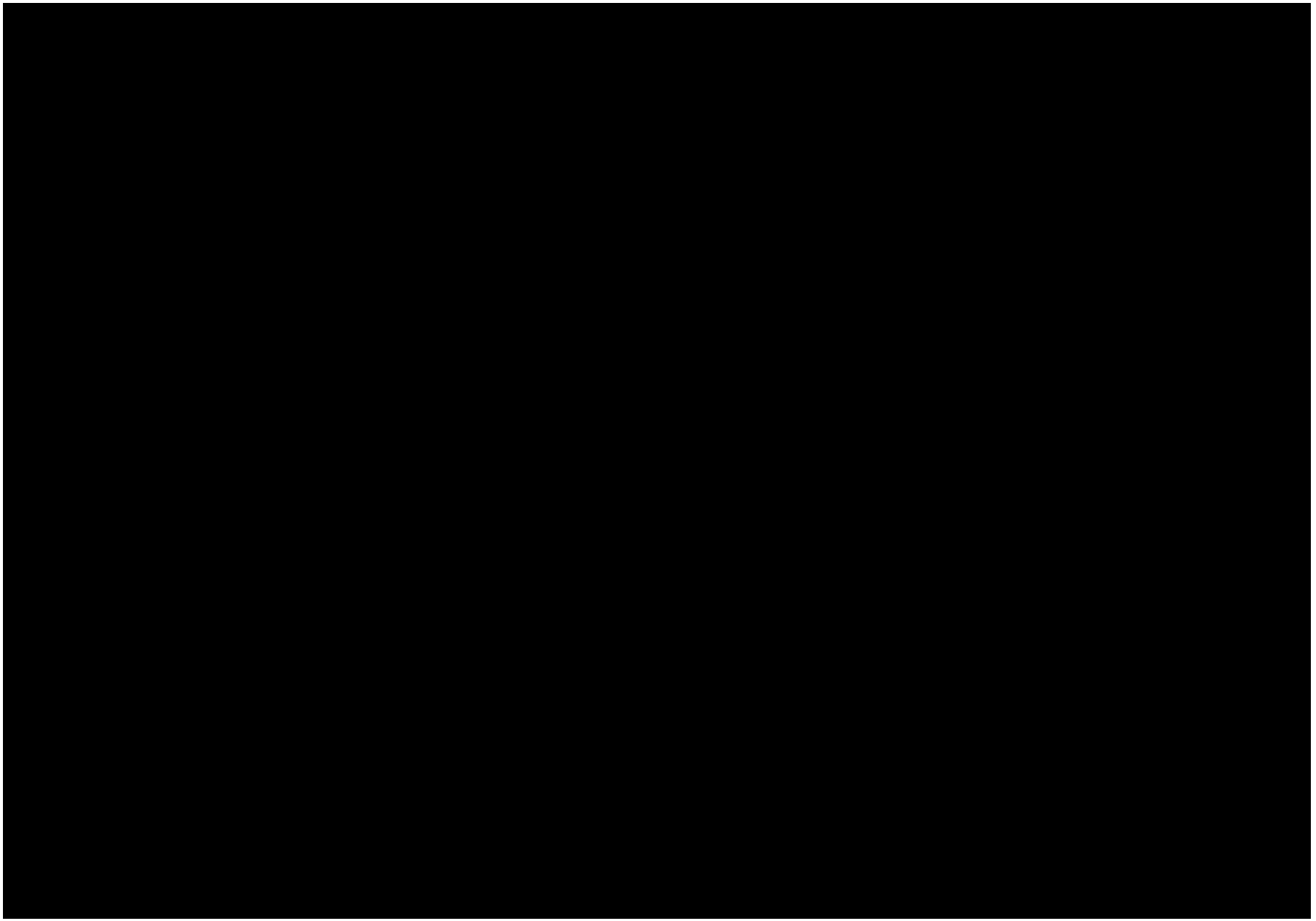


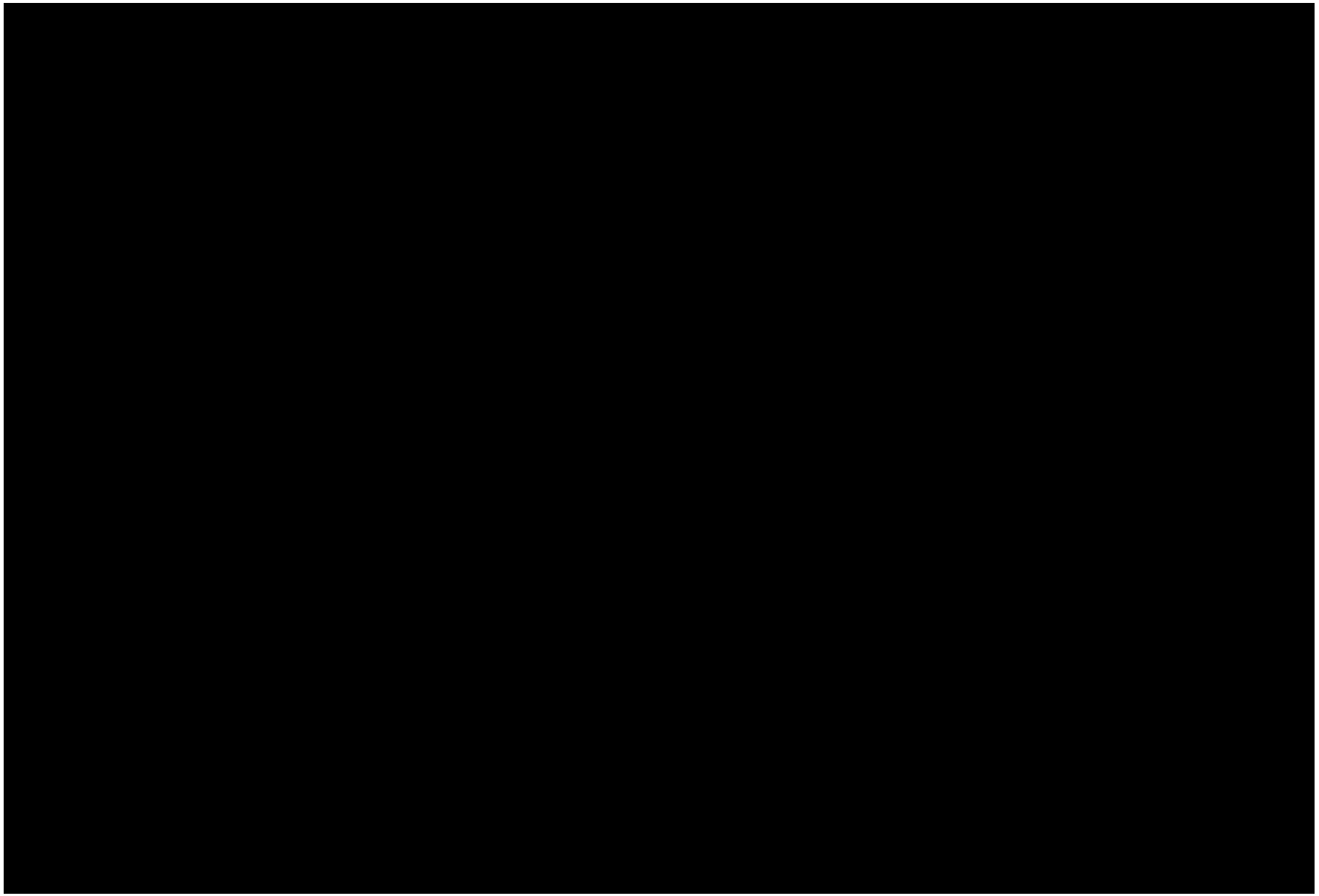






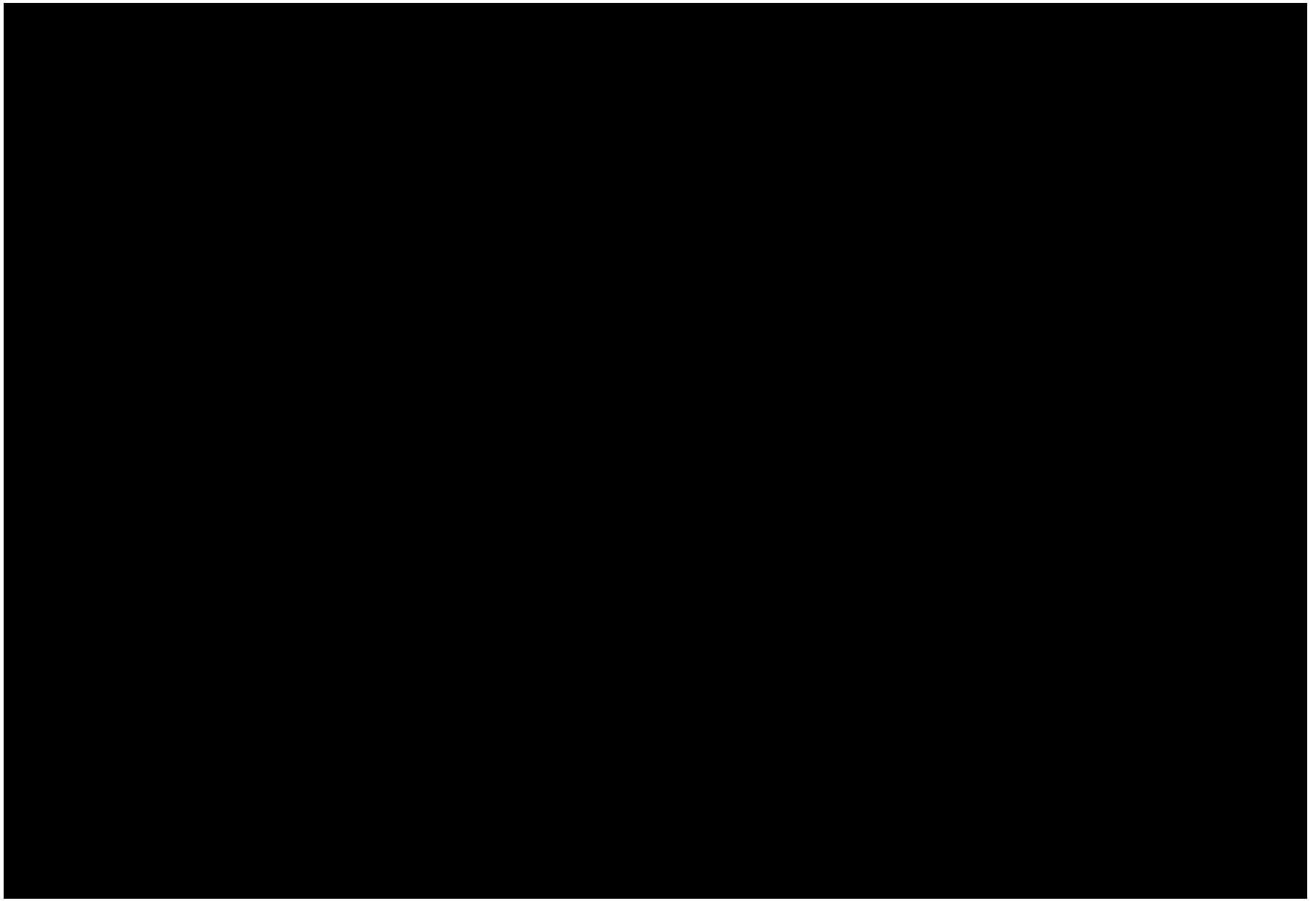


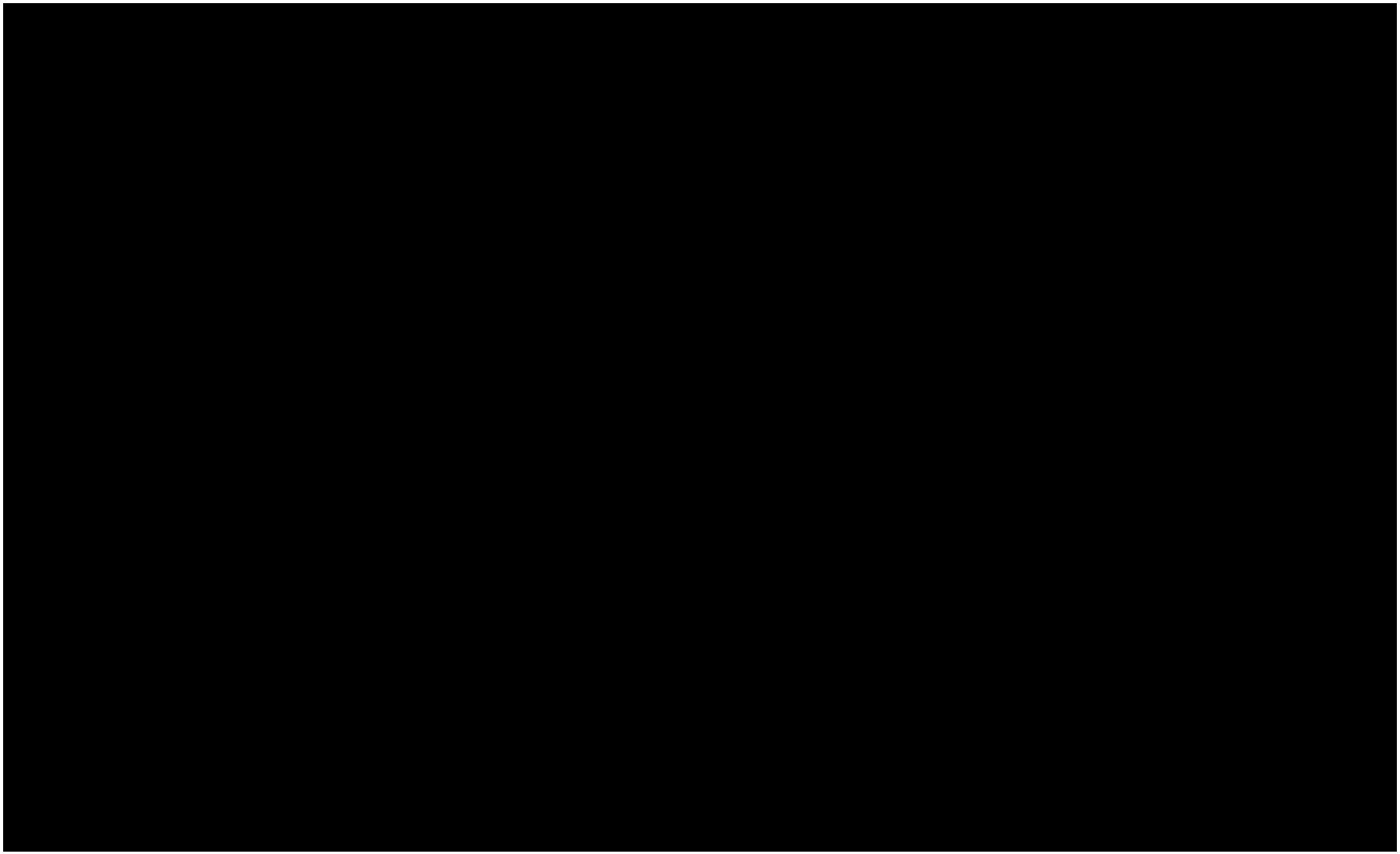




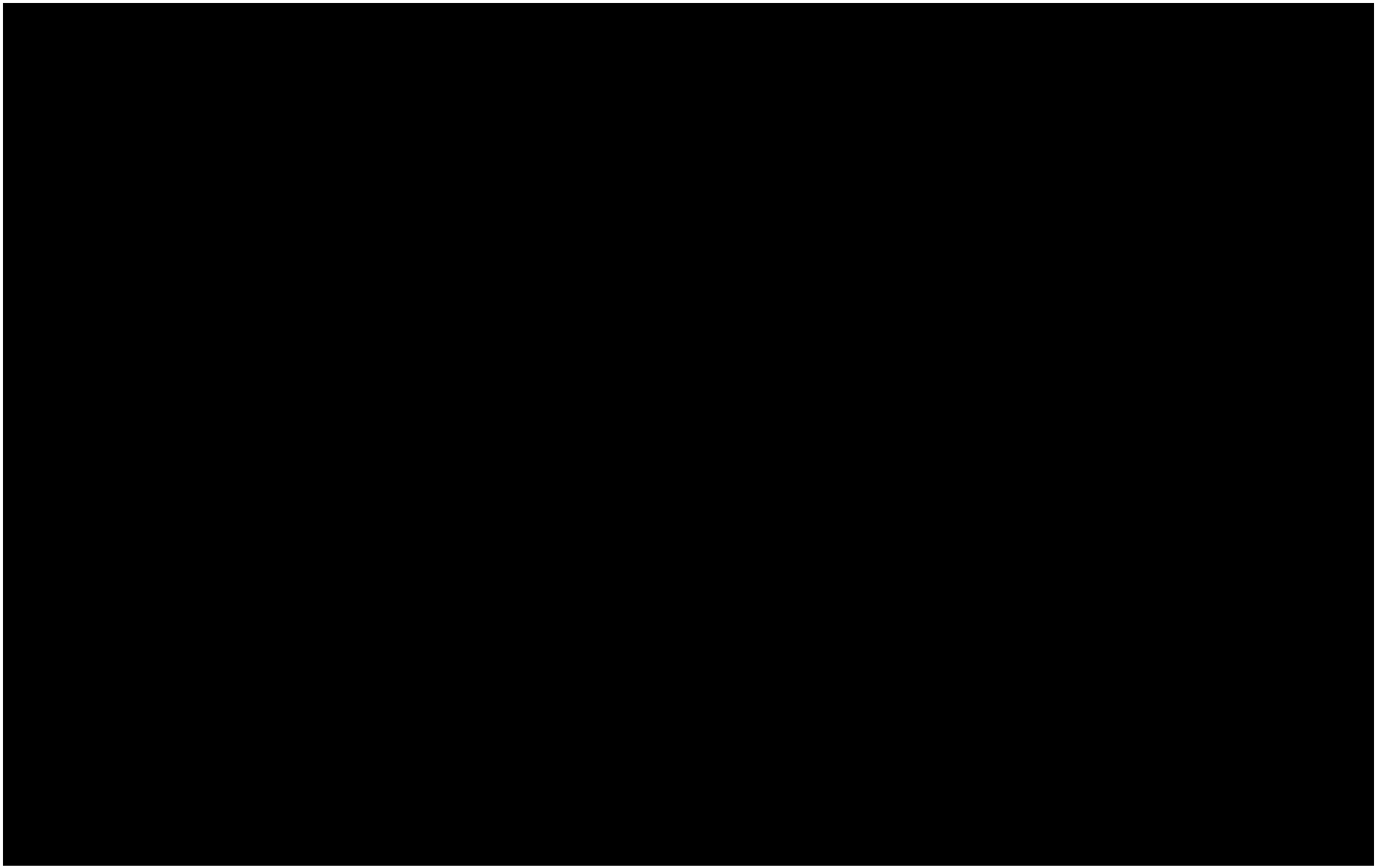








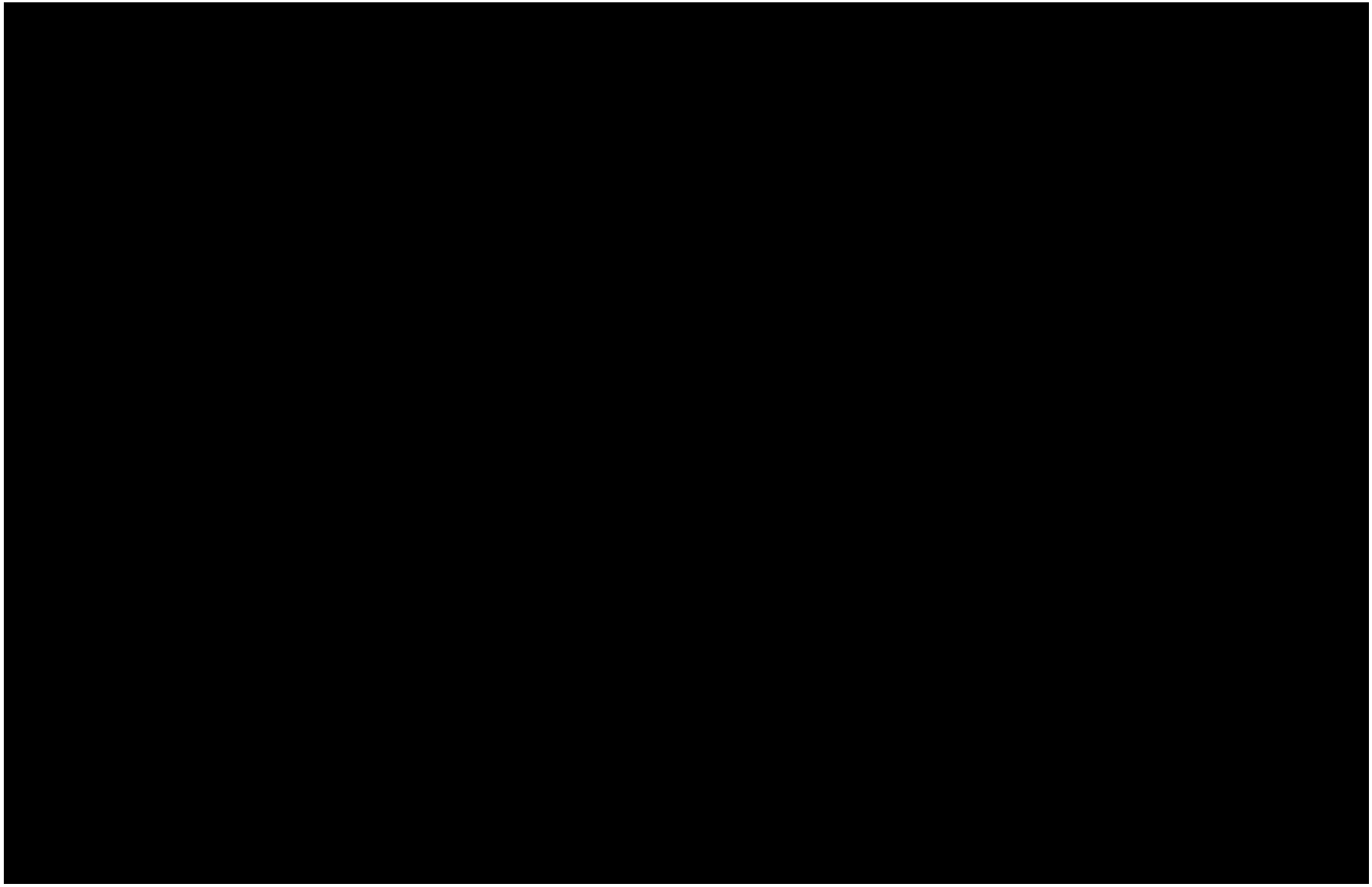
A.3 Concrete Canister Storage Facility

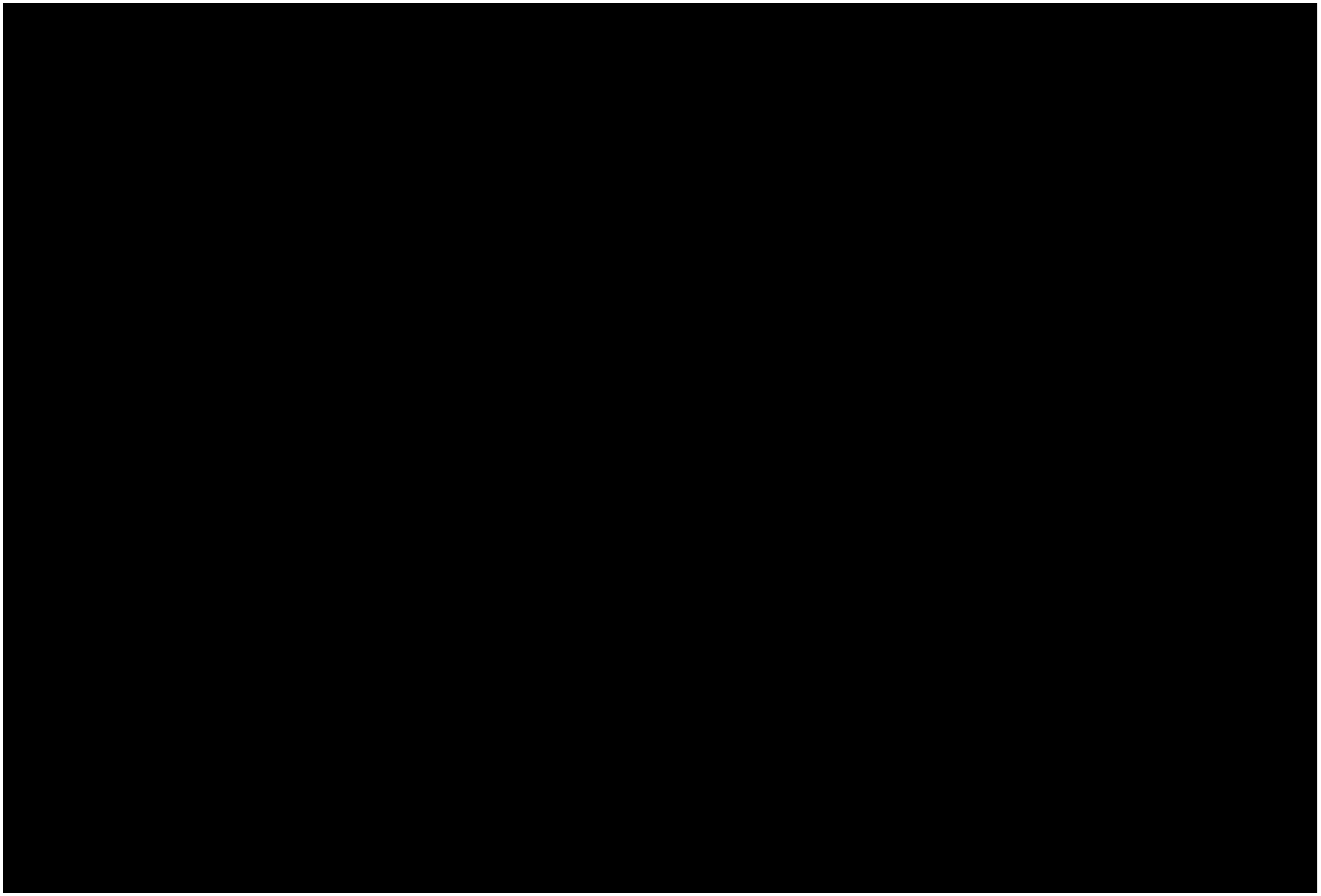


[redacted]

RED

Appendix B Assessment Table: Nuclear Facilities in Storage with Surveillance – WR-1 Reactor

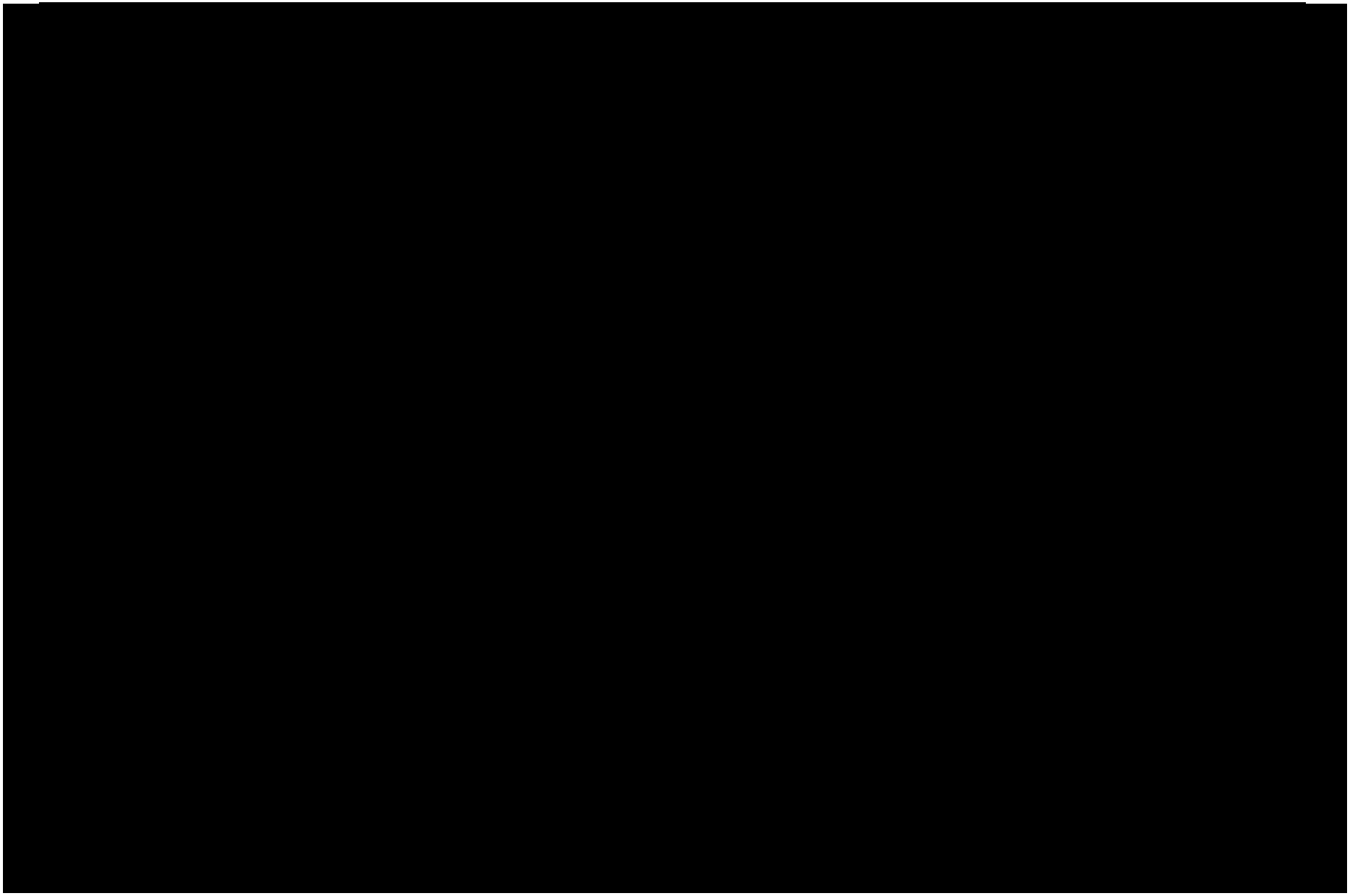




Appendix C Assessment Tables: Auxiliary Operating Facilities

[redacted]











Appendix D Assessment Tables: Facilities Undergoing Decommissioning

[redacted]



Appendix E Assessment Tables: Non-Radiological Emissions

Facility[29]	Source Description	EMS Group (Activity)	Stream Type	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2])
Nuclear Facilities					
WL Shielded Facilities:	All decontamination and lab processes are exhausted by fume hoods and subsequently through building ventilation (filters). Chemicals are dissolved in water.	103 - 13 (17,18,22)	N/A	N/A - not monitored for non-radiological parameters.	A score of less than 2 is given as emissions are expected to have negligible impact on the environment based on the severity and the quantities of chemicals being emitted.
Waste Management Area Operating Facilities	WMA[redacted], Building[redacted], Trenches, LLW Bunkers, LLW Waste Storage Buildings[redacted], ILW Bunkers, AGSB, Standpipes, Incinerator,[redacted], SMAGs, SSC. Greenhouse gases and acid gases from Diesel Generator. Methane from the decomposition of waste. Some facilities have air conditioner units that may result in halocarbon releases.	103 (4)	N/A	N/A – not monitored for non-radiological air emissions, diesel generator emissions included in site estimation.	GHGs are included in the site wide estimate discussed under general activities. Air conditioning units are checked regularly, halocarbon releases are included in the site wide estimate discussed under general activities.
Concrete Canister Storage Facility	Greenhouse gases and acid gases from diesel generator in CCSF.	103 (3)	N/A	N/A - not monitored for air emissions, diesel generator emissions included in site wide estimate discussed under general activities.	GHGs are included in the site wide estimate discussed under general activities.

REDACTED

[29] Full facility descriptions are given in Appendix A to Appendix D.

Facility[29]	Source Description	EMS Group (Activity)	Stream Type	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2])
Nuclear Facilities in Storage with Surveillance					
WR-1	Chiller system runs on R134-a halocarbon	103 - 1 (1)	N/A	N/A - not monitored for non-radiological air emissions. Air conditioning units are entered into the site wide registry and are checked regularly, halocarbon releases are included in the site wide estimate discussed under general activities.	A score of less than 2 is given as emissions are expected to have negligible impact on the environment based on the severity and the quantities of chemicals being emitted.
Auxiliary Operating Facilities					
[redacted] General Areas and [redacted] RP Workshop/Laboratory Instrument Storage	No source of routine emissions identified	103	N/A	N/A - not monitored for non-radiological parameters.	No airborne emissions of hazardous substances identified or anticipated.
[redacted] WL Laundry and Respirator Area [redacted]	Dilute chemicals, from laundry operations.	103 - 12 (21)	N/A	N/A - not monitored for non-radiological parameters.	A score of less than 2 is given as emissions are expected to have negligible impact on the environment based on the severity and the quantities of chemicals being emitted.
[redacted] IFTF Lab Complex Class B/C includes RP Sample Monitoring and Handling [redacted]	Dilute acid, various chemicals from normal lab operations.	103 - 13 (17) 114 (1,2)	N/A	N/A - not monitored for non-radiological parameters.	A score of less than 2 is given as emissions are expected to have negligible impact on the environment based on the severity and the quantities of chemicals being emitted.

REDACTED

Facility[29]	Source Description	EMS Group (Activity)	Stream Type	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2])
[redacted] Beta Irradiator Room [redacted].	No source of routine emissions identified.	103	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted] RP Instrument Shop (Room [redacted])	No source of routine emissions identified.	101 (3)	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted] Radioactive Material Shipping and Receiving Cage	No source of routine emissions identified.	103 (7)	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted] Room [redacted] Radiation and Industrial Safety Instrument Shop (Radiological Contamination Zone 1)	No source of routine emissions identified.	101 (6)	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted] Room [redacted] Radiography Room	No source of routine emissions identified.	108	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
Non-Nuclear Facilities					
[redacted]	Security, Reception, Fire Hall and Security Monitoring Room.	107	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.

REDACTED

Facility[29]	Source Description	EMS Group (Activity)	Stream Type	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2])
[redacted], Offices/Machine Shop	Welding fumes, painting fumes, cleaning materials, solvent use.	106 – 2 (1-9)	Point Source	N/A - not monitored for non-radiological parameters.	A score of less than 2 is given as emissions are expected to have negligible impact on the environment based on the severity and the quantities of chemicals being emitted.
[redacted]	Quonset: Cold Storage	113	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted]	Cold Garage	113 and 106	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted]	Outfall Sampling Station	114	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted]	Quonset: Cold Storage	106	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted]	Quonset: Cold Storage	106	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted]	Asbestos/PCB Storage	103 (6)	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted]	Hazardous Chemical Storage	103 (5)	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.

REDACTED

Facility[29]	Source Description	EMS Group (Activity)	Stream Type	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2])
[redacted]	Portable Boiler Building 1	103	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted]	Portable Boiler Building 2	103	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted]	Pump House Use/Storage of Chlorine Gas	103 (9)	Point source, Fugitive emission	N/A - not monitored for air emissions, no measurable release anticipated during normal operation.	A score of less than 2 is given as emissions are expected to have negligible impact on the environment based on the severity and the quantities of chemicals being emitted.
[redacted]	Water Filtration Plant Use/Storage of Chlorine Gas	103 (9)	Point source, Fugitive emission	N/A - not monitored for air emissions, no measurable release anticipated during normal operation.	A score of less than 2 is given as emissions are expected to have negligible impact on the environment based on the severity and the quantities of chemicals being emitted.
[redacted]	Fire Protection Water System	103	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted]	Process Water System	103	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted]	Storm Drainage System	103	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.

REDACTED

Facility[29]	Source Description	EMS Group (Activity)	Stream Type	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2])
[redacted]	Sewage Lift Station and Lagoons	103	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted]	Powerhouse: Historically, the main stationary source for non-radiological emissions to air from the WL site was the Powerhouse which supplied district heating to various buildings on the site. Starting in 2013 May, use of, and emissions, from Number 2 fuel oil heating operations at the Powerhouse ceased due to the completion of building conversions to either propane or electrical heating. Subsequently, a substantial increase was seen in the amount of cleaner burning propane used on site. Generally, fuel consumption continues to trend downward	103	Point source, Airborne Point Continuous	Air emissions are part of site general activities calculations for GHG and NPRI. GHGs are included in the site wide estimate discussed under general activities. Air conditioning units are checked regularly, halocarbon releases are included in the site wide estimate discussed under general activities.	Air emissions are part of site general activities calculations for GHG and NPRI. GHGs are included in the site wide estimate discussed under general activities.
[redacted]	Main Substation (Owned by MB Hydro)	103	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted]	Main Power Distribution	103	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted]	Communications System	103	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.

REDACTED

Facility[29]	Source Description	EMS Group (Activity)	Stream Type	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2])
[redacted]	Supervisory Control and Alarm	107	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted]	Clarified Water System, Shut Down Mid-1980s	103	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
[redacted]	Access Tunnel	103	N/A	N/A - not monitored for air emissions.	No airborne emissions of hazardous substances identified or anticipated.
Facilities Decommissioned					
[redacted]	Active Liquid Waste Treatment Centre (ALWTC)	N/A	N/A	Decommissioned. The building footprint area remains.	
[redacted] Facility	Experimental Loops	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination, end state report has been accepted by the SRC and will be sent to CNSC.	
[redacted] Facility	Experimental Loops	N/A	N/A	Experimental loops decommissioned within [redacted] Decommissioning results will be included as part of [redacted] Stage 3 work packages and end state summary.	
[redacted] (MU 3)	Field Irradiator - Gamma Control Shack FIG Trailer	N/A	N/A	Building removed from site. The building footprint area remains within the Outer Supervised Area where normal site operations continue under the site license. Building donated to Canadian Power Toboggan Championships Beausejour, Manitoba. FIG trailer donated to Eastman SnoPALs Power Toboggan Club in Pinawa, MB.	
[redacted]	Historically, served as storage shed for the Gas Dynamics Laboratory and more recently waste storage.	N/A	N/A	Building Removed, pad retained, underlying soil assessment needed. No events resulting in residual contamination. The building pad remains within the North Side Supervised Area where normal site operations continue under the site license.	

REDACTED

Facility[29]	Source Description	EMS Group (Activity)	Stream Type	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2])
[redacted]	[redacted] (Office) was a utility/construction trailer that was used as a control room for the Gas Dynamics Laboratory. [redacted] (Grain Bin) was a test structure for the Gas Dynamics Laboratory.	N/A	N/A	Structure removed, pad under Grain Bin retained (no pad under Office), underlying soil assessment needed. No events resulting in residual contamination occurred. The building footprint area remains within the Outer Supervised Area where normal site operations continue under the site license.	
[redacted]	Large Scale Vented Combustion Test Facility	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination, end state report in preparation.	
[redacted]	Large Scale Vented Combustion Test Facility - Local Services	N/A	NA	Decommissioned, land cleared, no events resulting in residual contamination, end state report in preparation.	
[redacted]	Large Scale Vented Combustion Test Facility - Local Services	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination, end state report in preparation.	
[redacted]	Large Scale Vented Combustion Test Facility Hydrogen Storage	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination, end state report in preparation.	
[redacted]	Housed a steam generator used in conjunction with the Gas Dynamics Laboratory.	N/A	N/A	Structures removed, pad retained, underlying soil assessment needed. No events resulting in residual contamination occurred. The building footprint area remains within the Outer Supervised Area where normal site operations continue under the site license.	
[redacted]	Administrative and Engineering Building	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination. The former building footprint area remains within the South Side Supervised Area where normal site operations continue under the site license.	
[redacted]	Gamma Irradiator Facility Environmental Laboratory Dosimetry Services Offices	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination. The former building footprint area remains within the South Side Supervised Area where normal site operations continue under the site license. Area has	

REDACTED

Facility[29]	Source Description	EMS Group (Activity)	Stream Type	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2])
				been converted to trailer complexes [redacted], tent structures [redacted] and dosimetry [redacted]	
[redacted]	Guard House located at the main entrance of the site.	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination. The former building footprint area remains within the South Side Supervised Area where normal site operations continue under the site license	
[redacted]	Meteorological Tower and sheds	N/A	N/A	Dismantled in a systematic fashion prior to complete removal of remainder of material, no events resulting in residual contamination. The footprint for the [redacted] MET Tower Facility will remain outside the Supervised Area where normal site operations continue under the site licence.	
[redacted]	Plant Cafeteria	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination. The former building footprint area remains within the South Side Supervised Area where normal site operations continue under the site license.	
[redacted]	Stores, Vehicle Garage Facility, carpentry shop, painting booth	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination. The former building footprint area remains within the South Side Supervised Area where normal site operations continue under the site license. Area nearby may contain hydrocarbon contamination due to refuelling practises as per known contaminated areas.	
[redacted]	Active Area Cold Storage	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination. The former building footprint area remains within the North Side Supervised Area where normal site operations continue under the site license.	
[redacted]	Cafeteria Garbage Shed	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination. The former building footprint area remains within the South Side Supervised Area where normal site operations continue under the site license.	

REDACTED

Facility[29]	Source Description	EMS Group (Activity)	Stream Type	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2])
[redacted]	Active Laundry and Decontamination Building	N/A	N/A	Decommissioned and remediated. The former building footprint area remains within the North Side Supervised Area where normal site operations continue under the site license. Residual Contamination possibly present because the footprint is down gradient of know contaminated area around [redacted] Area is being monitored as per known contaminated areas.	
[redacted]	Controlled Area 2 Entrance	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination.	
[redacted]	Warm Storage	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination. The former building footprint area remains within the South Side Supervised Area where normal site operations continue under the site license.	
[redacted]	Heated Storage, historically used as a geophysical laboratory by Applied Geoscience Branch, recently as storage of clean material.	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination. The former building footprint area remains within the North Side Supervised Area where normal site operations continue under the site license.	
[redacted]	Active (fissionable material) Area Storage	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination. The former building footprint area remains within the North Side Supervised Area where normal site operations continue under the site license.	
[redacted] and Organic Trap	WR-1 Organic Monitoring Building	N/A	N/A	Decommissioning initiated, some residual contamination present and the potential for release of residual HB40 and/or radioactivity to the processed outfall, no groundwater contamination anticipated.	
[redacted]	Cold Storage of Job Fabrication Materials	N/A	N/A	Building Removed, pad retained, underlying soil assessment needed. No events resulting in residual contamination. The building pad remains within the North Side Supervised Area where normal site operations continue under the site license.	

REDACTED

Facility[29]	Source Description	EMS Group (Activity)	Stream Type	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2])
[redacted]	Cold Storage for Mechanical/shop Fabrication	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination. The former building footprint area remains within the North Side Supervised Area where normal site operations continue under the site license.	
[redacted]	Historical Pump House, Internal Friction Laboratory	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination. The former building footprint area remains within the South-side Supervised Area where normal site operations continue under the site license.	
[redacted]	Historically, used as Aquatic Toxicology Lab.	N/A	N/A	Structure removed and donated to University of New Brunswick for fish research.	
[redacted]	Complex used to support research activities for the Environmental Research Branch.	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination. The former building footprint area remains within the Outer-area Supervised Area where normal site operations continue under the site license. [redacted] Annex taken to WL Landfill. Environmental Trailer repurposed at WL for fire training. [redacted] Shack donated to the Knights of Columbus in Lac du Bonnet, MB.	
[redacted]	Historical kitchen and cafeteria (oil heat). North extension added and building converted to a hydrostatic pressure testing laboratory. South extension added as an engineering laboratory. Lean-to added which housed an air compressor and hydraulic pump.	N/A	N/A	Decommissioned, no events resulting in residual contamination. The concrete pad was decommissioned and underlying soil screened. The former building footprint area remains within the South Side Supervised Area where normal site operations continue under the site license.	
[redacted]	Historical boiler house and later used as a concrete testing laboratory and offices and training facility for Emergency Services.	N/A	N/A	Decommissioned and remediated for hydrocarbon contamination as summarized in [81]. The former building footprint area remains within the South Side Supervised Area where normal site operations continue under the site license. Area is being monitored as per known impacted areas.	

REDACTED

Facility[29]	Source Description	EMS Group (Activity)	Stream Type	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2])
[redacted]	Historical Fire Hall. North extension added for carpentry shop, (heating oil), training facility for repair of small gasoline engines, housed a sandblasting equipment and grounds keeping equipment (lawn mowers, snow blowers, hand tools). Lean-to added for storage of carpentry equipment. Area was used as compressed gas and stores items and office area.	N/A	N/A	Decommissioned, no events resulting in residual contamination. The concrete pad was decommissioned and underlying soil screened. The former building footprint area remains within the South Side Supervised Area where normal site operations continue under the site license.	
[redacted]	Building [redacted] Temporary active waste storage shed for Immobilized Fuel Test Facility (IFTF) waste. Building [redacted] Temporary active waste storage shed for Shielded Facilities in [redacted] waste. Building [redacted] Temporary active waste storage shed for [redacted] waste. Building [redacted] Temporary active waste storage shed for [redacted]1 waste. Building [redacted] Temporary active waste storage shed for additional [redacted] waste.	N/A	N/A	Shed were dismantled, no events resulting in residual contamination. The concrete pads were screened and remediated where required but the soil was not tested for free release as the building footprint area remains within the north side Supervised Area where normal site operations continue under the site license.	
[redacted]	Building [redacted] storage shed and fence from the Borehole Test Area (BTA)	N/A	N/A	Shed was dismantled, no events resulting in residual contamination. The soil around the area was screened but not tested for free release as the building footprint area remains within the Outer Area Supervised Area where normal site operations continue under the site license.	
[redacted]	Building [redacted] Coffee Trailer	N/A	N/A	Structure removed and taken to WL Landfill.	

REDACTED

Facility[29]	Source Description	EMS Group (Activity)	Stream Type	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2])
[redacted]	Meteorology Trailer [redacted] used as a storage facility for data records and equipment for the Applied Geoscience work. Environmental Trailer	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination. The building footprint area remains within the North Side Supervised Area where normal site operations continue under the site license. Environmental Trailer was reused at site for storage of Environmental Field equipment.	
[redacted]	Borehole Instrumentation Test Facility and in recent years storage space for laboratory equipment and spare files and records	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination. The building footprint area remains within the South Side Supervised Area where normal site operations continue under the site license.	
[redacted]	Storage Shed for flammable liquids	N/A	N/A	Shed were dismantled, no events resulting in residual contamination. The concrete pads were screened but the soil was not tested for free release as the building footprint area remains within the Outer Supervised Area where normal site operations continue under the site license.	
[redacted]	Internal Friction Laboratory Annex	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination. The former building footprint area remains within the South Side Supervised Area where normal site operations continue under the site license	
[redacted]	Environmental Monitoring Storage Shed	N/A	N/A	Shed was removed, no events resulting in residual contamination. The concrete pad was screened but the soil was not tested for free release as the building footprint area remains within the Outer Supervised Area where normal site operations continue under the site license.	
[redacted]	South end pedestrian link building (between [redacted] and [redacted]	N/A	N/A	Decommissioned, land cleared, no events resulting in residual contamination. The former building footprint area remains within the South Side Supervised Area where normal site operations continue under the site license.	

REDACTED

Facility[29]	Source Description	EMS Group (Activity)	Stream Type	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2])
General Site Activities (Not Specific to One Facility or Location)					
Under the authority of the Canadian *Environmental Protection Act*, 1999 (CEPA, 1999), WL is required to calculate releases of Parts 1-5 substances for the NPRI program, using government reporting guidelines [26]. These releases to air include emissions caused by burning of Number 2 fuel oil and propane for heating (as discussed above), as well as diesel fuel used from site generators, dust emissions from unpaved roads, sandblasting and excavation projects. Emission factors are applied to fuel and sandblasting product consumption data, as well as estimated kilometres travelled on unpaved roads, to determine the amount of Criteria Air Contaminants (CACs) that are generated on site. Criteria Air Contaminants consist of carbon monoxide, oxides of nitrogen, sulphur dioxide, total (filterable) particulate matter (TPM), and particulate matter below 10 microns (PM10), particulate matter below 2.5 microns (PM2.5), and Volatile Organic Compounds (VOCs). Dust emissions from excavation projects were estimated based on a calculation for total particulate matter generated per excavation day. Dust generated from demolition activities is captured in the Progress Report on the Environmental Assessment Follow-up Program for Whiteshell Laboratories. Under the authority of the Canadian *Environmental Protection Act*, 1999 (CEPA, 1999), WL is required to calculate releases under the Greenhouse Gas (GHGs) emissions notice [27] providing the facility emits over 10,000 tonnes of carbon dioxide equivalent or more within the calendar-year. GHG emissions from WL include carbon dioxide, methane and nitrous oxide. Emissions are primarily from the burning of propane, the use of diesel generators, the on-site transportation fleet, the on-site landfill and open-pit wood burning. They are measured in CO_2 equivalent tonnes which is a measure used to compare between gases that have different Global Warming Potential (GWP). These emissions from the site have decreased over time due to the decrease in fuel required to heat the site as buildings are decommissioned. GHG emissions have decreased due to eliminating the use of Number 2 Fuel in 2013, which was historically the greatest contributor of GHG emissions at WL. In the atmosphere, halocarbons can contribute either to global warming or to ozone depletion, via separate mechanisms. Losses of halocarbon refrigerants and fire suppressants ≥10 kg are reported semi-annually to Environment Canada, pursuant to the *Federal Halocarbon Regulations* [25]. All releases over 100kg are reportable immediately.					
Site-Wide Backup Diesel Generators	Fuel used during routine testing and during operation in the event of a power outage. Emissions from generators brought on site by outside contractors.	Various	Point Intermittent Monitored (Estimate)	**Criteria (a), (h), (o):** NPRI: Emissions from generator diesel fuel combustion (Hg, NO_x, SO_2, CO, TPM, PM_{10}, $PM_{2.5}$ & VOCs) are reportable if the site-wide reporting thresholds for the substance(s) are met. **Criteria (a), (h), (k):** GHG: Emissions from generator diesel fuel combustion (CO_2e of CO_2, CH_4, N_2O) are reportable if the site-wide reporting threshold is met.	
Site-Wide Propane Use	Propane is used for heating buildings across the site as well as	Various	Point Continuou	**Criteria (a), (h):**	

REDACTED

Facility[29]	Source Description	EMS Group (Activity)	Stream Type	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2])
	other process type operations. Historically was mostly used for the heating of remote buildings but recent efforts have been converting a number of buildings over from the use of #2 fuel oil to the use of propane.		s Monitored (estimate)	NPRI: Emissions from stationary combustion (NO_x, SO_2, CO, TPM, PM_{10}, $PM_{2.5}$, and VOCs) are reportable if the site-wide reporting thresholds for the substance(s) are met. GHG: Emissions from stationary combustion (CO_2e of CO_2, CH_4, N_2O) are reportable if the site-wide reporting threshold is met.	
Site-Wide On-site Vehicle Transportation	Fuel emissions from WL vehicle fleets day-to-day operations (heavy and light). Emissions from Non-CNL fleet – contractors	Various	Fugitive Intermittent Monitored (Estimate)	**Criteria (a), (h):** GHG requires reporting of greenhouses gases from on-site transportation emissions (CO_2e of CO_2, CH_4, N_2O) if the site-wide reporting threshold is met.	
GHG emissions from: Landfill here – methane only as CO2e Lagoon here – CBOD as Methane	Release of Methane emissions from decomposition of materials within the Landfill and Lagoon	Various	Fugitive Continuous Monitored (Estimate)	**Criteria (a), (h):** GHG requires reporting of greenhouses gases from on-site emissions (CO_2e of CO_2, CH_4, N_2O) if the site-wide reporting threshold is met.	
Site-Wide Storage Tank Use	Storage Tanks containing products which can emit VOCs, passively release VOCs anytime the product is stored in them. These emissions vary depending on the type of product, amount of product and the specifics of the tank itself (size, design, colour, etc.),	Various	Fugitive Continuous Monitored (Estimate)	**Criteria (a), (h):** NPRI: All site VOC emissions are reportable under the NPRI if the site-wide reporting threshold is met.	
Site-Wide Halocarbon Releases	Site refrigeration systems, air-conditioning systems and fire-extinguishing systems which release halocarbons to the environment.	Various	Fugitive Intermittent Monitored (Estimate)	**Criteria (a):** FHR: All releases from refrigeration systems, air-conditioning systems and fire-extinguishing systems greater that 10 kg are reportable under the *Federal Halocarbon Regulations* (FHR).	

REDACTED

Facility[29]	Source Description	EMS Group (Activity)	Stream Type	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2])
Site-Wide Solvent Use	Use of paints, thinners, lacquers, solvents, lubricants, etc., on site which result in VOC emissions.	Various	Intermittent Monitored (Estimate)	**Criteria (a), (h):** NPRI: VOC estimations are required in order to determine if WL meets the reporting threshold under the NPRI Notice.	
Site-Wide Unpaved Road Dust	Dust emissions from traffic travelling on unpaved surfaces on site. For example, security checks, outer area operations, WMA activities, fire patrols and personal vehicle use on WL property (unpaved roadways).	Various	Intermittent Monitored (Estimate)	**Criteria (a), (h), (o):** NPRI: Emissions (TPM, PM_{10}, $PM_{2.5}$) are required to be reported under the NPRI if there were ≥ 10,000 Vehicle Kilometer Traveled (VKT) on unpaved surfaces on the WL property and the site-wide emission of particulates meets the reporting thresholds for each substance.	
Site-Wide Dust Emissions from Construction Activities	Dust emissions from various construction activity types taking place in both the built-up area as well as the outer area.	Various	Intermittent Monitored (Estimate)	**Criteria (a), (h), (i), (n), (o):** NPRI: Emissions (TPM, PM_{10}, $PM_{2.5}$) are required to be reported under the NPRI if they meet the site-wide reporting thresholds for each substance.	

Note: * Any source on site which is not necessarily facility specific such as emergency generators, building heating is summarized under "General Site Activities" instead of under each applicable facility.

CAC - Criteria Air Contaminant
CH_4 - Methane
CO_2 - Carbon dioxide
CO_2e - Carbon dioxide equivalent
EAA - Environmental Aspect Assessment Report
EMS - Environmental Management System
FHR - Federal Halocarbon Regulations
GHG - Greenhouse Gases
Hg - mercury
MPO - Manufacture, Process or Otherwise Use
N_2O - Nitrous oxide
NPRI - National Pollutant Release Inventory
PM_{10} - Particulate Matter 2.5 micron
$PM_{2.5}$ - Particulate Matter 2.5 micron
SF_6 - Sulphur hexafluoride
SO_2 - Sulphur dioxide
TPM - Total Particulate Matter
VOC - Volatile Organic Carbon

Note: Justification for Effluent Stream Criteria:
Criterion (a): (shall) If monitoring is designated for monitoring in, or required to demonstrate compliance with, a site or facility licence, statute, regulation, or permit.
Justification for Parameter(s) to be Monitored:
Criterion (h): (shall) If monitoring is explicitly specified by a site or facility licence, statute, regulation, or permit.
Criterion (i): (shall) If the results of an ERA or equivalent risk assessment indicate potential concern with the release of a contaminant, or with a physical stressor, then that contaminant or physical stressor shall be monitored.

REDACTED

Criterion (k): (shall) If there is an operational need to identify an unplanned or uncontrolled emission (reasonably foreseeable upset event) of a contaminant into the environment.
Criterion (n): (should) If a contaminant is likely to approach or has the potential to exceed regulatory emission limits or internal emission limits, then that contaminant should be monitored.
Criterion (o): (should) If a non-radioactive contaminant is a reportable substance under the *National Pollutant Release Inventory* (NPRI) and is released in an effluent stream at greater than 10% of the mass or concentration threshold for that contaminant, then it should be monitored.

REDACTED

Appendix F Assessment Table: Waterborne Effluents

Effluent Stream (Type)[30]	Source Description	Total MPER (mSv)/yr	Monitored? (Est. or Meas.)[31]	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2]).
1.0 Background/Reference Locations					
WL Intake	Winnipeg River Intake Well in [redacted]	NA	GB, GA Tot U See Table 15 and Appendix H for non-rad parameters	Background water being used to represent the water CNL uses prior to any processing, and use for process water, fire water, domestic water etc.	**Criterion (j):** Assigned to match the parameters for downstream locations and provide baseline data.
Winnipeg River @ Highway #211 Bridge	Winnipeg River Water	NA	See Table 15 and Appendix H for non-rad parameters	Background water sample to Verify water quality being used on site, upstream from the site location and impact.	**Criterion (j):** Assigned to match the parameters for downstream locations and provide baseline data.
Control Ditch	Control Ditch location along highway 211 and not impacted by WL operations	NA	GB, GA HTO γ-spec See **Table 16** and Appendix H for non-rad parameters	Background location that collects surface drainage from a location that is upstream of the outfall and not impacted by WL operations	**Criterion (j):** Assigned to match the parameters for downstream locations and provide baseline data.

REDACTED

30 From CSA Standard N288.5 [5].

31 The waterborne effluents requiring monitoring are all measured (not estimated).

Effluent Stream (Type)[30]	Source Description	Total MPER (mSv)/yr	Monitored? (Est. or Meas.)[31]	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2]).
2.0 Upstream Effluents (Batch Discharges)[32]					
[redacted] LAW [redacted] (Waterborne-Point-Batch) [redacted] LAW [redacted] (Waterborne-Point-Batch) [redacted] LAW [redacted] (Waterborne-Point-Batch) [redacted] LAW [redacted] (Waterborne-Point-Batch)	The SF low-level liquid waste flows by gravity to the Active Drain (AD) collection tanks, AD Tank [redacted] and AD Tank [redacted] in Building [redacted]. The low-level liquid waste from these tanks was pumped out automatically to the Active Liquid Waste treatment Center (ALWTC). An accurate determination of the SF contribution cannot be made as the SF low-level waste flows into a common tank with the low-level waste from Building [redacted] (sumps). In 2017 August, new Low Level Liquid Waste (LLLW) processing systems began operation in [redacted] All of the [redacted] low level liquid waste is now being tested, treated and controlled release to the river in the [redacted] LLLW system. All of the collection tanks in [redacted] were then isolated and taken out of service. The water sources from Building [redacted] that were routed through the R&D tanks in Building [redacted] includes decontamination, respirator and boot wash water [82] as well as [redacted] sump water for a combined total of 94% of total volumes in 2017.	[redacted] [redacted] [redacted] [redacted]	GA, GB, HTO γ-spec Sr-90 See Table 14 and Appendix H for non-rad parameters	**Criterion (a):** Shielded Facilities FA states "The Facility shall be operated in a manner such that radiation doses to the public and CNL personnel, due to radioactive substance releases and/or direct radiation fields, are less than the limits specified in the Radiation Protection Regulations and are ALARA, social and economic factors being taken into account." The LLLW CRD [39] states that "*Environmental emissions from the new LLLW treatment system shall be controlled so as to comply with the document "Derived Release Limits for Airborne and Liquid Effluents for Whiteshell Laboratories during Normal Operation"* [4] *and regulations under the Canadian Environmental Protection Act (CEPA).*" WL licence [3] limits in place, therefore monitoring in order to show evidence of compliance.	**Criterion (a) and (k):** WL licence [3] limits in place, therefore monitoring in order to show evidence of compliance. **Criterion (k):** Monitoring for GA, GB, Gamma and tritium is needed in order to identify any unplanned emissions (decommissioning work) or uncontrolled emissions. The expected form of radioactivity is tritium and beta/gamma and possibly alpha emitters. Hence monitoring is performed for these types of particulates. Sr-90 analysis is also performed as it is a major contributor to the gross beta activity in the tank effluent. **Criterion (k) and (n):** MISA process identified this release as a key process effluent which should be monitored prior to being diluted by OFS's flow in order to determine loading to the environment.

REDACTED

REDACTED

[32] MISA recommends collecting samples at locations prior to discharging to a watercourse, after final treatment of the effluent has taken place and/or upstream of any significant contaminant masking or significant dilution.

[redacted]LAW [redacted] (Waterborne-Point-Batch)	A Low Level Liquid Waste (LLLW) system was installed and put into service in 2017 August. This system replaces the WR-1 holding tanks in the ALWTC. This new system collects the low level liquid waste generated in Building [redacted] active sumps. After testing for pH, organic concentrations and gamma radiation levels and confirming they are below releasable quantities, the liquid waste is pumped out to the river. Low-level radioactive liquid waste generated from Building [redacted]/WR-1 operations, is primarily from the WR-1 sumps. There are not normally any hazardous liquid wastes generated from this facility.	[redacted]	GA, GB, HTO γ-spec Sr-90 See Table 13 and Appendix H for non-rad parameters	**Criterion (a):** As per the facility monitoring and surveillance plan [31] and end state report [70], radioactive materials shall be contained …through routine monitoring of the radioactive contaminants to ensure release remain within specified limits. Routine sampling will be maintained as long as Building [redacted] remains in operation. Sampling schedules require review in the event of any significant change in the building operating schedule." The LLLW CRD [39] states that "*Environmental emissions from the new LLLW treatment system shall be controlled so as to comply with the document "Derived Release Limits for Airborne and Liquid Effluents for Whiteshell Laboratories during Normal Operation"* [4] *and regulations under the Canadian Environmental Protection Act (CEPA).*" WL licence [3] limits in place, therefore monitoring in order to show evidence of compliance.	**Criterion (k):** Monitoring for GA, GB, Gamma and tritium is needed in order to identify any unplanned emissions (decommissioning work) or uncontrolled emissions. The expected form of radioactivity is tritium and beta/gamma and possibly alpha emitters. Hence monitoring is performed for these types of particulates. Sr-90 analysis is also performed as it is a major contributor to the gross beta activity in the tank effluent. C-14 analysis is required for [redacted] due to draining of the thermoshield and bioshield liquid into the [redacted] tank. **Criterion (k) and (n):** MISA process identified this release as a key process effluent which should be monitored prior to being diluted by OFS's flow in order to determine loading to the environment.

REDACTED

Effluent Stream (Type)[30]	Source Description	Total MPER (mSv)/yr	Monitored? (Est. or Meas.)[31]	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2]).
[redacted] LAW [redacted] (Waterborne-Point-Batch)	A Low Level Liquid Waste (LLLW) system was installed and put into service in 2017 August. This system replaces the WR-1 holding tanks in the ALWTC. This new system collects the low level liquid waste generated in Building [redacted] active sumps. After testing for pH,	[redacted]	GA, GB, HTO γ-spec Sr-90 C-14 See Table 13 and Appendix H for non-rad parameters	**Criterion (a):** As per the facility monitoring and surveillance plan [31] and end state report [70], radioactive materials shall be contained….through routine monitoring of the radioactive contaminants to ensure	**Criterion (k):** Monitoring for GA, GB, Gamma and tritium is needed in order to identify any unplanned emissions (decommissioning work) or uncontrolled emissions. The expected form of

REDACTED

Effluent Stream (Type)[30]	Source Description	Total MPER (mSv)/yr	Monitored? (Est. or Meas.)[31]	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2]).
[redacted] LAW [redacted] (Waterborne-Point-Batch)	organic concentrations and gamma radiation levels and confirming they are below releasable quantities, the liquid waste is pumped out to the river. Low-level radioactive liquid waste generated from Building [redacted]/WR-1 operations, is primarily from the WR-1 sumps. There are not normally any hazardous liquid wastes generated from this facility	[redacted]	GA, GB, HTO γ-spec Sr-90 See Table 13 and Appendix H for non-rad parameters	release remain within specified limits. Routine sampling will be maintained as long as Building [redacted] remains in operation. Sampling schedules require review in the event of any significant change in the building operating schedule." The LLLW CRD [39] states that "*Environmental emissions from the new LLLW treatment system shall be controlled so as to comply with the document "Derived Release Limits for Airborne and Liquid Effluents for Whiteshell Laboratories during Normal Operation"* [4] *and regulations under the Canadian Environmental Protection Act (CEPA)*." WL licence [3] limits in place, therefore monitoring in order to show evidence of compliance.	radioactivity is tritium and beta/gamma and possibly alpha emitters. Hence monitoring is performed for these types of particulates. Sr-90 analysis is also performed as it is a major contributor to the gross beta activity in the tank effluent. **Criterion (k) and (n):** MISA process identified this release as a key process effluent which should be monitored prior to being diluted by OFS's flow in order to determine loading to the environment.

REDACTED

Effluent Stream (Type)[30]	Source Description	Total MPER (mSv)/yr	Monitored? (Est. or Meas.)[31]	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2]).
Process Effluents to the River					
Process Outfall (Waterborne-Point Continuous) Weir and Ultrasonic Level	The primary source of liquid radioactive effluents is the process water outflow (Outfall), which discharges continuously to the Winnipeg River. The discharge from the Outfall is composed of storm water runoff from paved roadways or around buildings, water used in process and experimental facilities, and holding tank discharges including the new active liquid waste treatment system tanks based in Building [redacted] and Building [redacted] The ALWTC was taken out of service in 2017 as part of preparations for the decommissioning of Building [redacted] Holding tanks collect water containing low levels of radioactivity, as a result of cleanup activities associated with operational and decommissioning work, as well as historical activities at WL. Monitoring takes place in [redacted] which is located after all	[redacted]	M GA, GB, HTO γ-spec Sr-90 Pu-239/240 Pu-238 Total Uranium C-14 See Appendix H for non-rad parameters	**Criterion (a):** The WL Licence Handbook [4] requires that the licensee identify control and monitor all releases of radioactive and hazardous substances and effects on the environment from facilities or as the result of licensed activities. **Criterion (q):** Although routine emissions are very low, i.e., 3.2×10^{-3} mSv/yr to public (2016 to 2020 avg) this stream is WL's largest source of radioactive liquid effluent discharges to the Winnipeg River. Hence monitoring is performed for due diligence reasons. Under MISA, process effluent is required to be monitored at the final outfall after the	**GA** **Criterion (l):** The site-wide waterborne gross alpha emissions (0.0019 mSv/y) exceeds the 0.0001 mSv/y trigger, and this stream falls within the top 70% of contributors. **GB** **Criterion (l):** The site-wide waterborne gross beta emissions (0.0018 mSv/y) exceeds the 0.0001 mSv/y trigger, and this stream falls within the top 70% of contributors.

REDACTED

Effluent Stream (Type)[30]	Source Description	Total MPER (mSv)/yr	Monitored? (Est. or Meas.)[31]	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2]).
	contributions to the effluent but prior to reaching the Winnipeg River.			addition of process and other effluent streams.	**Others:** **Criterion (j):** Monitoring serves to support and confirm a public radiation dose assessment performed by the WL EMP. There is an interest in determining the contributors to gross alpha and gross beta because they exceed the trigger level. **Criterion (k):** There exists extensive OCM on the various facility inputs to this stream. However, EVMP monitoring parallels a defense-in-depth approach by serving as redundant and independent monitoring for unplanned or uncontrolled emissions. This includes tritium and the introduction of C-14 testing due to new waste streams as a result of decommissioning activities. **Criterion (k) and (n):** MISA process to support determination of effluent quality

REDACTED

Sewage Lagoon (SL2) (Waterborne-Point Continuous during discharge) Depth of the lagoon water Vertical Scale for relative depth observation	The secondary source of liquid effluent is the Sewage Lagoon (Lagoon). The Lagoon collects sanitary and wastewater from most buildings on the site, as well as from the laundry facility. Lagoon water residence time is more than three months, to allow for biodegradation and settling. Prior to each planned discharge, the secondary cell is isolated, and tested for a series of parameters [24]. If these are acceptable, the accumulated contents of the secondary cell only are released to the Winnipeg River via a small drainage ditch leaving the Lagoon's north side. The outflow of the Lagoon is continuously sampled during discharge.	[redacted]	M GA, GB γ-spec Sr-90 Pu-239/240 Pu-238 Total Uranium See Appendix H for non-rad parameters.	**Criterion (a):** The WL Licence Handbook [4] requires that the licensee identify control and monitor all releases of radioactive and hazardous substances and effects on the environment from facilities or as the result of licensed activities. Federal Wastewater Regulations [24] require this monitoring to be performed. **Criterion (q):** Although routine emissions are very low, i.e., 8.65×10^{-4} mSv/yr to public (2016 to 2020 avg), this stream constitutes a process effluent discharged directly to the Winnipeg River and monitoring is performed for due diligence reasons. The sediments in the lagoon are known to contain radioactive contamination.	**GA** **Criterion (l):** The site-wide waterborne gross alpha emissions (0.00093 mSv/y) exceeds the 0.0001 mSv/yr trigger, and this stream falls within the top 70% of contributors. **GB** **Criterion (l):** The site-wide waterborne gross beta emissions (0.00036 mSv/y) exceeds the 0.0001 mSv/yr trigger, and this stream falls within the top 70% of contributors. **Others:** **Criterion (a):** Monitoring serves to demonstrate compliance to Federal Wastewater Regulations. **Criterion (j):** Monitoring serves to support and confirm a public radiation dose assessment performed by the WL EMP. There is an interest in determining the contributors to gross alpha and gross beta because they exceed the trigger level.

REDACTED

Effluent Stream (Type)[30]	Source Description	Total MPER (mSv)/yr	Monitored? (Est. or Meas.)[31]	Justification: Effluent Stream (Criteria from [2])	Justification: Contaminant (Criteria from [2]).
					Criterion (k): There exists extensive OCM on the various facility inputs to this stream. However, EVMP monitoring parallels a defense-in-depth approach by serving as redundant and independent monitoring for unplanned or uncontrolled emissions. **Criterion (k) and (n):** MISA process to support determination of effluent quality.

REDACTED

WMA Surface (Ditch) Water: Related Effluents to River					
Ditch Location [redacted] and Ditch Location [redacted]	Small quantities of radionuclides at levels seen at the control point are also released to the Winnipeg River from the two ditches. Water from the recharge area east of the WMA is diverted around the WMA to the west-flowing ditch [redacted] and into the Winnipeg River. The other ditch [redacted], running northward, drains the land north of the WMA up to the site boundary and beyond. The volume of water in the ditches and resulting flow to the river is entirely dependent on rainfall and spring runoff	NA	M GA, GB γ-spec HTO Total Uranium See Table 14 and Appendix H for non-rad parameters	**Criterion (a):** The WL Licence Handbook [4] requires that the licensee identify control and monitor all releases of radioactive and hazardous substances and effects on the environment from facilities or as the result of licensed activities. **Criterion (q):** Although routine emissions are very low, (i.e., near screening levels for drinking water levels [60]) this stream constitutes a final effluent discharge to the Winnipeg River from WMA and monitoring is performed for due diligence reasons.	**All** **Criterion (k):** Monitoring serves to identify unplanned or uncontrolled emissions, i.e., to track WMA containment breach.

Note: **Justification for Effluent Stream Criteria:**
Criterion (a): (shall) If monitoring is designated for monitoring in-, or required to demonstrate compliance with- a site or facility licence, statute, regulation, or permit.
Criterion (c): (should) If total MPER exceeds 0.0005 mSv/yr (or 0.05%DRL) to off-site critical group. Normal emission rates, instead of MPER, may be used if an OCMP is in place.
Criterion (q): (should) Required for other business reasons (e.g., stakeholder concerns, due diligence, etc.
Justification for Parameter (s) to be Monitored:
Criterion (h): (shall) If monitoring is explicitly specified by a site or facility licence, statute, regulation, or permit.
Criterion (j): (shall) If effluent monitoring of a contaminant supports a radiation dose assessment or assessment of potential exposure, then that contaminant shall be monitored.
Criterion (k): (shall) If there is an operational need to identify an unplanned or uncontrolled emission (reasonably foreseeable upset event) of a contaminant into the environment.
Criterion (l): (should) If the site-wide MPER for a contaminant exceeds 0.0001 mSv/yr (or 0.01%DRL) to off-site critical group (then at least 70% of site emissions should be monitored).
Criterion (n): (should) If contaminant is likely to approach or has the potential to exceed regulatory emission limits.

REDACTED

Appendix G Calculation of Maximum α and β-γ Emission Rates for Various Effluent Streams Based on Radiological Safety Contamination Zoning of Vented Areas

[redacted]

RE

Appendix H Effluent Verification Monitoring Program History

WL has had a Radiological Effluent Monitoring Program since the early 1960s in an effort to assess potential dose to the public and to ensure the site effluent remained under regulatory limits.

A formal Non-Radioactive Effluent Monitoring Program began in 1994 at WL and was implemented for all effluent streams discharging to the Winnipeg River and for internal wastewater discharges to the processed outfall.

In 1986, the Ontario Ministry of the Environment (MOE) introduced the "Municipal/Industrial Strategy for Abatement (MISA)" program with the goal of virtual elimination of toxic chemical discharges to Ontario's surface waters. In order to accomplish this, the MOE needed to determine what was being discharged and in what amounts (stream characterization).

The MISA program consists of a series of phases. CNL's CRL site took part in the first "*pre-regulation phase*" which was designed to provide information and data for the development of effluent monitoring regulations. This phase consisted of "pre-regulation monitoring" which took place at CRL in the fall of 1988 and involved identifying, in conjunction with the MOE, various locations requiring monitoring as well as which type of monitoring (i.e., stream characterization). Among the types of effluents requiring monitoring are *process* effluents*, once-through-cooling water* effluents*, combined* effluents and *storm sewer* effluents.

Based on the data collected from this "*pre-regulation phase*"[83], general regulations for effluent monitoring were released in 1989 and then subsequently, effluent monitoring regulations specific to the Electric Power Generating Sector in 1995.

CNL has committed to continuing this monitoring at WL as the basis of a program for good environmental management and as required by its decommissioning licence. The monitoring program has gone through many changes since its inception and continues to evolve.

REDACTED

H.1 Description and Monitoring History for OFS and Intake

Table 18: Non-radiological effluent monitoring history and justification for OFS and Intake.

ATG	Parameter Name	Criteria for Monitoring-Parameter[33]	Justification for Monitoring of Parameter	Reference	Monitoring Frequency	Justification for Monitoring Frequency	Reference
Description and Monitoring History for OFS, Intake, and Winnipeg River at Bridge on Highway 211							
3	pH	(n), (p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality Site operations have the potential to affect the effluent's pH through chemical usage, or exposure to concrete	[83], [84]	OFS Wc Monthly for intake and Winnipeg River	1994: As recommended by MISA for characterization purposes.	[68]
6	Phosphorus, Unfiltered Total	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	OFS Wc Monthly for intake and Winnipeg River	1994: as recommended by MISA for characterization purposes.	[68]
7	Conductivity	(p)	1996: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[85]	OFS Wc Monthly for intake and Winnipeg River	1996: as recommended by MISA for characterization purposes.	[68]
8	Total Suspended Solids	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	OFS Wc Monthly for intake and Winnipeg River	1994: as recommended by MISA for characterization purposes.	[68]

[33] Criteria for Monitoring Parameters are covered in Section 7.3 of this document.

REDACTED

AT G	Parameter Name	Criteria for Monitoring-Parameter[33]	Justification for Monitoring of Parameter	Reference	Monitoring Frequency	Justification for Monitoring Frequency	Reference
Description and Monitoring History for OFS, Intake, and Winnipeg River at Bridge on Highway 211							
9	Chromium, Unfiltered Total	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	OFS Wc Monthly for intake and Winnipeg River	1994: as recommended by MISA for characterization purposes.	[68]
9	Copper, Unfiltered Total	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	OFS Wc Monthly for intake and Winnipeg River	1994: as recommended by MISA for characterization purposes.	[68]
9	Lead, Unfiltered Total	(p), (q)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality. Stakeholder Concern	[83], [84]	OFS Wc Monthly for intake and Winnipeg River	1994: as recommended by MISA for characterization purposes.	[68]
9	Nickel, Unfiltered Total	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	OFS Wc Monthly for intake and Winnipeg River	1994: as recommended by MISA for characterization purposes.	[68]
9	Zinc, Unfiltered Total	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	OFS Wc Monthly for intake and Winnipeg River	1994: as recommended by MISA for characterization purposes.	[68]

REDACTED

ATG	Parameter Name	Criteria for Monitoring-Parameter[33]	Justification for Monitoring of Parameter	Reference	Monitoring Frequency	Justification for Monitoring Frequency	Reference
Description and Monitoring History for OFS, Intake, and Winnipeg River at Bridge on Highway 211							
9a	Iron, Unfiltered Total	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	OFS Wc Monthly for intake and Winnipeg River	1994: as recommended by MISA for characterization purposes.	[68]
12	Mercury, Unfiltered Total	(p), (q)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality. Stakeholder Concern	[83], [84]	OFS Wc Monthly for intake and Winnipeg River	1994: as recommended by MISA for characterization purposes.	[68]
9	Full ICP metals scan	(p),(q)	2017: Metals list expanded to include all ICP metals as part of effluent stream characterization Stakeholder Concern 2020: Assessment of Characterization data	[86] [68]	OFS Wc Monthly for intake and Winnipeg River	1994: as recommended by MISA for characterization purposes.	[68]
14	Phenolics, Unfiltered React	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	OFS Wc Monthly for intake and Winnipeg River	1994: Grab sampling during Lagoon Discharge, Internal Tank Discharges	[68]
25	Solvent Extractables (Oil and Grease)	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	OFS Wc Monthly for intake and	1994: as recommended by MISA for characterization purposes.	[68]

REDACTED

ATG	Parameter Name	Criteria for Monitoring-Parameter[33]	Justification for Monitoring of Parameter	Reference	Monitoring Frequency	Justification for Monitoring Frequency	Reference
Description and Monitoring History for OFS, Intake, and Winnipeg River at Bridge on Highway 211							
					Winnipeg River		
93	Flow	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	Continuous at the OFS and Intake	1994: Monthly as recommended by MISA for characterization purposes.	[68]
-	Acute Rainbow Trout Toxicity Testing	(h)	2021: Reg Doc 2.9.1: The Licensee shall ensure that the effluent and emission monitoring demonstrate that controlled releases to water frequented by fish are not acutely toxic.	[86]	Quarterly at OFS	Frequency is to align with CRL testing.	

Note: Sampling Frequency: Wc = Weekly composite
ATG: Analytical Test Group
MISA: Municipal/Industrial Strategy for Abatement

REDACTED

H.2 Description and Monitoring History for Lagoon

Table 19: Non-radiological effluent monitoring history and justification for lagoon.

ATG	Parameter Name	Criteria for Monitoring-Parameter[34]	Justification for Monitoring of Parameter	Reference	Monitoring Frequency	Justification for Monitoring Frequency	Reference
Description and Monitoring History for Lagoon[35]							
-	Acute Rainbow Trout Toxicity Testing	(h)	2011: Introduced in 2011 in preparation for the full implementation of the Federal Wastewater Regulations for Lagoon emissions. 2026: Updates to the Federal Wastewater Regulations for Lagoon emissions.	[24]	Pre-discharge, discharge	2011: Grab Sample pre-discharge. 2026: Grab sampling during Lagoon discharge. If this sample fails, another sample is collected immediately, and every 2 weeks thereafter.	[24]
1b	CBOD	(h)	(h) Introduced in 2011 in preparation for the full implementation of the Federal Wastewater Regulations for Lagoon emissions.	[24]	Pre-discharge, discharge	2011: Grab Sample pre-discharge. Grab sampling during Lagoon discharge.	[24]
3	pH	(n), (p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality. Algae blooms in the spring have a tendency to drive the pH above the internal discharge criteria	[83], [84]	Discharge	1994: as recommended by MISA for characterization purposes. Grab sampling during Lagoon Discharge.	[68]

REDACTED

[34] Criteria for Monitoring-Parameters are covered under “Parameters to be Monitoring” section of this document.

[35] Submission of data under *Wastewater Systems Effluent Regulations* [24] is from grab data at the final effluent discharge point only. It is not to include pre-discharge sampling results.

ATG	Parameter Name	Criteria for Monitoring-Parameter[34]	Justification for Monitoring of Parameter	Reference	Monitoring Frequency	Justification for Monitoring Frequency	Reference
Description and Monitoring History for Lagoon[35]							
--	Unionized ammonia	(h)	Introduced in 2011 in preparation for the full implementation of the Federal Wastewater Regulations for Lagoon emissions.	[24]	Discharge	Grab sampling during Lagoon discharge.	[68]
6	Phosphorus, Unfiltered Total	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	Discharge	1994: as recommended by MISA for characterization purposes. Grab sampling during Lagoon Discharge	[68]
7	Conductivity	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83]	Discharge	1994: as recommended by MISA for characterization purposes. Grab sampling during Lagoon Discharge.	[68]
8	Total Suspended Solids	(h), (p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality. Requirement under the Wastewater Regulations for Lagoon emissions.	[24], [83], [84]	Discharge	1994: as recommended by MISA for characterization purposes. Grab sampling during Lagoon Discharge	[24], [68]
9	Chromium, Unfiltered Total	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	Discharge	1994: as recommended by MISA for characterization purposes. Grab sampling during Lagoon Discharge.	[68]
9	Copper, Unfiltered Total	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	Discharge	1994: as recommended by MISA for characterization purposes.	[68]

REDACTED

ATG	Parameter Name	Criteria for Monitoring-Parameter[34]	Justification for Monitoring of Parameter	Reference	Monitoring Frequency	Justification for Monitoring Frequency	Reference
Description and Monitoring History for Lagoon[35]							
9	Lead, Unfiltered Total	(p), (q)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality. Stakeholder Concern	[83], [84]	Discharge	1994: as recommended by MISA for characterization purposes.	[68]
9	Nickel, Unfiltered Total	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	Discharge	1994: as recommended by MISA for characterization purposes.	[68]
9	Zinc, Unfiltered Total	(p), (q))	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality. Stakeholder Concern	[83], [84]	Discharge	1994: as recommended by MISA for characterization purposes.	[68]
9a	Iron, Unfiltered Total	(q)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	Discharge	1994: as recommended by MISA for characterization purposes.	[68]
12	Mercury, Unfiltered Total	(p), (q)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	Discharge	1994: as recommended by MISA for characterization purposes.	[68]
14	Phenolics, Unfiltered React	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	Discharge	1994: Grab sampling during Lagoon Discharge.	[68]
25	Solvent Extractables (Oil and Grease)	(p)	1994: Core parameter required under MISA specifically for this	[83], [84]	Discharge	1994: as recommended by MISA for characterization purposes.	[68]

REDACTED

ATG	Parameter Name	Criteria for Monitoring-Parameter[34]	Justification for Monitoring of Parameter	Reference	Monitoring Frequency	Justification for Monitoring Frequency	Reference
Description and Monitoring History for Lagoon[35]							
			location as a gross indicator of effluent quality.				
--	Fecal Coliforms	(q)	Stakeholder Concern		Pre-discharge	1994: Grab sampling pre-discharge Lagoon Discharge	
--	Total Coliform	(q)	Stakeholder Concern		Pre-discharge	1994: Grab sampling pre-discharge Lagoon Discharge	
93	Discharge Volume	(h) (p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality. Requirement under the Wastewater Regulations for Lagoon emissions.	[83], [84]	Discharge	1994: as recommended by MISA for characterization purposes.	[68]

Note: ATG: Analytical Test Group;
MISA: Municipal/Industrial Strategy for Abatement;

REDACTED

H.3 Description and Monitoring History for Tanks and Ditches

Table 20: Non-radiological effluent monitoring history and justification for tanks and ditches.

ATG	Parameter Name	Criteria for Monitoring-Parameter [36]	Justification for Monitoring of Parameter	Reference	Monitoring Frequency	Justification for Monitoring Frequency	Reference
Description and Monitoring History for Tanks and Ditches							
3	pH	(n), (p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality. Site operations have the potential to affect the effluent's pH through chemical usage, or exposure to concrete	[83], [84]	Discharge for ditches and pre-discharge for tanks.	1994: Grab Sample during discharge as recommended by MISA for characterization purposes.	[68]
6	Phosphorus, Unfiltered Total	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	Dis	1994: Grab Sample during discharge as recommended by MISA for characterization purposes.	[68]
7	Conductivity	(p)	1996: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83]	Dis	1996: Grab Sample during discharge as recommended by MISA for characterization purposes.	[68]
8	Total Suspended Solids	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	Dis	1994: Monthly as recommended by MISA for characterization purposes.	[68]
9	Chromium, Unfiltered Total	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	Dis	1994: Grab Sample during discharge as recommended by MISA for characterization purposes.	[68]

[36] Criteria for Monitoring-Parameters are covered under "Parameters to be Monitoring" section of this document.

REDACTED

ATG	Parameter Name	Criteria for Monitoring-Parameter [36]	Justification for Monitoring of Parameter	Reference	Monitoring Frequency	Justification for Monitoring Frequency	Reference
Description and Monitoring History for Tanks and Ditches							
9	Copper, Unfiltered Total	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	Dis	1994: Grab Sample during discharge as recommended by MISA for characterization purposes.	[68]
9	Lead, Unfiltered Total	(p), (q)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality. Stakeholder Concern	[83], [84]	Dis	1994: Grab Sample during discharge as recommended by MISA for characterization purposes.	[68]
9	Nickel, Unfiltered Total	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	Dis	1994: Grab Sample during discharge as recommended by MISA for characterization purposes.	[68]
9	Zinc, Unfiltered Total	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	Dis	1994: Grab Sample during discharge as recommended by MISA for characterization purposes.	[68]
9a	Iron, Unfiltered Total	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	Dis	1994: Grab Sample during discharge as recommended by MISA for characterization purposes.	[68]
12	Mercury, Unfiltered Total	(p), (q)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality. Stakeholder Concern	[83], [84]	Dis	1994: Grab Sample during discharge as recommended by MISA for characterization purposes.	[68]

REDACTED

ATG	Parameter Name	Criteria for Monitoring-Parameter [36]	Justification for Monitoring of Parameter	Reference	Monitoring Frequency	Justification for Monitoring Frequency	Reference
Description and Monitoring History for Tanks and Ditches							
14	Phenolics, Unfiltered React	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	Dis	1994: Grab sampling during, Internal Tank Discharges	[68]
25	Solvent Extractables (Oil and Grease)	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	Dis	1994: Grab Sample during discharge as recommended by MISA for characterization purposes.	[68]
93	Discharge Volume	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[83], [84]	Dis	1994: Grab Sample during discharge as recommended by MISA for characterization purposes.	[68]
--	Total Organic Screening	(p)	1994: Core parameter required under MISA specifically for this location as a gross indicator of effluent quality.	[37], [38]	Pre-discharge and discharge	1994: Grab Sample as required by FA for characterization purposes.	[31]
9	Full ICP metals scan	(q)	2017: Metals list expanded to include all ICP metals as part of effluent stream characterization	[5]	Dis	2017: Grab Sample during discharge	[86]

Note: Sampling Frequency: Dis - grab sample on discharge or during flowing conditions in the ditch defined as when the water is visibly moving in the ditch
ATG: Analytical Test Group;
MISA: Municipal/Industrial Strategy for Abatement

REDACTED

Appendix I Analysis Methods

ATG	Parameter Name	Units	Labs	MISA Recommended Method	Method Description/ Method Reference	Lab Procedure
1	Chemical Oxygen Demand	mg/L	Bureau Veritas	Colorimetry	SM 24 5220D m	AB SOP-00016
1a	Biological Oxygen Demand	mg/L	Bureau Veritas	Oxygen electrode or Winkler Method	SM 24 5210B m	AB SOP-00017
1b	Carbonaceous Biological Oxygen Demand	mg/L	Bureau Veritas	Oxygen electrode or Winkler Method	Standard Method 5210B m	Based on SM-5210B
3	pH	-	Bureau Veritas	pH electrode or on-line analyzer	pH electrode - electrometric	EENVSOP-00159
			Bureau Veritas		pH electrode–electrometric SM 24 500H+ B	AB SOP-00005
			EM		pH electrode - electrometric	WL-127610-PRO-008032
4a	Total Kjedahl Nitrogen (TKN)	mg/L	Bureau Veritas	Colorimetry or Ion Chromatography	SM 24 4500-N C m, SM 24 4500 NO3m	Auto Calc (TN, N/N) SN 23 4500-NO3-I m, SM 22 4500-NO3-I m
4a	Total Ammonia (as N)	mg/L of (N)	Bureau Veritas	Colorimetry or Ion Chromatography	SM 24 4500 NH3 A G m	AB SOP-00007
--	Un-ionized ammonia	mg/L	Bureau Veritas	--	SM 24 4500 NH3 A G m, Calculation	Auto Calc (EPA 350.1 m)
4b	Nitrates, Total Filter Reactive	mg/L (N)	Bureau Veritas	Colorimetry or Ion Chromatography	SM 24 4500 NO3m	AB SOP-00091
5a	Dissolved Organic Carbon	mg/L (C)	Bureau Veritas	Digestion followed by Colorimetry	MMCW 119 1996 m	MMCW 119 1996 m
5b	Total Organic Carbon	mg/L (C)	Bureau Veritas	Digestion followed by Colorimetry	MMCW 119 1996 m	AB SOP-00087
6	Phosphorus, Unfiltered Total	mg/L (P)	Bureau Veritas	Colorimetry or ICP	SM 24 4500-P A,B,F m	AB SOP-00024
7	Conductivity, at 25C	µs/cm	Bureau Veritas	On-line analyzer or conductivity probe and meter	Conductivity probe and meter, SM 23 2510 B m	AB SOP-00005
			EM	On-line analyzer or conductivity probe and meter	Conductivity probe and meter	WL-127610-PRO-008033
8	Residue, Particulate (TSS)	mg/L	Bureau Veritas	Gravimetry	Modified Version of SM 2540D	AB SOP-00061

REDACTED

ATG	Parameter Name	Units	Labs	MISA Recommended Method	Method Description/ Method Reference	Lab Procedure
8a	Total Dissolved Solids (TDS)	mg/L	Bureau Veritas	Gravimetry	SM 24 2540 C m	Based on SM 2540C
9	Aluminum, Unfiltered Total	µg/L	Bureau Veritas	ICP	EPA 6020b R2 m	AB SOP-00043
			GEL		SW846 3005A/6020B	GL-MA-E-014 REV# 37
9	Boron, Unfiltered Total	µg/L	Bureau Veritas	ICP	EPA 6020b R2 m	AB SOP-00043
			GEL		SW846 3005A/6020B	GL-MA-E-014 REV# 37
9	Cadmium, Unfiltered Total	µg/L	Bureau Veritas	ICP	EPA 6020b R2 m	AB SOP-00043
			GEL		SW846 3005A/6020B	GL-MA-E-014 REV# 37
9	Chromium, Unfiltered Total	µg/L	Bureau Veritas	ICP	EPA 6020b R2 m	AB SOP-00043
			GEL		SW846 3005A/6020B	GL-MA-E-014 REV# 37
9	Copper, Unfiltered Total	µg/L	Bureau Veritas	ICP	EPA 6020b R2 m	AB SOP-00043
			GEL		SW846 3005A/6020B	GL-MA-E-014 REV# 37
9	Lead, Unfiltered Total	µg/L	Bureau Veritas	ICP	EPA 6020b R2 m	AB SOP-00043
			GEL		SW846 3005A/6020B	GL-MA-E-014 REV# 37
9	Lithium, Unfiltered Total	µg/L	Bureau Veritas	ICP	EPA 6020b R2 m	AB SOP-00043
			GEL		SW846 3005A/6020B	GL-MA-E-014 REV# 37
9	Nickel, Unfiltered Total	µg/L	Bureau Veritas	ICP	EPA 6020b R2 m	AB SOP-00043
			GEL		SW846 3005A/6020B	GL-MA-E-014 REV# 37
9	Silver, Unfiltered Total	µg/L	Bureau Veritas	ICP	EPA 6020b R2 m	AB SOP-00043
			GEL		SW846 3005A/6010D	GL-MA-E-013 REV# 34
9	Strontium, Unfiltered Total	µg/L	Bureau Veritas	ICP	EPA 6020b R2 m	AB SOP-00043
			GEL		SW846 3005A/6020B	GL-MA-E-014 REV# 37
9	Vanadium, Unfiltered Total	µg/L	Bureau Veritas	ICP	EPA 6020b R2 m	AB SOP-00043
			GEL		SW846 3005A/6010D	GL-MA-E-013 REV# 34
9	Zinc, Unfiltered Total	µg/L	Bureau Veritas	ICP	EPA 6020b R2 m	AB SOP-00043
			GEL		SW846 3005A/6020B	GL-MA-E-014 REV# 37

REDACTED

ATG	Parameter Name	Units	Labs	MISA Recommended Method	Method Description/ Method Reference	Lab Procedure
9a	Iron, Unfiltered Total	µg/L	Bureau Veritas	ICP	EPA 6020b R2 m	AB SOP-00043
			GEL		SW846 3005A/6020B	GL-MA-E-014 REV# 37
9a	Uranium, Unfiltered Total	µg/L	Bureau Veritas	ICP	EPA 6020b R2 m	AB SOP-00043
			GEL		SW846 3005A/6020B	GL-MA-E-014 REV# 37
10	Antimony, Unfiltered Total	µg/L	Bureau Veritas	Atomic Absorption or ICP	EPA 6020b R2 m	AB SOP-00043
			GEL		SW846 3005A/6010D	GL-MA-E-013 REV# 34
10	Arsenic, unfiltered Total	µg/L	Bureau Veritas		EPA 6020b R2 m	AB SOP-00043
			GEL		SW846 3005A/6020B	GL-MA-E-014 REV# 37
10	Selenium, Unfiltered Total	µg/L	Bureau Veritas		EPA 6020b R2 m	AB SOP-00043
			GEL		SW846 3005A/6020B	GL-MA-E-014 REV# 37
12	Mercury, Unfiltered Total	µg/L	Bureau Veritas	Cold Vapour with AA, ICP or Fluorescence	BCMOE BCLM Oct2013 m	AB SOP-00084
14	Phenolics, Unfiltered React	µg/L phenol	Bureau Veritas	Colorimetry	OMOE E3179 m	CAM SOP-00444
16	Volatiles, Halogenated	µg/L	Bureau Veritas	GC/MS	EPA 5021a/8260d m	AB SOP-00056
16	Chloroform	µg/L	Bureau Veritas			
16	1,1,1 Trichloroethane	µg/L	Bureau Veritas			
17	Volatiles, Non-Halogenated	µg/L	Bureau Veritas	GC/MS	CCME CWS/EPA 8260d m	AB SOP-00056
18	Volatiles, In Water	µg/L	Bureau Veritas	GC/MS	EPA 5021a/8260d m	AB SOP-00056
25	Solvent Extractables	mg/L	Bureau Veritas	Gravimetry	SM 24 5520B/5520F m	AB SOP-00092
27	Polychlorinated Biphenyls, Total	mg/L	Bureau Veritas	GC/MS	EPA 8082A R1 m	CAL SOP-00149
29	Barium	µg/L	Bureau Veritas	ICP	6020b R2 m	AB SOP-00043
			GEL		SW846 3005A/6020B	GL-MA-E-014 REV# 37
30	Chloride	mg/L	Bureau Veritas	Ion Chromatography Colorimetry	SM 24-4500-Cl/SO4-E m	AB SOP-00020
30	Sulphates	mg/L	Bureau Veritas	Ion Chromatography	SM 24-4500-Cl/SO4-E m	AB SOP-00020

REDACTED

ATG	Parameter Name	Units	Labs	MISA Recommended Method	Method Description/ Method Reference	Lab Procedure
				Colorimetry		
31	Total Residual Chlorine	mg/L	Bureau Veritas	Amperometry, potentiometry or colorimetry	SM 24 4500-Cl G m	AB SOP-00032
35	*E. coli*	Counts/100 mL	Bureau Veritas	Membrane filtration with mFC-BCIG	SM 24 9223 m	WIN SOP-00004
35	Fecal Coliforms	Counts/100 mL	Bureau Veritas	Membrane filtration, mEnterococcus agar	SM 24 9223 m	WIN SOP-00004
35	Total Coliforms	Counts/100 mL	Bureau Veritas	Membrane filtration, mEndo LES agar	SM 24 9221 B m	WIN SOP-00004
--	Flow	m^3/day		--	OFS Lagoon	N/A
--	Temperature Maximum	^oC	EM	--	Temperature probe and Meter	N/A
--	Alkalinity	mg/L (as $CaCO_3$)	Bureau Veritas	Titration, colorimetry	SM 24 2320B m	Based on SM-2320B
--	Hardness	mg/L (as $CaCO_3$)	Bureau Veritas	--	Hardness by Calculation - SM 2340B	BBY WI-00033

Note: ATG: Analytical Test Group
EPA: U.S. Environmental Protection Agency (1986)
Bureau Veritas: Bureau Veritas, Winnipeg, MB
GEL: GEL Laboratories LLC, Charleston, SC, USA
EM: Whiteshell Laboratories, Environmental Management

REDACTED

Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

Whiteshell Laboratories Environmental Monitoring Plan

WL-509200-PLA-002

Revision 1.2

REDACTED

Approved by:	George Dolinar	2025/09/24
	Director, Corporate Environmen	Date

Effective Date: 2025/09/24
Expiry Date: 2030/09/23

Refer to ATOM for current version. Printed copies should not be considered current without first consulting ATOM.

[redacted] This Information Asset (IA) and the elements of information contained within it are the property of Atomic Energy of Canada Limited (AECL).

This page is for Content Controls that apply to this document. If no Content Controls apply, none will be listed.

Intellectual Property NOTICE: The attached documents/files/information includes information owned/developed by CNL which has particular value to CNL's business interests (CNL IP). Access is restricted to authorized persons for authorized purposes only. Third party disclosure or use of CNL IP requires a license or nondisclosure agreement, depending on the nature of the information, failing which such disclosure or use is strictly prohibited.

REDACTED

Revision History

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
1.2	2025/09/29	Issued as "Approved for Use".	P. Vilks	R. Bilinsky	G. Dolinar
1.2D1	2025/09/22	Issued for "Review and Comment". Minor Changes: - Updated Tables 1, 3, 5. - Updated Section 5.2.6.2.	P. Vilks	R. Bilinsky A. Van Aert	
1.1	2023/10/31	Issued as "Approved for Use".	P. Vilks	R. Bilinsky	G. Dolinar
1.1D1	2023/10/10	Issued for "Review and Comment". Minor Changes: - Figures re-numbered. - Reference to figures updated. - [redacted] decommissioned, references to the monitoring has been removed. - Tables updated with tritium and organically bound tritium in native vegetation and garden vegetables monitoring. - Updated to new template.	P. Vilks	R. Bilinsky C. Kitson	
1	2021/01/28	Issued as "Approved for Use". Minor changes to address identified errors during use of the plan and to include additional quality assurance information.	K. Ross	R. Bilinsky	G. Dolinar
0	2019/05/10	Issued as "Approved for Use".	K. Ross	R. Bilinsky	G. Dolinar
D1	2019/03/12	Issued for "Review and Comment".	K. Ross	R. Bilinsky M. K. Boileau T. Donnelly P. Patel	

REDACTED

Table of Contents

Section **Page**

1. Purpose and Scope 6
2. Definitions 6
3. WL Site Operations 7
4. Need for an Environmental Monitoring Program 8
5. Systematic Informed Planning Process 10
5.1 Step 1: Objectives of the EMP 10
5.2 Step 2: Information Required to Meet the Defined Objective 10
5.2.1 Media to be Monitored 11
5.2.2 Frequency of Monitoring 11
5.2.2.1 Deviation from the Default Monitoring Frequency 18
5.2.3 Duration of Monitoring 18
5.2.4 Sampling and Analysis 19
5.2.5 Locations to be Monitored 19
5.2.6 Parameters to be Monitored 40
5.2.6.1 Chemical Parameters, Physical Stressors of Effect to be Monitored 40
5.2.6.2 Radionuclides 40
5.2.7 Quality Assurance (QA) and Quality Control 50
5.2.7.1 Field Quality Verification Monitoring 51
5.2.8 Additional Monitoring Details 52
5.2.8.1 Type of Data to be Collected 52
5.3 Step 3: Boundaries of the EMP 52
5.4 Step 4: How the Monitoring Results will be Used to Meet the Defined Objectives 56
5.4.1 Monitoring to Assess the Level of Risk to Human Health 56
5.4.2 Monitoring to Demonstrate Compliance with Limits 56
5.4.2.1 Regulatory Limits 57
5.4.2.2 Background Screening Criteria 57
5.4.2.3 Benchmark Values (BV) 64

REDACTED

5.4.3 Short-Term Evaluation of EMP Data 69
5.4.3.1 Short and Long-Term Evaluation of EMP Data 74
5.4.3.2 Long-Term Evaluation of EMP Data 74
5.4.4 Monitoring to Confirm the Effectiveness of Containment/Effluent Controls 74
5.4.4.1 Relocation of Water from Sumps, Standing Water and/or Excavations within the WL WMA 75
5.4.4.2 Relocation of Water from Manholes and/or Excavations on the WL Main Campus 76
5.4.5 Monitoring to Provide an Indication of Unusual or Unforeseen Circumstances . 77
5.4.6 Verify Model Predictions, Refine Models, and Reduce Uncertainty in Model Predictions 78
5.4.7 Monitoring to Demonstrate Due Dilligence 78
5.5 Step 5: Performance and Acceptance Criteria 78
5.5.1 Performance Criteria 78
5.5.2 Acceptance Criteria 79
5.5.3 LMDL's versus WL Monitoring Limits 79
5.5.4 Data Acceptance Criteria 79
5.6 Step 6: Detailed Design of the EMP 80
5.6.1 Planned Samples and Analysis 80
6. Modification of the EMP 80
6.1 Additions to the EMP 81
6.2 Reduction of Monitoring 81
7. References 81
Appendix A Figures 87

Figures

Figure 1: Near Field Map of WL Site 8
Figure 2: Short-Term Evaluation of Surface Water Monitoring Data 70

Figure A-1: Main Campus TLD Placement 87
Figure A-2: WL Monitoring Locations 88

REDACTED

Figure A-3: WL Canioster TLD Monitoring Locations 89
Figure A-4: WL Land Gamma Outer Area Monitoring Locations 90
Figure A-5: WL WMA Monitoring Locations 91
Figure A-6: WL WMA Surface Water Run-off Locations 92
Figure A-7: WL WMA Surface Water Run-off Monitoring Locations 93
Figure A-8: WL Landfill 94
Figure A-9: WL Main Campus and Lagoon 95
Figure A-10: WL Drainage in Vicinity of WL WMA 96
Figure A-11: Site Wide Water Table Elevation Contours 97
Figure A-12: WL Site Conceptual Model 98
Figure A-13: Sagkeeng Reports Site Specific Medicine, Berries and Other Food Plants 99

Tables

Table 1: Criteria and Justification for Monitoring of Environmental Media and Default Frequencies 12
Table 2: Summary of Residual Effects from WL Decommissioning Activities 20
Table 3: Need for Monitoring of Locations 24
Table 4: Dose Contribution by Radionuclide for the WL Site 41
Table 5: Criteria and Justification for Monitoring of Parameters 42
Table 6: Non-Radiological Parameters and Frequencies for Environmental Samples 49
Table 7: Field QV Frequency Recommended by MISA 51
Table 8: Summary of WL Monitoring Activities 53
Table 9: Environmental Monitoring Radiological Method Detection Limits (MDL) and Background Values 57
Table 10: Non-Radioactive Background Values for the Whiteshell Laboratories Site and their Comparison to Current Laboratory Method Detection Limits (MDL) 61
Table 11: Environmental Monitoring Radiological Method Detection Limits (MDL) and Benchmark Values (BV) 65
Table 12: Non-Radioactive Benchmark Values for the Whiteshell Laboratories Site and their Comparison to Current Laboratory Method Detection Limits (LMDL) 71
Table 13: Radiation Screening Criteria 76
Table 14: Targets for Percentage of Planned Samples to be Obtained in all Environmental Media 79

REDACTED

1. Purpose and Scope

This monitoring plan documents details of the Environmental Monitoring Program (EMP) for Whiteshell Laboratories (WL) including the decision for the need and development of the program, and shows how the planned monitoring meets the objectives of the program. It also documents and provides justification for the monitoring activities that are part of the EMP.

The EMP was developed and is executed in such a way as to conform to the *Municipal/Industrial Strategy for Abatement (MISA)* program [1] and the effluent regulations for the Electric Power Generating Sector [2], and to comply with:

- Conditions in the WL Operating Licence [3] and Licence Conditions Handbook [4];
- The WL framework document, Whiteshell *Laboratories Integrated Environmental Monitoring Program Framework* [5];
- The Environmental Protection Program procedure, *Environmental Monitoring Program* [6];
- Canadian Standards Association (CSA) N288.4-10 [7];
- The WL Environmental Assessment Follow-up Program [8];
- Other applicable regulations and standards; and
- Canadian Nuclear Laboratories (CNL) policies.

This plan addresses the monitoring of contaminants and meteorological parameters at the WL Site.

This monitoring plan does not address any Effluent Verification Monitoring or Operational Control Monitoring in place at WL as a result of the requirements outlined in the Environmental Protection Program procedure, *Management and Monitoring of Emissions* [9].

This document is primarily intended for use by groups or laboratories which are directly involved in the WL Environmental Monitoring Program.

Note that the EMP is dynamic in nature and is continually evolving. As a result, this plan is current as of its issuance but does not necessarily completely reflect the program after this date. The most current monitoring schedules should always be consulted [10].

REDACTED

2. Definitions

For terms not defined below, refer to Appendices A and B in 900-509200-PDD-001, *Environmental Protection Program Description Document* [11] and *Environmental Monitoring Program* [6] for definitions and acronyms pertaining to this document. For additional terms, refer to the Acronyms, Abbreviations, and Definitions of Terms web page on the CNL Intranet.

Environmental media	Refers to both biotic and abiotic components of the environment. Environmental media is also referred to as media (or a medium) [7].
Pathway	Route of pollutant from source to receptor through one or more environmental media or compartments [7].

Pathways monitoring	Monitoring contaminant levels in abiotic or biotic components in the environment [7].
Receptor	A biological entity that can be exposed to contaminants or physical stressors, and might be subject to associated effects [7].
Reference area	A sampling area that has no effluent exposure from the facility in question; and has natural habitat features that are similar to those of the exposure areas, including anthropogenic areas [7].
Uncertainty	A quantitative expression of error that results from incomplete knowledge of information about a parameter or value [7].

3. WL Site Operations

Whiteshell Laboratories (WL) was established by Atomic Energy of Canada Limited (AECL) in the early 1960s to carry out nuclear research and development activities. The site is a Class 1B nuclear facility which encompasses an area of 4,375 hectares as shown in Figure 1. The WL site is owned by AECL and operated by CNL under a licence [3] issued by the Canadian Nuclear Safety Commission (CNSC). The WL site is located near Pinawa, Manitoba; approximately 100 kilometres northeast of Winnipeg, on the east bank of the Winnipeg River. It is downstream from the towns of Pinawa and Seven Sisters Falls, and upstream of the communities of Lac du Bonnet and Pine Falls.

The Whiteshell Reactor-1 (WR-1) organic-cooled experimental test reactor was shut down in 1985. AECL made a business decision in 1997 to discontinue most of the research programs and operations at WL. Subsequently, AECL received government concurrence in 1998 to proceed with actions to achieve closure of WL.

In 2014, Canadian Nuclear Laboratories (CNL) Ltd. was created as a wholly owned subsidiary of AECL. Implementation of the Government-Owned, Contractor-Operated model was achieved with share transfer of CNL from AECL to Canadian National Energy Alliance (CNEA) in 2015 September.

Activities to complete the orderly decommissioning of the WL site, following the general plan laid out in the Comprehensive Study Report (CSR) [12] [13] [14] supporting the approval of the Environmental Assessment of the WL Decommissioning Project have been underway since 2003 January.

The major operating facilities are the Shielded Facilities, and the Waste Management Area (WMA). The Shielded Facilities includes the Hot Cell Facility and the Immobilized Fuel Test Facility area which includes a decontamination center and waste processing/handling area. Areas undergoing sampling and characterization activities include WR-1 Reactor Building and Active Liquid Waste Treatment Center (ALWTC). The ALWTC was shut down near the end of 2017, and is now being decommissioned. In total, these facilities are the major sources of radiological airborne effluent releases from the site. The primary source of liquid effluent releases at WL is the process water outfall (Outfall), which discharges continuously to the

REDACTED

Winnipeg River. The secondary source of liquid effluent is the sewage lagoon (Lagoon), which is normally discharged semi-annually to the Winnipeg River.

Finally, the site contains numerous smaller non-nuclear facilities, development and analytical laboratories and support facilities (Power House, various workshops, maintenance shops, etc.). Industrial boilers are operated at the Power House to provide steam heating to the majority of the site, while some facilities in the outer areas are heated with propane.

Waste management facilities designed for the storage or disposal of wastes are located in WMA. Radiological and non-radiological contaminants that appear in groundwater down gradient of the WL WMA and other monitoring sites are largely the result of early operations.

More detailed information regarding population, as well as topography, land use, hydrography, and meteorology pertaining to the site is available in the WL Derived Release Limits document [15].

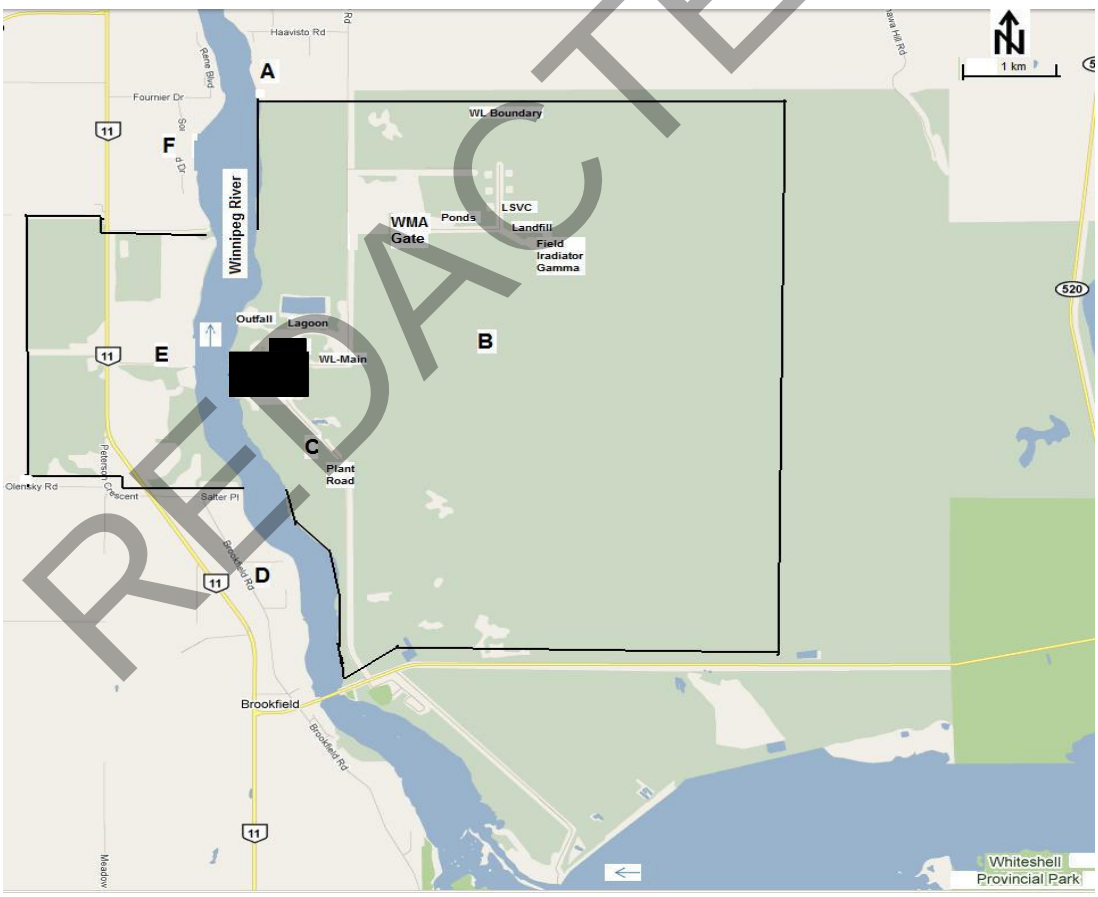


Figure 1: Near Field Map of WL Site

4. Need for an Environmental Monitoring Program

The criteria used to determine whether there was a need to establish an EMP for the Whiteshell site are outlined in *Environmental Monitoring Program* [6]. The criteria which were

REDACTED

met, thereby requiring the need to establish the EMP, are identified below. Note that only one of the criteria need be met to warrant the establishment of a program.

a) *A governing statute, regulation, licence, or permit requires it;*

Clause 1.8 of the current site Licence [3] and Licence Conditions Handbook [4] states that the "licensee shall implement and report on the progress of the Environmental Assessment Follow-Up Program" which identifies the requirement for maintaining an environmental monitoring program. Clause 11.1 of these two documents also state "The licensee shall implement and maintain an environmental protection program".

b) *The results of an Environmental Risk Assessment (ERA) (or equivalent) indicate a likelihood that the concentration of a contaminant or the intensity of a physical stressor could exceed a Benchmark Value (BV);*
Based on the results of the assessment of the low-level waste trenches (Volume 2 Appendix C of [13]) performed as part of the Comprehensive Study Report for the Whiteshell Laboratories site, there is reasonable likelihood that the concentration of some hazardous substances and/or physical stressors in the soil, surface water and groundwater within the WMA could exceed benchmark values. This is also the case for abandoned active drain lines and previously impacted areas on the main campus of the WL site.

c) *The effective dose to members of an off-site critical group from all radioactive emissions from the site during normal operations and anticipated transients is estimated to exceed 5×10^{-5} Sv (or 0.05 mSv) per year* [7][1];

Based on public dose assessments for WL for the most recent five years of normal operation (including anticipated transients), the threshold in *(c)* of 0.05 mSv per year is not exceeded. The calculated effective dose to off-site members of the public (i.e. critical groups) from all radioactive emissions from WL ranged from 0.00004 mSv in 2015 to 0.0014 mSv in 2014.

d) *The potential effective dose to members of an off-site critical group from all radioactive emissions from the site in the event of an accident is estimated to exceed 1×10^{-3} Sv (or 1 mSv) per year* [16];

In the event of a deflagration event inside a standpipe if there were flammable mixtures of gas in the void space of a standpipe and an ignition source, and a pyrophoric fire if there were flammable material and an ignition source this has the potential to result in a significant airborne release of radioactivity that could result in a dose up to 17 mSv to members of an off-site critical group [17].

e) *There are uncertainties in environmental transfer parameters such that emissions from the site could potentially cause doses exceeding the levels in c) or d); or*

Emissions from the site are not expected to cause doses exceeding the levels in *(c)* and *(d)*

[1] From Annex B 1.6.5 Calculated doses will be compared to the 1 mSv/a public dose limit and the benchmark of 50 uSv/a, which is a trigger for ALARA assessment under CNSC Regulatory Guide G-129

REDACTED

There are other business reasons, i.e., stakeholder concerns, due diligence, etc.
Stakeholders want assurance that CNL is managing the site in an environmentally responsible manner.

5. Systematic Informed Planning Process

The EMP for WL was developed following a systematic, informed planning process, defined in CSA N288.4-10 [7] as consisting of six iterative steps:

STEP 1: Define the objectives of the EMP (Section 5.1).

STEP 2: Identify the information required to meet the defined objectives (Section 5.2).

STEP 3: Define the boundaries of the EMP (Section 5.3).

STEP 4: Determine how the data collected will be used to achieve the defined objectives (Section 5.4).

STEP 5: Specify performance and acceptance criteria (Section 5.5).

STEP 6: Develop the detailed design of the program that will be implemented to obtain the required data (Section 5.6).

Sections 5.1 to 5.6 provide details on each of these six steps.

The same systematic, informed planning process is applied when making changes to the EMP.

5.1 Step 1: Objectives of the EMP

The objectives of the WL EMP are shared among all of CNL's EMPS and are therefore defined in *Environmental Monitoring Program* [6].

5.2 Step 2: Information Required to Meet the Defined Objective

In order to identify the information required to meet the defined objectives of the program, a set of monitoring criteria was established and is documented in *Environmental Monitoring Program* [6]. These include criteria that are specific to the environmental media to be monitored, the locations to be monitored, and the parameters to be measured.

Detailed sampling design to address these criteria is described in Sections 5.2.1 to 5.3. Justification is provided, in the context of the criteria, for the locations to monitor, selection of environmental media to sample, and contaminants to monitor for. In addition, further details are provided on the frequency and duration of monitoring based on guidance provided in *Environmental Monitoring Program* [6].

There have been many environmental studies completed in addition to those in the routine monitoring program. This available monitoring information was taken into account in the development of the site's *Comprehensive Study Report* [12] [13], from which its results feed back into the decision making process as to what should be monitored under the routine EMP.

The exercise of identifying information to be obtained was completed both during the initial setup of the program and again over time as the program develops.

REDACTED

5.2.1 Media to be Monitored

The environmental media chosen for monitoring in and around WL include all media that trigger the environmental monitoring criteria.

The environmental media in which radioactive contaminants are measured are those that could contribute to the estimated dose to both human and non-human receptors. The selection of appropriate media is based on an understanding of receptor exposure pathways. A description of the exposure pathways for human receptors living near WL can be found in *Derived Release Limits (DRLs) for AECL's Whiteshell Laboratories* [15] and a description of the exposure pathways for non-human receptors living on or near WL can be found in the CSR [12].

The following principles are considered in the selection of environmental media for pathways monitoring:

- Where practical, monitoring is done near the end of a pathway (i.e. closer to the receptor) to reduce the uncertainties that arise from inaccuracies in the exposure/pathway models and transfer coefficients.
- The fate and distribution of the radionuclides along the pathway linking the source to the receptor are considered when selecting the media to be sampled.
- The mobility of the receptor relative to the area of contamination is considered when selecting the media to be sampled.

The selection of environmental media to be sampled and of contaminants to be measured in each medium also considers the feasibility of sampling the medium, obtaining quantitative results distinguishable from natural background, and obtaining measurements when estimated concentrations have high uncertainty.

A matrix of the relevant environmental media and their relation to the environmental monitoring criteria is summarized in Table 1.

5.2.2 Frequency of Monitoring

Subject to the considerations noted in *Environmental Monitoring Program* [6] and N288.4 [7], default monitoring and sample collection frequencies are provided in Table 1.

Samples are analyzed at the same frequency as sample collection, except where frequent sub-samples are collected for the purpose of preparing a composite (e.g. drinking water). Concentrations in the environment may vary considerably from point-to-point and day-to-day (due to temperature variations, air and water currents, and other factors). Where variability is high or unknown, a representative sample can be obtained by collecting a composite sample. This sample has a better chance of being closer to the average representative sample than any of the small samples making it up.

Deviations from the default monitoring frequencies are discussed in Section 5.2.2.1 and are justified on a case-by-case basis.

REDACTED

Table 1: Criteria and Justification for Monitoring of Environmental Media and Default Frequencies

Environmental Component	Media	Monitoring Frequency	Analysis Frequency[2]	Environmental Media Criteria (q)	(r)	(s)	(t)	(u)	(v)	Justification
Air Quality and Noise: To what extent are human and non-human receptors affected by airborne effluents, radiation fields and noise generated by Whiteshell? Is there a record of any long-term accumulation of radiation or changes in radiation fields? Can we verify the DRL model?	Ambient Air included	Continuous measurement by TLDs	Annual change out[3]	×	×	×				(q) Monitoring, and recording of the gamma fields on contact with, and in the immediate vicinity of, each fuelled canister is required by the CCSF FA [18] and SAR [19] documents which are referenced in WL Site Licensing Handbook [4]. Perimeter TLD monitoring is performed as confirmatory monitoring for the CCSF, WMA [17]. Radiation surveys within [redacted] [20] and [redacted] [21] are also required. TLD monitoring is also conducted around [redacted] and [redacted] Shielded Facilities [22] to confirm background radiation levels. (r) External exposure to, and inhalation of contaminants in ambient air could contribute to the dose to non-human receptors. (s) TLD monitoring in the vicinity of the former [redacted] ALWTC is conducted to monitor the remaining radiation field from the [redacted] demolition site. Of particular concern was the MLW storage tank [redacted] which has been removed. Another area of concern is 7 meters southeast of the ALWTC near active drain line break that occurred in 1980 as stated in the AL [23]. Note: The annual ambient gamma radiation at WL and the surrounding area is monitored by means of thermoluminescent lithium fluoride dosimeters (TLDs).
	Ground Surfaces included	Annual Land gamma surveys – must be performed before the first snowfall	Annual	×		×				(q) Contamination could be spread by vehicles that travel between the controlled area and the supervised areas (e.g. WMAs), and by vehicles leaving the WL site. This was described as a potential residual effect in the CSR [12] as per Table 2 release of airborne radioactivity. (s) Gamma dose rates are measured annually on and off the WL site. Of particular interest is east side of the AWLTC due to the nature of the activities conducted in the facility and historical spills. Land gamma surveys are also conducted around [redacted] [24] and [redacted] Shielded Facilities [22] to confirm background radiation levels. Note: Off-site road monitoring is not used directly in estimating dose to human receptors. It is primarily intended to serve as a gross trend indicator since it represents an intermediate step in environmental exposure pathways. The survey is part of the terrestrial monitoring performed to provide verification that there has not been a build-up of radioactivity due to deposition of air emissions from the site. This monitoring serves primarily as a gross trend indicator providing, for

[2] Monitoring frequencies are in line with Environmental Protection Program requirements from 900-509200-STD-010 [6], unless otherwise indicated within this table, and as outlined in Section 5.2.2.1 of this document.

[3] These TLDs may be changed out more frequently at the request of the Facility Manager, or if there was an unexpected increase in activity indicated in the air effluent data, or failure of the air monitoring equipment.

REDACTED

Environmental Component	Media	Monitoring Frequency	Analysis Frequency[2]	Environmental Media Criteria (q)	(r)	(s)	(t)	(u)	(v)	Justification
										example, baseline data for emergency preparedness and response purposes. It also provides an indication of radiation fields that may be emanating from buildings on site where radioactive materials are stored or processed.
	Wet/Dry Deposition included	Continuous - Monthly collection	Monthly							Note: Not triggered by any criteria. Monitoring of total wet and dry atmospheric deposits is primarily intended to serve as a gross trend indicator since it represents an intermediate step in environmental exposure pathways. This monitoring serves to verify the predictions made by the DRL model (i.e. groundshine). It also serves as a baseline for emergency preparedness purposes and provides confirmation of the absence of significant quantities of radioactive particulate material in airborne emissions. This monitoring is part of the WL EAFP [8].
	Noise	Noise Monitoring	At time of activity			×				(s) As identified in the CSR [12] as per Table 2, noise during periods of demolition and site restoration could impact some sensitive receptors if conducted during times of wildlife breeding, migration or could negatively impact feeding patterns [12]. Work is to be planned such that these noisy activities are only sporadic, short in duration and limited to daytime.
	Airborne Releases			Airborne releases area monitored as part of the Effluent Verification Monitoring Program (EVMP), the details of which are documented in program specific documentation [25].						
Surface Water and Public Health: Are human and non-human receptors getting a dose from WL liquid effluents as a result of drinking water from the Winnipeg River? Are the ditches draining the Waste Management Area releasing	Winnipeg River Water included	Monthly composite of daily samples, except for K-11 which is monthly composite of weekly samples	Monthly	×	×					(q) (shall) Sampling of river water is required as part of the WL EAFP [8] which is WL Site Licence condition 1.8 [3] and referenced in WL Site Licensing Handbook [4]. (r) (shall consider) Immersion in (e.g. swimming, washing, etc.), and ingestion of contaminated river/lake water could potentially contribute to human dose [15]. (o) (may) River water has been identified as a Valued Component to the Sagkeeng Anicinabe [26] and to members of the MMF [27].
	Surface Water Run-off from WMA (Ditch Water) included	Periods of Flow[4]	At time of sampling	×		×	×			(q) (shall) The WMA Facility Authority [28] document and WMA Safety Analysis [17] document states "Surface drainage water shall be sampled and analysed for activity levels monthly during the months when surface waters are present and not frozen". These two documents are referenced in the WL Site Licensing Handbook [4]. (s) (should) Ditch water is anticipated to contain contaminants/physical stressors of concern as identified in the CSR [12] as per Table 2 and should be included in the EMP. (t) (should) Ditch water in which contaminant BVs have been exceeded or

[4] When ditches have flowing water, usually after a rain event (>5 millimetre of rain in a 24-hour period, preceded by at least 48 hours of no precipitation) or snow melt and not more than weekly unless there is some operational concern that triggers additional sampling.

REDACTED

Environmental Component	Media	Monitoring Frequency	Analysis Frequency[2]	Environmental Media Criteria (q)	(r)	(s)	(t)	(u)	(v)	Justification
radioactivity from the WMA to the river? Is there radioactivity in dugouts, catch trays, sumps, excavations and manholes that must not be allowed to reach the river?										are predicted to be exceeded should be considered for inclusion in the EMP for measurement of those same contaminants CSR [12] as per Table 2.
	Dugouts included	Annual Measurement	At time of sampling			×				(s) (should) These surface and ground waters have the potential for containing contaminants/physical stressors of concern identified in the CSR [12] as per Table 2(leaks from existing facilities or contamination during remediation) and should be included in the EMP. Landfill dugout water is known to have elevated levels of tritium (not above BVs) [29].
	Misc catch trays, Sumps, Excavations, Manholes	Pre-discharge collection	At time of sampling			×	×			(s) (should) These surface and ground waters have the potential for containing contaminants/physical stressors of concern identified in the CSR [12] as per Table 2 (leaks from existing facilities or contamination during remediation) and should be included in the EMP. (t) (should) Any environmental media in which contaminant BVs have been exceeded or are predicted to be exceeded as per Table 2 should be considered for inclusion in the EMP for measurement of those same contaminants.
	WMA Catch/Containment Tray for Underground Amine Waste Tank[5]	Monthly (when accessible)	At time of sampling			×	×			(s) (should) The water in the catch/containment tray has the potential for containing contaminants/physical stressors of concern identified in the CSR [12] as per Table 2 (leaks around existing facilities) and should be included in the EMP. (t) (should) Any environmental media in which contaminant BVs have been exceeded or are predicted to be exceeded as per Table 2 should be considered for inclusion in the EMP for measurement of those same contaminants.
Aquatic Biota[6] and Public Health Do human receptors receive a dose from WL water effluents by consuming fish?	Fish[7] (walleye, pike, common sucker and whitefish) included	Annual Collection (four to six of each type)	At time of sampling	×	×					(q) (shall) Annual sampling is required as part of the WL EAFP [8] which is WL Site Licence condition 1.8 [3] and referenced in WL Site Licensing Handbook [4]. (r) (shall consider) Ingestion of contaminated fish could contribute to human dose [15]. Although there were no predicted effects to aquatic biota identified in the CSR [12], annual sampling continues as part of the WL EAFP [8] to verify that prediction. (o) (may) Fish have been identified as a Valued Component to the Sagkeeng Anicinabe [26] and to members of the MMF [27].
	Winnipeg River Sediment (surface) included	Annual Measurement	At time of sampling	×						(q) (shall) Although the contamination in the Winnipeg River sediments was found to present no risk to human or ecological health [12] [13] [14], annual sampling continues as part of the WL EAFP [8] to ensure that no additional impacts to Winnipeg River sediments as a result of

[5] At least quarterly monitoring of the high-level liquid waste tank tray is conducted to confirm there is no leakage from the residue remaining in the storage tanks. In the late fall of 2004, the high-level liquid waste had been removed from high-level liquid waste Tank 2 and transferred to the SF for cementation. A heel of waste remains to be removed. High-level liquid waste Tank 1 remains empty [29].

[6] Wild rice has been identified as a Valued Component to the Sagkeeng Anicinabe [26]. CNL is currently investigating the locations of harvesting areas down stream of WL site.

[7] Fish netting activities must be in compliance with the annual permit issued under the Fisheries Act (Manitoba). Report of these activities must also be completed as the conditions listed in the permit.

REDACTED

Environmental Component	Media	Monitoring Frequency	Analysis Frequency[2]	Environmental Media Criteria (q)	(r)	(s)	(t)	(u)	(v)	Justification
Do sediments contain radioactivity from WL operations? Is there a record of radioactivity deposited over time in sediments in known depositional zones within the Winnipeg River? Have the sediments in the sewage lagoon and Landfill dugouts accumulated radioactivity that indicates a loss of operational control and/or should be considered during decommissioning?										decommissioning operations. Implementation of the WL EAFP is listed as WL Site Licence condition 1.8 [3] and referenced in WL Site Licensing Handbook [4].
	Winnipeg River Sediment (depositional zones)	Every twenty years starting (2026)	At time of sampling	×						(q) (shall) Although the contamination in the Winnipeg River sediments was found to present no risk to human or ecological health [12] [13], sampling of depositional areas as part of the WL EAFP [8] is required to ensure that no additional impacts to Winnipeg River sediments as a result of decommissioning operations and to verify the predictions in the CSR.. Implementation of the WL EAFP is WL Site Licence condition 1.8 [3].and referenced in WL Site Licensing Handbook [4]. Note: This frequency is a deviation from 900-509200-STD-010 [6] and follows the frequency defined in WLDP-03704-REPT-007 [30] and EAFP [8] and accepted by the CNSC [31].
	Sediment (Lagoon)	Every five years (starting 1999)	At time of sampling	×						(q) (shall) As part of the WL EAFP [8] " Sewage lagoon Primary and Secondary Discharge pathway soils are required to be collected every five years (starting in 1999)" as per WLDP-03704-ENA-005 [32]. Implementation of the WL EAFP is WL Site Licence condition 1.8 [3].and referenced in WL Site Licensing Handbook [4].
	Sediment (Landfill Dugouts)	Every five years (starting 2007)	At time of sampling	×						(q) (shall) As part of the WL EAFP [8] "monitoring of the dugouts around the landfill should be continued every 5 years to determine if contamination levels have risen significantly. Enhanced monitoring of the Landfill area should be implemented to detect possible contamination of sub-surface drainage". Implementation of the WL EAFP is WL Site Licence condition 1.8 [3].and referenced in WL Site Licensing Handbook [4].
Terrestrial Biota and Human Health Do human receptors acquire a dose from WL air effluents by	Game, (Deer, Bear, Grouse, Rabbit) Livestock, (Beef/Pork/Lamb/Poultry)[8], Honey included	Annual Collection[9]	Analyzed as a sample set annually	×	×					(q) (shall) If environmental monitoring of a media is required by any statute, regulation, licence, or permit that governs the operation of the nuclear facility, or otherwise directed by a regulator, then that media shall be included in the EMP. Annual sampling is required as part of the WL EAFP [8]. Implementation of the WL EAFP is WL Site Licence condition 1.8 [3].and referenced in WL Site Licensing Handbook [4]. (r) (shall consider) Ingestion of contaminated game, beef, pork, poultry, eggs and/or honey could contribute to human dose [15]. Milk was

[8] Monitoring of milk was conducted in 2017 [33] and there is no indication of impact. This monitoring would be initiated if beef results indicate uptake. Eggs have not been monitored but would be if the results from poultry meat indicate uptake.

[9] Game are obtained by CNL staff through roadkills and/or from local trappers. Animal collection activities must be in compliance with the permit issued under the Wildlife Act. Reporting of these activities must also be completed as per the conditions listed in the permit. Species (normally deer, moose, bear, grouse or rabbit) sex and age should be report to the WL Environmental Specialist along with the radioactivity in Bq/kg, fresh weight for flesh (and bone - for deer/moose). Livestock are obtained by EnvP staff from local farmers/farmer's markets.

REDACTED

Environmental Component	Media	Monitoring Frequency	Analysis Frequency[2]	Environmental Media Criteria (q)	(r)	(s)	(t)	(u)	(v)	Justification
eating wild game, domesticated meat and honey? Does native vegetation contain radioactivity from WL air effluents or liquid effluents via groundwater? Does native vegetation provide an indication of subsurface contamination?. Do human receptors acquire a dose from WL effluents by eating locally grown vegetables and wild foods?										analyzed for radioactivity in 2017 [33] and all parameters were at background levels. This media has been removed from the program. Although there were no predicted effects to terrestrial biota identified in the CSR [12], annual collection continues as part of the WL EAFP [8] to verify that prediction. (o) (may) Game and honey have been identified as Valued Components to the Sagkeeng Anicinabe [26] and to members of the MMF [27].
	Native Vegetation (mixed grasses, weeds and clover) included	Annual Measurement	At time of sampling	×		×	×			(q) (shall) The WMA Facility Authority [28] document and WMA Safety Analysis [17] document states "Samples of vegetation shall be collected annually and analysed for any changes in activity from normal background levels." These documents are referenced in the WL Site Licensing Handbook [4]. (s) (should) Although no residual effects are expected, deer consumption of vegetation in and around the WMA is a concern identified in the CSR [12] and this monitoring should be included in the EMP to verify no effect. (t) (should) Native vegetation within the WMA is known to have contaminants that exceed, or are predicted to exceed, BVs and should be considered for inclusion in the EMP for measurement of those same contaminants [33].
	Garden Vegetables (fruit (including berries), root, leafy (include mushrooms)) and Canola included	Annual Measurement	At time of sampling	×	×					(q) (shall) Although, no residual effects were identified for terrestrial biota, annual sampling is required as part of the WL EAFP [8] to confirm effects predictions. Implementation of the WL EAFP is WL Site Licence condition 1.8 [3].and referenced in WL Site Licensing Handbook [4]. (r) (shall consider) Ingestion of contaminated vegetables or crops could contribute to human dose [15]. (o) mushrooms and berries have been identified as a Valued Components to the Sagkeeng Anicinabe [26] and to members of the MMF [27].
Soil (Geology): Is the soil in various WL locations contaminated to the point of requiring remediation or being classified as a waste form?	Soil – WMA included	Annual and periodic measurements	At time of sampling	×		×	×			(q) (shall) Impacted areas shall be characterized and remediated to clearance levels as per the WL EAFP.[8], and in accordance with the WL Closure Land-Use and End-State criteria [34]. The frequency of sampling and parameters to be tested for are included in this plan and also detailed in WLDP-03704-ENA-005 [32]. Implementation of the WL EAFP is WL Site Licence condition 1.8 [3].and referenced in WL Site Licensing Handbook [4]. (s),(t) (should) Soil within the WMA is known to have contaminants [33] that exceed, or are predicted to exceed, BVs and should be considered for inclusion in the EMP for measurement of those same contaminants.
	Soil – Lagoon Discharge path	Periodically (starting 1999)	At time of sampling	x						(q) (shall) Impacted areas shall be characterized and remediated to clearance levels as per the WL EAFP.[8], and in accordance with the WL Closure Land-Use and End-State criteria [34] and as per WLDP-03704-ENA-005 [32]. Implementation of the WL EAFP is WL Site Licence condition 1.8 [3].and referenced in WL Site Licensing Handbook [4].

REDACTED

Environmental Component	Media	Monitoring Frequency	Analysis Frequency[2]	Environmental Media Criteria (q)	(r)	(s)	(t)	(u)	(v)	Justification
	Soil – Main Campus	Continuous, as impacted areas are identified and remediated and pre-clearance	At time of sampling	x						(q) (shall) Impacted areas shall be characterized and remediated to clearance levels as per the WL EAFP.[8], and in accordance with the WL Closure Land-Use and End-State criteria [34]. Implementation of the WL EAFP is WL Site Licence condition 1.8 [3].and referenced in WL Site Licensing Handbook [4].
Groundwater	Groundwater is monitored as part of the Groundwater Monitoring Program (GWMP), the details of which are documented in program specific documentation [35].									

Criteria:

(q) (shall) If environmental monitoring of specific media is required by any statute, regulation, licence, or permit that governs the operation of the nuclear facility, or otherwise directed by a regulator, then that media shall be included in the EMP..

(r) (shall consider) Any environmental media that could contribute to the dose/exposure of a receptor that is anticipated to experience an effect shall be considered for inclusion in the EMP.

(s) (should) Any environmental media for which contaminants/physical stressors of concern were identified in an ERA (or equivalent) should be included in the EMP.

(t) (should) Any environmental media in which contaminant benchmark concentrations have been exceeded or are predicted to be exceeded should be considered for inclusion in the EMP for measurement of those same contaminants.

(u) (should) Selection of the environmental media to be monitored should be based on the following principles:

i) Where practical, monitoring should be done near the end of a pathway (i.e., closer to the receptor) to give dose/exposure estimates with fewer uncertainties that arise from inaccuracies in the models and transfer coefficients;

ii) The fate and distribution of contaminants along the pathway linking the source to the receptor should be considered when selecting the media to be sampled; and

iii) The mobility of the receptor relative to the area of contamination should be considered when selecting the media to be sampled.

(v) (should) Final selection of environmental media to be sampled and of contaminants to be measured in each medium should consider the feasibility of

i) Sampling the medium;

ii) Obtaining quantitative results distinguishable from background; and

iii) Obtaining measurements when estimated concentrations have high uncertainty.

(o) (may) The choice of contaminants to monitor in the environment may also be based on the following:

iv) There are other business reasons, i.e. stakeholder concerns, due diligence, etc

REDACTED

5.2.2.1 Deviation from the Default Monitoring Frequency

In certain circumstances, the EMP deviates from the default monitoring frequencies provided in Table 1

When setting the sample collection frequency, a reduced frequency is considered in cases where:

- Expected temporal variability in concentrations and/or conditions is low;
- Capital and operating costs are high;
- The default frequency may lead to significant losses or uncertainties;
- The half-life of the radionuclide(s) being monitored is much longer than the default monitoring or sample collection frequency;
- Concentrations of the radionuclide(s) being monitored are very low (at or near detection levels); and
- The likelihood of concentrations approaching or exceeding a BV is negligible.

When setting the sample collection frequency, an increased frequency is considered in cases where:

- There is high variability in releases at the source;
- Expected temporal variability in concentrations and/or conditions is high (more variable quality may require more frequent sampling to obtain sufficiently precise estimates of contaminants);
- Capital and operating costs are low;
- The half-life of the radionuclide(s) being monitored is much less than the default monitoring or sample collection frequency – collection frequency should not normally exceed two half-lives in such cases; and
- Concentrations of the radionuclide(s) being monitored are very high (at or near bvs) and the likelihood of concentrations approaching or exceeding a bv is high.

When setting the analysis frequency, a reduced frequency (i.e. less than the sample collection frequency) is considered in cases where:

- Analysis costs are large relative to sampling costs;
- Analysis is labour/time intensive; and
- The objective is to estimate the mean of a population. (Note: Composite samples can produce equally precise or more precise estimates, compared to non-composite samples, with fewer analyses).

5.2.3 Duration of Monitoring

The routine monitoring outlined in this Plan is intended to continue indefinitely unless a change is justified. The process for making modifications to the EMP is described in Section 6.

REDACTED

5.2.4 Sampling and Analysis

The collection of environmental samples is conducted by the WL Environmental Management field team. The analysis of the environmental thermoluminescent dosimeters (TLDs) is conducted by Dosimetry Services. Analysis of all other environmental samples is conducted by, or sent to a Contract Lab by Environmental Management staff. Detailed sampling and analysis methods are described in laboratory specific procedures per [36]. Specific analysis methods used for each parameter are given in Table 12.

The Environmental Management group conducts frequent internal checks of their technical capabilities as they perform their measurements. This is discussed further in Section 5.5.

5.2.5 Locations to be Monitored

Locations on the site which are in need of monitoring were determined by reviewing potential areas with the *Need for Monitoring Criteria – Location* as outlined in the *Environmental Monitoring Program* procedure [6]. The rationale used in the selection of locations to be monitored in the EMP is discussed below, and a matrix of the monitoring locations and their relation to the environmental monitoring criteria is presented in Table 3.

Areas identified in the Environmental Assessment (EA)

The locations monitored in the EMP represent the areas in which contaminants of concern were identified in the CSR [12] [13] for WL. The CSR (WL EA) describes the stressors and possible residual effects arising from WL decommissioning and summarized in Table 2. The CSR further defines the areas subject to those stressors and possible effects, and identifies the receptors (both human and non-human) potentially affected. The stressors of potential concern that were identified, and the areas and receptors potentially affected are summarized below:

- Surface water contamination in the Project Study Area and potential migration to the Winnipeg River from the WMA, buried services and affected lands.
- Potential for groundwater contaminant migration to the Winnipeg River from the WMA, sewage lagoons and the inactive landfill.
- Winnipeg River water, sediments and selected fish species (Walleye, Pike and Whitefish).
- Winnipeg River Shoreline and Gullies and Ravines on site.
- Deer and moose - the risk is that these may graze in areas affected by groundwater contamination.
- Coniferous Forest on site.
- Loss of archaeological sites in the region.
- Noise

During Decommissioning and Institutional Control period, the use of some lands will be restricted.

REDACTED

Table 2: Summary of Residual Effects from WL Decommissioning Activities

Category	Description of Residual Effect	Potential Spatial Effect	Facility/Source
Air Quality and Noise	Release of airborne radioactive particulates during disconnecting of services, decontamination retrieval and repackaging of materials and remediation	On-site	WR-1, [redacted], Decontamination Centre, WMA, Buried Services, Affected Lands, North Ditch, River Sediments
	Release of airborne radioactive particulates during demolition of canisters	On-site	Concrete Canisters
	Nuisance dust and fine particulates from building demolition, and site restoration and rehabilitation	On-site	All Building Demolition
	Production of methane gases from landfill	On-site	Inactive Landfill
	Noise during demolition and site restoration	On-site	All Building Demolition
Surface Water (hydrology)	Surface water contamination associated with migration of decontamination process water, suspended particles washed into storm drains from main campus roads, the removal of drains and other buried services and remediation	Off-site Winnipeg River	Buried Services, WMA, Affected Lands, North Ditch
	Discharge of treated water flows into Winnipeg River (active and inactive)	Off-site Winnipeg River	[redacted] and [redacted] LLLW treatment tanks, Sewage Lagoon
	Leaks into surface water from in-situ trenches	Off-site Winnipeg River	WMA
Soil and Groundwater (geology and hydrology)	Soil and Groundwater contamination during operations	Off-site Winnipeg River	WMA, Sewage Lagoons
	Contamination from leaks around existing facilities or contamination during remediation	Off-site Winnipeg River	Off-site Contaminated Lands, Sewage Lagoons, Buried Services, Affected Lands, North Ditch, WMA
	Leachate from in-situ trenches	Off-site Winnipeg River	WMA
	Leachate from remediated facilities	Off-site Winnipeg River	Inactive Landfill
Terrestrial Biota	No residual effects identified		
Aquatic Biota	No residual effects identified		
Worker Health and Safety	No residual effects identified		
Socio-economics	No residual effects identified		
Public Health	No residual effects identified		
Physical and Cultural Heritage	Potential to disrupt traditional uses of the Winnipeg River	Off-site Winnipeg River Shoreline	Shoreline

REDACTED

Category	Description of Residual Effect	Potential Spatial Effect	Facility/Source
Land and Resource Use	Land-use restriction associated with in-situ disposal of radioactive waste	On-site	WMA
	Land-use restrictions associated with in-situ disposal of non-radioactive waste	On-site	Inactive Landfill
Archaeology	Artifact loss during excavation near shorelines of the Winnipeg River	On-site Shoreline	Sewage Lagoon, Outfall shoreline
First Nation and Metis Interests	General interest in the project especially as it affects the Winnipeg River. Artifact loss during excavations near the shores of the Winnipeg River	On-site shoreline	Sewage Lagoon, Outfall shoreline

Monitoring near critical groups

A large portion of the off-site locations monitored in the EMP are representative of WL's critical groups. As part of the DRL calculations, doses were modelled for a number of potential critical groups (Figure 1; Farms A,D,E,F) selected based on lifestyle and proximity to WL. Monitoring is done near all potential critical groups, with the focus being on the critical groups that are likely to receive the highest radiation doses as a result of WL operations.

While human exposures (i.e. doses to WL critical groups) do not approach regulatory dose limits, routine monitoring near critical group locations is required in order to meet the regulatory requirement for an annual public dose assessment. It also contributes to identification of the most-exposed group(s) and important exposure pathways, to ensure that these receptors and pathways are considered in calculating DRLs for WL according to CSA N288.1 [37] and Candu Owner's Group (COG) [38] guidance.

For the critical groups that are subject to annual dose assessments, it is necessary to measure radioactive contaminant concentrations in environmental media along applicable/critical exposure pathways. Not all environmental media identified in Table 1 represent exposure pathways to each critical group. The decision to monitor specific media are based on the environmental pathways models for WL described in *Derived Release Limits (DRLs) for AECL's Whiteshell Laboratories* [15], and the results of historic effluent and environmental monitoring.

Monitoring in nearby population centres

In cases where there is public concern regarding emissions, monitoring is established in nearby population centres other than locations of identified or potential critical groups, or identified in the CSR (WL EA) [12] [13] [14] and Sagkeeng Land Use and Occupancy Study [26] (Figure A-13).

Benchmark value exceedances

Certain on-site locations are included in the EMP because BVs have been exceeded or are predicted to be exceeded there. The surface water BVs for WL are listed in Table 11.

In order to identify locations where surface water BVs are predicted to be exceeded (e.g. WMA ditches) for the purpose of Table 3, surface water concentrations at all monitored locations (with the exception of those locations that have already been found to exceed the BVs) were

REDACTED

compared to the BVs for WL Table 11. However, it is used as a conservative means to indicate where there is the potential for a BV to be exceeded.

Verifying the effectiveness of containment and effluent controls

Monitoring of surface water, ambient air, direct radiation, and deposition serves to verify the effectiveness of containment and effluent controls. Where monitoring is being done for this purpose, the basic design aspects of the monitoring locations (i.e. specific monitoring location, parameter(s) to be monitored, and the frequency of monitoring) take into consideration several principles, as described below;

Surface Water

Monitoring of surface water at locations downgradient of, and within reasonable proximity to, points of groundwater discharge are included in the EMP. Monitoring at these locations is intended to provide feedback to the Groundwater Monitoring Program (GWMP). The evaluation of the groundwater results together with the surface water results is done at the GWMP's annual Environmental Performance Review, and as part of the annual EMP Report. Locations that fall under this category include the WMA ditch locations and water that accumulates in excavations within the WMA as shown in Figure A-6 and Figure A-7. Surface hydrology is taken into consideration in the selection of monitoring locations. There is only one main drainage basin identified for WL, the WL WMA Drainage Basin (Figure A-10 and Figure A-11).

Monitoring to evaluate the environmental performance of specific facilities that contain significant quantities of hazardous materials in dispersible form (i.e. monitoring for leak detection), where releases could escape detection by other monitoring means (e.g. facility-specific monitoring, groundwater monitoring), is included in the EMP where needed. Monitoring to meet this purpose is done in locations within reasonable proximity to the points of discharge and in the likely path of the discharges. Locations that fall under this category include WMA ditch locations, water that accumulates in sumps, excavations, Landfill dugouts and manholes. Figure A-12 shows the WL Site Conceptual Model indicating the Contaminant Transport from WL Waste Management Area, Landfill, Lagoon and Main Campus Affected Areas to the Winnipeg River.

Wet and dry deposition

Monitoring to verify wet and dry deposition rates and direct radiation resulting from WL airborne releases is achieved through a network of monitors (ARMS) located at the site boundary, and at strategic off-site locations (Figure A-2). Monitoring locations established for this purpose, in most cases, are selected to be within the main upriver and downriver wind rose sectors.

Direct radiation

Where monitoring of direct radiation (e.g., TLDs) is being undertaken in areas affected by airborne effluents from the WL site, monitoring at locations within reasonable proximity to the site and in the prevailing wind direction are included in the EMP. Monitoring at these locations is intended to provide feedback to the Effluent Verification Monitoring Program. Locations that

REDACTED

fall under this category include: Controlled Area Fence, WMA Perimeter Fence, and Canister Area Perimeter Fence, and Land Gamma Survey of Roads. See Figure A-1, Figure A-2, Figure A-3 and Figure A-4.

Reference areas

In addition to the locations mentioned above, areas with similar environmental conditions but without the potential for facility-related effects are included in the EMP as reference locations to provide information on “normal” variations in natural background radiation and are included in Table 3.

REDACTED

Table 3: Need for Monitoring of Locations

Criteria Identification [6]		Need for Monitoring Criteria - Location [6]									Justification
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	
Monitoring Location (emLine Code)	Comment										
Air Quality and Noise											
	Ambient Air - Based on a continuous 1 year sampling period, how constant is the ambient radiation in and around WL?										
On-site (Main Campus) TLDs (see Figure A-1**):** The annual ambient gamma radiation at WL and the surrounding area is monitored by means of thermoluminescent lithium fluoride dosimeters (TLDs). Six of these locations, labelled ARMS, have been monitored since 1966. The locations of the ARMS are indicated on Figure A-2. Five of the ARMS stations are situated within 4 km of the [redacted] stack and are arranged according to the prevailing wind direction. The sixth is located near Pinawa, about 11 km to the east-southeast. Starting in 1986, twelve TLD packages were mounted at various locations along the fence enclosing the WL site active area. Another series of twelve TLD packages were installed in 1987 along the WMA fence (see Figure A-5), and in 1994 a series of ten were installed along the Canister Area fence (see Figure A-3). The TLD package system (4 TLDs per package) was changed to a TLD holder assembly system (two TLDs per badge) in 2017.										
(a) **Controlled (Active) Area Fence** - Do WL activities affect ambient radiation within the Controlled Area?											(f) (should) TLD monitoring in the vicinity of the former [redacted] ALWTC is conducted to monitor the remaining radiation field from the former facility. Of particular concern was the MLW storage tank [redacted] which has been removed. Another area of concern is 7 meters southeast of the ALWTC near active drain line break that occurred in 1980 as stated in the AL [23]. Radiation surveys within [redacted] [20] and [redacted] [21] are also required. TLD monitoring is also conducted around [redacted] and [redacted] Shielded Facilities [22] to confirm background radiation levels.
AAF-001 to 003	AAF South Fence (3 locations)						×				
AAF-004 to 006	AAF East Fence (3 locations)						×				
AAF-007 to 009	AAF North Fence (3 locations)						×				
AAF-010 to 012	AAF West Fence (3 locations)						×				
(b) **WMA Perimeter Fence (4 chips/locations)**							×				(f) (should) Perimeter TLD monitoring is performed as confirmatory monitoring for the WMA [17] and as per [39].
WMP-002 to 004	WMA South Fence (3 locations)						×				
WMP-005 to 007	WMA East Fence (3 locations)						×				
WMP-008 to 010	WMA North Fence (3 locations)						×				
WMP-011, 012, 001	WMA West Fence (3 locations)						×				
(c) **Canister Area Perimeter Fence** - Are gamma fields surrounding fueled canisters constant as predicted?											(f) (should) Monitoring, and recording of the gamma fields on contact with, and in the immediate vicinity of, each fueled canister is required by the CCSF FA [18] and SAR [19] documents. Perimeter TLD monitoring is performed as confirmatory monitoring for the CCSF,
CAP-NW, CAP-NE	CAP North Fence (2 locations)						×				
CAP-ENCAN, CAP-ENWMA, CAP-	CAP East Fence (4 locations)						×				

REDACTED

Criteria Identification [6]		Need for Monitoring Criteria - Location [6]									Justification
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	
Monitoring Location (emLine Code)	Comment										
ESCAN, CAP-ESWMA											
CAP-SE, CAP-SW	CAP South Fence (2 locations)						×				(f) (should) Monitoring, and recording of the gamma fields on contact with, and in the immediate vicinity of, each fuelled canister is required by the CCSF FA [18] and SAR [19] documents. Perimeter TLD monitoring is performed as confirmatory monitoring for the CCSF,
CAP-WS, CAP-WN	CAP West Fence (2 locations)						×				
Site Boundary TLDs (see Figure A-2**) -** What gamma fields could critical groups be exposed to?											
Ambient Radiation Monitoring Stations											
ARMST1	WL Perimeter, 3.2 km North, ARMS1		×						×		b) (shall) Air Effluent Critical groups C, B and E [15] are within Ambient Radiation Monitoring stations (ARMS) and critical groups A, D and F are within a 5 km radius of the site. h) (should) This location serves as a background location for comparison to locations within the WMA [29].
ARMST2	WL Perimeter, 4.3 km ESE, ARMS2	Location is no longer accessible									
ARMST3	WL Perimeter, 3.4 km SSE, ARMS3		×						×		
ARMST4	WL Perimeter, 2.2 km W, ARMS4		×						×		
ARMST5	WL Perimeter, 2.4 km NW, ARMS5		×						×		
Off-Site TLDs (see Figure A-2**) -** What gamma fields are present further than 5 km from site?											
Pinawa											
006	Pinawa Town Yard, ARMS6 (TYARDT) (2 locations)		×						×	×	b) (shall) Air Effluent Critical groups C, B and E [15] are within Ambient Radiation Monitoring stations (ARMS) and critical groups A, D and F are within a 5 km radius of the site. h) (should) This location serves as a background location for comparison to locations within the WMA [29]. i) (should) Monitoring provides confirmation to the public that there has been no deposition of radioactivity of concern in these areas [12] [13] [14] [15].
007	Pinawa Hospital		×						×	×	
008	Pinawa Golf Course		×						×	×	
STACK TLDs - What gamma fields **are** produced by air effluents leaving the HCF and IFTF stacks?											
HCF	HCF Stack	×									(a) (shall) These TLDs were in to confirm air effluent emissions and provide back-up monitoring should the air monitoring equipment fail. They are no longer monitored
IFTF	IFTF Stack	×									
	Ground Surfaces - Land Gamma Survey of Roads - Is there a variation of gamma fields off and onsite from year to year?										
On-site Controlled (Active) Area Roads - What gamma fields are present on-site in controlled areas?											

REDACTED

Criteria Identification [6]		Need for Monitoring Criteria - Location [6]									Justification
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	
Monitoring Location (emLine Code)	Comment										
A01-WL	[redacted] into active area						×				(f) (should) Gamma dose rates are measured annually on and off the WL site. Of particular interest is east side of the AWLTC due to the nature of the activities conducted in the facility and historical spills. Land gamma surveys are also conducted around [redacted] [24] and [redacted] Shielded Facilities [22] to confirm background radiation levels. Note: This monitoring is not used directly in estimating dose to human receptors. It is primarily intended to serve as a gross trend indicator since it represents an intermediate step in environmental exposure pathways. The survey is part of the terrestrial monitoring performed to provide verification that there has not been a build-up of radioactivity due to deposition of air emissions from the site. This monitoring serves primarily as a gross trend indicator providing, for example, baseline data for emergency preparedness and response purposes. It also provides an indication of radiation fields that may be emanating from buildings on site where radioactive materials are stored or processed.
A02-WL	South side [redacted]						×				
A03-WL	West side of [redacted]						×				
A05-WL	South side of [redacted] & [redacted]						×				
A06-WL	East of [redacted]						×				
A08-WL	East Gate to [redacted]						×				
On-site Uncontrolled (Outer Area) Roads - What gamma fields are present on-site in uncontrolled areas?											
A09-WL	North Road at Lagoon Road						×				(f) (should) Gamma dose rates are measured annually on and off the WL site [33]. Note: This monitoring is not used directly in estimating dose to human receptors. It is primarily intended to serve as a gross trend indicator since it represents an intermediate step in environmental exposure pathways [15]. The survey is part of the terrestrial monitoring performed to provide verification that there has not been a build-up of radioactivity due to deposition of air emissions from the site. This monitoring serves primarily as a gross trend indicator providing, for example, baseline data for emergency preparedness and response purposes. It also provides an indication of radiation fields that may be emanating from buildings on site where radioactive materials are stored or processed.
A12-WL	East Road at Canister Area						×				
A13-WL	East Road at WMA Gate						×				
A14-WL	East Road at Landfill Site						×				
A-15-WL	SMAGs						×				
Off-Site Roads (see Figure A-4**) -** What gamma fields are present further than 10 km from site?											
B01-WL	Road at ARMS #1									×	(i) (should) Monitoring provides confirmation to the public that there are no emissions of concern in these areas. Gamma dose rates are measured annually on and off the WL site [33]. Note: This monitoring is not used directly in estimating dose to human receptors. It is primarily intended to serve as a gross trend indicator since it represents an intermediate step in environmental exposure
B02-WL	Riverland School									×	
B03-WL	Highway 520 at Old Pinawa									×	
B08-WL	West Side of Lac du Bonnet Bridge									×	

REDACTED

Criteria Identification [6]		Need for Monitoring Criteria - Location [6]									Justification
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	
Monitoring Location (emLine Code)	Comment										
B09-WL	Lac du Bonnet Circuit									×	pathways [15]. The survey is part of the terrestrial monitoring performed to provide verification that there has not been a build-up of radioactivity due to deposition of air emissions from the site. This monitoring serves primarily as a gross trend indicator providing, for example, baseline data for emergency preparedness and response purposes. It also provides an indication of radiation fields that may be emanating from buildings on site where radioactive materials are stored or processed.
B12-WL	Plant Road and Highway 211						×				
B13-WL	Highway 211 and Rifle Range						×				
B14-WL	Pinawa Stage 1						×				
B15-WL	Pinawa Stage 2						×				
B18-WL	Junction of Highway 11 and Highway 307						×				
B25-WL	Halfway between Milner Ridge and Junction of Highway 11 and Highway 214						×				
C01	Bridge to Seven Sisters						×				
C03	Town Circuit at Dam						×				
	Wet Dry Deposition - <u>What radioactivity is present in atmospheric precipitation and is it consistent with WL air effluents?</u>										
006	Pinawa Town Yard										No criteria is triggered for this location. Note: Monitoring of total wet and dry atmospheric deposits is primarily intended to serve as a gross trend indicator since it represents an intermediate step in environmental exposure pathways. This monitoring serves to verify the predictions made by the DRL model (i.e. groundshine). It also serves as a baseline for emergency preparedness purposes and provides confirmation of the absence of significant quantities of radioactive particulate material in airborne emissions. This monitoring is part of the WL EAFP [8].
Surface Water and Public Health - <u>Does drinking water contain radioactivity from WL?</u>											
	Winnipeg River Water (see Figure A-2**) -** <u>What is the reference concentration of radioactivity upstream of WL?</u>										
Pinawa (SFD) Winnipeg River Upstream	Water Collected daily by Municipal staff at Pinawa Water Treatment Center								×		h) (should) This location serves as a background location for comparison to locations downstream of the WL processed outfall.
<u>What is the radioactivity in Winnipeg River water downstream of Whiteshell Laboratories</u>											

REDACTED

Criteria Identification [6]		Need for Monitoring Criteria - Location [6]									Justification
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	
Monitoring Location (emLine Code)	Comment										
Winnipeg River Water Location (K-11)	Closest location to critical group (Farm A) [15] Collected weekly by EM staff Near shoreline		×	×		×	×				b) (shall) Closest location to liquid effluent critical group (Farms A and F) [15] (c) (should) This location is the closest downstream location, from the processed outfall, sampled. Potential effects to Winnipeg River water were identified in the CSR as per Table 2 (e) (may) The gradient in contaminant concentration is expected over a spatial extent, this monitoring locations is along the gradient [15]. (f) (should) This environmental monitoring is being done to verify the effectiveness of containment and effluent controls, this monitoring location is within reasonable proximity to the points of discharge and in the likely path of the discharges [15] of the processed outfall and lagoon discharge.
Lac du Bonnet (LDB)	Sample collected daily by Municipal staff at Water Treatment Center					×				×	(e) (may) The gradient in contaminant concentration is expected over a spatial extent, this monitoring location is along the gradient [15]. i) (should) This locations is at the closest downstream population centres (other than locations of identified or potential critical groups or locations identified in an ERA, or equivalent) for the most dominant contaminants and environmental pathways and where there is public concern regarding emissions [12] [13] [14] and [15].
Great Falls Dam (GFD) Power Dam	Sample collected daily by Manitoba Hydro staff at Power Dam					×				×	(e) (may) The gradient in contaminant concentration is expected over a spatial extent, this monitoring location is along the gradient [15]. i) (should) This location is at the closest downstream population centres (other than locations of identified or potential critical groups or locations identified in an ERA, or equivalent) for the most dominant contaminants and environmental pathways and where there is public concern regarding emissions [12] [13] [14] and [15].
	Waste Management Area - Surface Water Run-off (Ditch Water)[10] (See Figure A-5**,** Figure A-6**and** Figure A-7**) -** What radioactivity is released from the WMA via the surrounding ditch system?										
East of WMA (WMA-1)	Former [redacted] location								×		h) (should) This location serves as a background location for WMA ditch water. This ditch may contain run-off from the Inactive Landfill or historical operations at [redacted] or Cs-pond remediation work.
East of WMA (WMA-2)	Closer to WMA, just east of dam								×		h) (should) This location serves as a background location for WMA ditch water. This ditch may contain run-off from the Inactive Landfill or Cs-

[10] WMA Ditch Locations [redacted] and Control are considered direct effluents to the Winnipeg River and are included in the Effluent Monitoring Plan

REDACTED

Criteria Identification [6]		Need for Monitoring Criteria - Location [6]									Justification
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	
Monitoring Location (emLine Code)	Comment										
											pond remediation work.
SE of WMA (WMA-3)	Outlet of swale east of ILW bunkers	×		×	×	×	×				(a) (shall) The WMA Facility Authority [28] document and WMA Safety Analysis [17] document states "Surface drainage water shall be sampled and analysed for activity levels monthly during the months when surface waters are present and not frozen". These documents are referenced in WL Site Licensing Handbook [4]. (c) (should) As per Table 2, the potential effect of "leaks into surface water from in-situ trenches" was identified. (d) (should) As per the 2017 WL Annual Safety Report [29], some parameters at these locations have exceeded the drinking water screening levels and/or are above background levels. (e) (may) A gradient in contaminant concentration is expected over a spatial extent, these monitoring locations are distributed along the gradient [15]. (f) (should) These locations were chosen to verify the effectiveness of containment and effluent controls, and are within reasonable proximity to the points of discharge and in the likely path of the discharges. Surface water sampling is conducted as part of the Monitoring and Surveillance [39] for the WMA and as part of the Periodic Inspection Plan for the WMA Concrete bunkers [40].
SW of WMA (WMA-4)	Between WMA and Canisters	×		×	×	×	×				
SW of Canisters (WMA-5)	Southwest corner of Canister fence	×		×		×	×				(a) (shall) The Concrete Canister Storage Facility states that "Surface drainage water shall be sampled, at a minimum at the locations shown in the "Whiteshell Laboratories Concrete Canister Storage Facilities Annual Safety Review- 1997", (AECL-MISC-378-97), and analyzed for activity levels monthly during the months when surface waters are present and not frozen." A similar statement is made in the Safety Analysis Report [19] for the CCSF. These documents are referenced in WL Site Licensing Handbook [4]. (c) (should) As per Table 2, the potential effect of "leaks into surface water from in-situ trenches" was identified. (e) (may) A gradient in contaminant concentration is expected over a spatial extent, these monitoring locations are distributed along the gradient [15]. (f) (should) These locations were chosen to verify the effectiveness of containment and effluent controls, and are within reasonable proximity to the points of discharge and in the likely path of the discharges.. Surface water sampling is conducted as part of the Monitoring and Surveillance [39] for the WMA and as part of the Periodic Inspection Plan for the WMA Concrete bunkers [40].
West of Canisters (WMA-6)	In ditch along the west Canister fence	×		×		×	×				
Road West of Canisters (WMA-7)	At junction of the road to WMA and the road leading to RM of LDB	×		×		×	×				
Drill Site Rd (WMA-10)	At junction of the Drill Site road and the road leading to RM of LDB	×		×		×	×				
West Side of WMA (WMA-12)	Ditch between LLW [redacted] and LLW [redacted]	×		×	×	×	×				(a) (shall) The WMA Facility Authority [28] document and WMA Safety Analysis [17] document states "Surface drainage water shall be sampled

REDACTED

Criteria Identification [6]		Need for Monitoring Criteria - Location [6]									Justification
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	
Monitoring Location (emLine Code)	Comment										
East side of WMA (WMA-13)	East side ditch between [redacted] and [redacted] and near [redacted]	×		×	×	×	×				and analysed for activity levels monthly during the months when surface waters are present and not frozen". These documents are referenced in WL Site Licensing Handbook [4]. c) (should) As per Table 2, the potential effect of "leaks into surface water from in-situ trenches" was identified. (d) (should) Any locations in which contaminant BVs have been exceeded or are predicted to be exceeded should be included in the EMP [12] [13]. (e) (may) A gradient in contaminant concentration is expected over a spatial extent, these monitoring locations are distributed along the gradient [15]. (f) (should) These locations were chosen to verify the effectiveness of containment and effluent controls, and are within reasonable proximity to the points of discharge and in the likely path of the discharges. Surface water sampling is conducted as part of the Monitoring and Surveillance [39] for the WMA and as part of the Periodic Inspection Plan for the WMA Concrete bunkers [40].
NW Corner of WMA (WMA-15)	Northwest corner of WMA ditch system	×		×	×	×	×				
NW of WMA (WMA-19A)	Northwest of SMAGs	×		×	×	×	×				
North Center of WMA (WMA-19B)	Northeast of SMAGs	×		×	×	×	×				
WMA-14	NW corner of extended WMA	×		×	×	×	×				
WMA-14A	To east of WMA-14	×		×	×	×	×				
WMA-14B	To east of WMA-14A	×		×	×	×	×				
WMA-14C	NE corner of extended WMA	×		×	×	×	×				
NE of WMA (WMA-19C)	Northeast of former Cs pond soil pile in WMA	×		×	×	×	×				
	Landfill Dugouts (see Figure A-8**) -** Do Landfill Dugouts contain radioactivity leached from the Landfill?										
Landfill Dugouts (ILS)	Normally six locations are sampled annually depending on seasonal precipitation and operational concerns (see Figure A-8).			×	×		×				c) (should) Leachate into surface and/or groundwater was identified in the CSR as a potential effect Table 2. (d) (should) Elevated levels of tritium and some metals are found in the Landfill dugout water as reported in the series of annual safety reports [29]. (f) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and the locations are within reasonable proximity to the points of discharge and in the likely path of the discharges as identified in CSR [12] as per Table 2 .
	WMA Water – Miscellaneous (see Figure A-5**) -** Do WMA waters contain radioactivity that must be considered for water relocations?										

REDACTED

Criteria Identification [6]		Need for Monitoring Criteria - Location [6]									Justification
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	
Monitoring Location (emLine Code)	Comment										
[redacted]Tank catch/containment tray (WMT)	Monitoring of Liquid Waste Storage tank Catch/Containment Tray Water at WMA[redacted]	×					×				(a) (shall) The WMA Facility Authority [28] document states *"Those storage structures for solid wastes that incorporate sumps for in-leakage collection shall be monitored annually, and any accumulated water shall be removed and treated, if required*." The WMA Safety Analysis [17] has a similar statement indicating that sampling of this water is performed. This requirement is reiterated in [41]. These documents are referenced in WL Site Licensing Handbook [4]. (f) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and the locations are within reasonable proximity to the points of discharge and in the likely path of the discharges as identified in CSR [12] as per Table 2
SMAGs sump (SMAGS)	Monitoring of the sump waters from the SMAGs facility prior to pump-out (samples includes west tank)	×					×				(a) (shall) The WMA Facility Authority [28] document states *"Those storage structures for solid wastes that incorporate sumps for in-leakage collection shall be monitored annually, and any accumulated water shall be removed and treated, if required*." The SMAGs Safety Analysis Report [42] states *"Sump tanks shall be monitored monthly. Liquid shall be sampled for analysis at first evidence of accumulation".* These documents are referenced in WL Site Licensing Handbook [4]. (f) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and the locations are within reasonable proximity to the points of discharge and in the likely path of the discharges [12] [13].
SSC sump (SSC)	Monitoring of Soil Storage Compound Primary and Secondary Membrane Inspection Tank water prior to pump-out	×					×				(a) (shall) The WMA Facility Authority [28] document states *"Those storage structures for solid wastes that incorporate sumps for in-leakage collection shall be monitored annually, and any accumulated water shall be removed and treated, if required*." The WMA Safety Analysis [17] has a similar statement indicating that sampling and testing of this water is performed. These documents are referenced in WL Site Licensing Handbook [4].
SSC standing water	Monitoring of Soil Storage Compound – standing water prior to pump-out	×					×				

REDACTED

Criteria Identification [6]		Need for Monitoring Criteria - Location [6]									Justification
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	
Monitoring Location (emLine Code)	Comment										
WMA Misc Sumps	Monitoring of various sump waters prior to pump-out	×					×				(f) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and the locations are within reasonable proximity to the points of discharge and in the likely path of the discharges [12] [13] [14].
WMA Excavations	Monitoring of water collected in various locations prior to pump-out			×			×				(c) (should) As per Table 2, the potential effect of "leaks into surface water from in-situ trenches" was identified. (f) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and the locations are within reasonable proximity to the points of discharge and in the likely path of the discharges [12] [13].
	WL Main Campus and Outer Areas Water – Miscellaneous - Do these waters contain radioactivity that must be considered to determine discharge path?										
Manholes	Monitoring of manhole water in various locations prior to pump-out			×			×				(c) (should) As per Table 2, the potential effect of *"surface water contamination associated with migration of contamination from the removal of drains and other buried services and remediation"* (f) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and the monitoring locations are within reasonable proximity to the points of discharge and in the likely path of the discharges [12].
Excavations	Monitoring of water in various locations prior to pump-out			×			×				(c) (should) As per Table 2, the potential effect of *"surface water contamination associated with migration of contamination from the removal of drains and other buried services and remediation".* (f) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and the monitoring locations are within reasonable proximity to the points of discharge and in the likely path of the discharges [12].
Primary Cell of the Sewage Lagoon	Monitoring of water prior to isolation from Secondary Cell						×				(f) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and the monitoring locations are within reasonable proximity to the points of discharge and in the likely path of the discharges [12] [13].
Aquatic Biota and Public Health[11]											
	FISH (walleye (pickerel), pike, common sucker, and whitefish) see Figure A-2 **-** Do fish eaten by human receptors contain radioactivity released to the river by WL operations?										

[11] Wild rice has been identified as a Valued Component to the Sagkeeng Anicinabe [26]. CNL is currently investigating the locations of harvesting areas down stream of WL site.

REDACTED

Criteria Identification [6]		Need for Monitoring Criteria - Location [6]									Justification
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	
Monitoring Location (emLine Code)	Comment										
Pinawa (Sylvia Lake) (J40)	Background – upstream from Seven Sisters Fall Dam								×		(h) (should). This location serves as a background location for comparison to locations downstream of the WL processed outfall [15].
K-11 (2 km downstream of WL Outfall)	Sample location may vary from 0.5 km to 2.0 km downstream of the Outfall		×								(b) (shall) This location is closest location to critical group (Farms A and F) [15].
K-23 (5 km downstream of WL outfall)	This is where the drainage from the north portion of the WL site enters the Winnipeg River via Farm A.		×			×				×	(b) (shall) This location is representative of a site's identified liquid effluent critical group(s), then this location shall be included in the EMP [15]. (e) (may) A gradient in contaminant concentration is expected over a spatial extent, these monitoring locations are distributed along the gradient [15]. (i) (should) This monitoring location is nearby a residential area (just off Riverland Road) and where there is public concern regarding emissions [12] [13] [14] and [15].
Terrestrial Biota and Public Health - Does the consumption of flesh from local domesticated and wild animals give a WL-derived dose to human receptors?											
	Large Game (flesh and bone), (Deer, Bear, Grouse, Rabbit), Livestock (Beef, Pork, Lamb, Poultry), Honey - Does wild food contain radioactivity released by WL?										
Within the vicinity (3 km radius) of Whiteshell Labs	Game , Livestock (Beef/Pork/Lamb/Poultry) Honey collected/raised within the vicinity of the airborne effluent critical group (see Figure A-2)		×							×	(b) (shall) Air Effluent Critical groups C, B and E [15] are within Ambient Radiation Monitoring stations (ARMS) and critical groups A, D and F are within a 5 km radius of the site. (i) (should) Honey is collected from suppliers in the local communities (Seven Sisters, Lac du Bonnet Whitemouth) within 3 km of the site.

REDACTED

Criteria Identification [6]		Need for Monitoring Criteria - Location [6]									Justification
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	
Monitoring Location (emLine Code)	Comment										
Outside the vicinity of Whiteshell Labs (>3 km radius of the site) [12]	Game, Livestock (Beef/Pork/Lamb/Poultry), Honey collected/raised outside the airborne effluent critical group of the site (see Figure A-2)					×			×	×	(e) (may) A gradient in contaminant concentration is expected over a spatial extent, these monitoring locations are distributed along the gradient [15]. (h) (should) This location serves as a background location for comparison to locations within 5 km of the site [15]. (i) (should) Game is collected as road kill from local areas and livestock is purchased from local suppliers (Lac du Bonnet and Whitemouth) where there is public concern regarding emissions [12] and [15].
	Native Vegetation (mixed grasses, weeds and clover) see Figure A-2 **and** Figure A-5 **-** Could grazing animals pick up radiation released from WL by airborne effluents or groundwater by consuming these plants?										
ARMS1	North west corner of the WL Site Boundary on east side of the Winnipeg River		×						×		(b) (shall) Air Effluent Critical groups C, B and E [15] are within Ambient Radiation Monitoring stations (ARMS) and critical groups A, D and F are within a 5 km radius of the site. (h) (should) This location serves as a background location for comparison to locations within the WMA [12] [13].
ARMS3	South west corner of the WL Site Boundary on the east side of the Winnipeg River										
ARMS4	West central location on WL property on west side of the Winnipeg River		×						×		(b) (shall) Air Effluent Critical groups C, B and E [15] are within Ambient Radiation Monitoring stations (ARMS) and critical groups A, D and F are within a 5 km radius of the site. (h) (should) This location serves as a background location for comparison to locations within the WMA [15].
ARMS5	North central location on the WL property on the west side of the Winnipeg River		×						×		
WMA1	Outside of WMA in the flow path of ground and surface water from the WMA, may also include effects from aerial deposition								×		h) (should) This location serves as a background location for comparison to locations within the WMA [15].

[12] This is an air deposition pathway, canola, honey, poultry, pork, and beef can be obtained from the local colony near Whitemouth. Background samples can be obtained from local stores that bring in produce from un-impacted areas.

REDACTED

Criteria Identification [6]		Need for Monitoring Criteria - Location [6]									Justification
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	
Monitoring Location (emLine Code)	Comment										
WMA2	In the north region of a series unlined trenches [redacted]	×		×	×	×	×				(a) (shall) The WMA Facility Authority [28] document and WMA Safety Analysis [17] document states "Samples of vegetation shall be collected annually and analysed for any changes in activity from normal background levels." These documents are referenced in WL Site Licensing Handbook [4]. (c) (should) If a location represents an area in which contaminants of concern, physical stressors of concern, or potential effects were identified in an ERA (or equivalent), then this location should be included in the EMP. As per Table 2, the potential effect of "leaks into surface water from in-situ trenches" was identified. (d) (should) Any locations in which contaminant BVs have been exceeded or are predicted to be exceeded should be included in the EMP. Elevated levels of radioactivity in vegetation are found in the WMA as reported in the series of annual safety reports [29]. (e) (may) A gradient in contaminant concentration is expected over a spatial extent, these monitoring locations are distributed along the gradient [15]. (f) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and the locations are within reasonable proximity to the points of discharge and in the likely path of the discharges [12] [13].
WMA3	In the ground and surface water flow of Trench [redacted] and near low level waste bunker [redacted]	×		×	×	×	×				
WMA4	In ground and surface water direction of run-off from standpipe row [redacted] and ILW Bunker [redacted]	×		×	×	×	×				
WMA5	Southwest of the incinerator and in the southern region of unlined trenches [redacted]	×		×	×	×	×				
WMA6	East of and between ILW Bunker [redacted]	×		×	×	×	×				
WMA7	East of the incinerator and outside of the WMA	×		×	×	×	×				
	Garden Vegetables and Canola - Could human receptors receive a dose from WL effluents by consuming local vegetables?										
Upstream of Outfall (UPSTRM)	Collected from Pinawa. Whitemouth or Seven Sisters Falls - Root, fruit, and leafy type vegetables and Canola								×		(h) (should) This location serves as a background location for comparison to locations downstream of the WL processed outfall [15]. Vegetables are purchased from suppliers in the local communities (Pinawa Seven Sisters or Whitemouth) normally through local markets [12] and [15] or donations from CNL staff.
Downstream of Outfall (DNSTRM)	Collected from farms downstream of the OFS or from Lac du Bonnet or Great Falls Root, fruit, and leafy type vegetables and Canola		×							×	(b) (shall) Local suppliers along the east side of the river are representative of critical group Farm A [15]. (i) (should) Vegetables are purchased from suppliers in the local communities (Lac du Bonnet Great Falls) normally through local markets [12] and [15] or donations from CNL staff.
Soil (geology) - How much radioactivity from WL operations is contained in soil in and around the WL site?											

REDACTED

Criteria Identification [6]		Need for Monitoring Criteria - Location [6]									Justification
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	
Monitoring Location (emLine Code)	Comment										
WMAE	Known affected area from past loading of the standpipes (see Figure A-5)			×	×	×	×				(c) (should) As per Table 2, the potential effect of "leaks into surface water from in-situ trenches" was identified. (d) (should) These locations are areas in which contaminant BVs have been exceeded or are predicted to be exceeded. Elevated levels of radioactivity in soil are found in the WMA as reported in the series of annual safety reports [29]. (e) (may) A gradient in contaminant concentration is expected over a spatial extent, these monitoring locations are distributed along the gradient [15]. (f) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and the locations are within reasonable proximity to the points of discharge and in the likely path of the discharges [12] [13] and [15].
WMAF				×	×	×	×				
WMAG				×	×	×	×				
WMA Ditch system	Known affected areas from facility operations (see Figure A-5).			×	×	×	×				
Excavation/Land Clearance	Soil Clearance samples	×									(a) (shall) Impacted areas shall be remediated to clearance levels as per the WL EAFP.[8], and in accordance with the WL Closure Land-Use and End-State criteria [34]. The WL EAFP is WL Site Licence condition 1.8 [3] and referenced in WL Site Licensing Handbook [4].
Sewage Lagoon Secondary Cell (SL2) Discharge Path (Figure A-9)	Soil Samples collected along the Sewage Lagoon Discharge Path	×									(a) (shall) Impacted areas shall be characterized and remediated to clearance levels as per the WL EAFP.[8], and in accordance with the WL Closure Land-Use and End-State criteria [34]. The WL EAFP is WL Site Licence condition 1.8 [3] and referenced in WL Site Licensing Handbook [4]. The frequency of sampling and parameters to be tested for area included in the plan and also detailed in WLDP-03704-ENA-005 [32].
Sewage Lagoon Primary Cell (SL1) Discharge Path		×									
Aquatic Biota and Public Health											
	Winnipeg River Sediments – Surface - - <u>What radioactivity from past and present WL operations is present in Winnipeg River Sediments?</u>										
Upstream Of WL Outfall	J04 (-0.76 km from outfall) J02 (-0.37 km from outfall)								×		(h) (should) These locations serves as a background locations for comparison to locations at, and, downstream of the WL processed outfall [8] and [12] [13].
Downstream of WL Outfall (see Figure A-2)	OFL (outfall)	×			×	×	×				(a) (shall) Although the contamination in the Winnipeg River sediments was found to present no risk to human or ecological health [12] [13], annual sampling continues as part of the WL EAFP [8] to ensure that no additional impacts to Winnipeg River sediments as a result of decommissioning operations. The WL EAFP is WL Site Licence condition
	K01 (0.15 km from outfall)	×			×	×	×				

REDACTED

Criteria Identification [6]		Need for Monitoring Criteria - Location [6]									Justification
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	
Monitoring Location (emLine Code)	Comment										
	K03 (0.52 km from outfall)	×			×	×	×				1.8 [3] and referenced in WL Site Licensing Handbook [4]. (d) (should) Elevated levels of radioactivity in sediment are found in the Winnipeg River as reported in the series of annual safety reports [29]. (e) (may) A gradient in contaminant concentration is expected over a spatial extent, these monitoring locations are distributed along the gradient [15]. (f) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and the locations are within reasonable proximity to the points of discharge and in the likely path of the discharges Table 2 [12] [13].
	K05 (0.79 km from outfall)	×			×	×	×				
	K14 (2.56 km from outfall)	×	×		×	×	×			×	(a) (shall) Although the contamination in the Winnipeg River sediments was found to present no risk to human or ecological health [12] [13], annual sampling continues as part of the WL EAFP [8] to ensure that no additional impacts to Winnipeg River sediments as a result of decommissioning operations. The WL EAFP is WL Site Licence condition 1.8 [3] and referenced in WL Site Licensing Handbook [4]. (b) (shall) This location is representative of Critical group Farm A [15]. (d) (should) Elevated levels of radioactivity in sediment are found in the Winnipeg River as reported in the series of annual safety reports [29]. (e) (may) A gradient in contaminant concentration is expected over a spatial extent, these monitoring locations are distributed along the gradient [15]. (f) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, then monitoring should be in locations within reasonable proximity to the points of discharge and in the likely path of the discharges [8]. (i) (should) These monitoring locations are nearby farms and cottage areas where there is public concern regarding emissions [12] [13] and [15].
	K19 (3.48 km from outfall)	×	×		×	×	×			×	
	K22 (4.63 km from outfall)	×	×		×	×	×			×	
	K23 (4.78 km from outfall)	×	×		×	×	×			×	
	K24 (4.93 km from outfall)	×	×		×	×	×			×	
	K30 (13.06 km from outfall)	×	×		×	×	×			×	
	Winnipeg River Sediments – Depositional Zones - Do sediments in known depositional zones show evidence of the transport and deposition of radioactity originating from WL?										
Target Area 1 [30]	Located upstream of WL, and is the background reference area.								×		(h) (should) These locations serves as a background locations for comparison to locations downstream of the WL processed outfall as per WLDP-03704-REPT-007 [30].

REDACTED

Criteria Identification [6]		Need for Monitoring Criteria - Location [6]									Justification
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	
Monitoring Location (emLine Code)	Comment										
Target Area 2 [30]	Southwest end of Lac du Bonnet	×	×		×	×	×			×	(a) (shall) Although the contamination in the Winnipeg River sediments was found to present no risk to human or ecological health [12] [13], sampling of depositional areas as part of the WL EAFP [8] to ensure that no additional impacts to Winnipeg River sediments as a result of decommissioning operations and to verify the predictions in the CSR. The WL EAFP is WL Site Licence condition 1.8 [3] and referenced in WL Site Licensing Handbook [4]. (b) (shall) This location is representative of Critical group Farm A [15]. (d) (should) Elevated levels of radioactivity in sediment are found in the Winnipeg River as reported in the series of annual safety reports [29]. (e) (may) A gradient in contaminant concentration is expected over a spatial extent, these monitoring locations are distributed along the gradient [15]. (f) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and the locations are within reasonable proximity to the points of discharge and in the likely path of the discharges [8]. (i) (should) These monitoring locations are nearby residential, farm and cottage areas where there is public concern regarding emissions [12] [13] [14]and [15].
Target Area 3 [30]	Northwest end of Lac du Bonnet upstream from McCarthur Falls Dam	×	×		×	×	×			×	
	Landfill Dugout Sediments (see Figure A-8**)**										
ILF	Landfill dugout sediment sampling as per [32] and [43].	×			×		×				(a) (shall) As part of the WL EAFP [8] "monitoring of the dugouts around the landfill should be continued every 5 years to determine if contamination levels have risen significantly. Enhanced monitoring of the Landfill area should be implemented to detect possible contamination of sub-surface drainage". The WL EAFP is WL Site Licence condition 1.8 [3] and referenced in WL Site Licensing Handbook [4]. (d) (should) Elevated levels of radioactivity and some metals have been found in the landfill dugout sediment as reported in the series of annual safety reports [29]. (f) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and the locations are within reasonable proximity to the points of discharge and in the likely path of the discharges [12].[13],

REDACTED

Criteria Identification [6]		Need for Monitoring Criteria - Location [6]									Justification
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	
Monitoring Location (emLine Code)	Comment										
	Sewage Lagoon Sediments										
SL1	Sediments in Primary Cell as per [32].	×			×		×				(a) (shall) As part of the WL EAFP [8] " Sewage lagoon Primary and Secondary Discharge pathway soils are to be collected every five years starting in 2012 [32]. The WL EAFP is WL Site Licence condition 1.8 [3] and referenced in WL Site Licensing Handbook [4]. (d) (should) Elevated levels of radioactivity and some metals have been found in the landfill dugout sediment as reported in the series of annual safety reports [29]. (f) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, the monitoring locations are within reasonable proximity to the points of discharge and in the likely path of the discharges .
SL2	Sediments in Secondary Cell as per [32].	×			×		×				

Criteria from 900-509200-STD-010 [6]:

a) shall) If environmental monitoring of a location is required by any statute, regulation, licence, or permit that governs the operation of the nuclear facility, or otherwise directed by a regulator, then that location shall be included in the EMP.

b) (shall) If a location is representative of a site's identified critical group(s), then this location shall be included in the EMP.

c) (should) If a location represents an area in which contaminants of concern, physical stressors of concern, or potential effects were identified in an ERA (or equivalent), then this location should be included in the EMP.

d) (should) Any locations in which contaminant BVs have been exceeded or are predicted to be exceeded should be included in the EMP.

e) (may) If a gradient in contaminant concentration is expected over a spatial extent, monitoring locations may be distributed along the gradient.

f) (should) If environmental monitoring is being done to verify the effectiveness of containment and effluent controls, then monitoring should be in locations within reasonable proximity to the points of discharge and in the likely path of the discharges.

g) (should) If environmental monitoring at a location is triggered by the MISA Protocol [1], then this location should be included in the EMP.

h) (should) In addition to the locations mentioned above, locations with similar environmental conditions but without potential for facility-related effects (i.e. representative of natural background) should be included in the EMP as reference areas.

i) (should) Consideration should be given to establishing monitoring locations in nearby population centres (other than locations of identified or potential critical groups or identified in the ERA) for the most dominant contaminants and environmental pathways where there is public concern regarding emissions

REDACTED

5.2.6 Parameters to be Monitored

5.2.6.1 Chemical Parameters, Physical Stressors of Effect to be Monitored

In order to determine which physical stressors and/or parameters require monitoring under the non-radioactive EMP, another set of *Need for Monitoring Criteria (Need for Monitoring Criteria – Parameter)* has been developed as outlined in *Environmental Monitoring Program* [6] and is applied to those locations determined to require monitoring.

These criteria were applied to those locations requiring monitoring (see Table 3). The results of this review are summarized in Table 5 and Table 6. Further details pertaining to the reasoning for this monitoring including historical changes in this monitoring are outlined in the *WL Effluent Verification Monitoring Plan* [25] and non-radiological monitoring of groundwater, soils was introduced in 2008 based on a review of the site reference hazard information and on-site effluent data.

5.2.6.2 Radionuclides

The radionuclides chosen for monitoring in and around WL include all those that trigger the environmental monitoring criteria. The rationale used in the selection of radionuclides to be monitored in the EMP is discussed below, and a matrix of the monitored parameters and their relation to the environmental monitoring criteria are presented in Table 5.

Fate of radionuclides in the environment

Certain conditions have to be present in order for radioactivity to accumulate to measurable levels in the environment. The radioisotope must be released in significant quantity from WL and must be capable of being efficiently transported through the environment. Also, the radioisotope must have a sufficiently long half-life to allow time for environmental transport, sample collection, sample processing and counting. These factors are considered in the selection of radionuclides for inclusion in the EMP, as well as in the selection of the monitoring (i.e. sample collection and analysis) frequency.

Significant dose contributors

There is no regulatory requirement to monitor the concentration of specific radionuclides in the environment. Also, radionuclides are only important contaminants as defined in CSA N288.4 [7] if they contribute a dose of 10% or more of the relevant dose benchmark to members of the public i.e. 1 mSv per year. They were deemed important for the EMP because of a regulatory requirement to report the potential dose to the public from WL operations. To this end, the radionuclides selected for monitoring include those estimated to contribute 1% or more of total radiation dose to a critical group, based on the results of historical monitoring and dose assessments for the WL site (Table 4). These doses are associated with water ingestion (Cs-137 and Sr-90), meat and fish ingestion (Cs-137), and for 2013, vegetable ingestion (Sr-90). Initial radiochemical analysis of some media, particularly air filters, will result in the detection of short-lived radionuclides that do not meet the threshold to be classified as significant dose contributors. A recount, performed on the sample media after a period of ten days, will

REDACTED

eliminate the short-lived nuclides and provide a higher degree of accuracy in the detection of significant dose contributors.

Table 4: Dose Contribution by Radionuclide for the WL Site

Parameter	2013		2014		2015		2016		2017	
	Adult	Infant	Adult	Infant	Adult	Infant	Adult	Infant	Adult	Infant
Cs-137	4%	3%	99%	85%	100%	100%	90%	85%	100%	100%
Sr-90	96%	97%	1%	15%	0%	0%	10%	15%	0%	0%

Parameters identified in the Environmental Risk Assessment

The radionuclides selected for monitoring in the EMP include those that have the potential to produce effects in the receiving environment. Tritium, carbon-14, cesium-137 and strontium-90 in surface waters in the WL WMA were identified as contaminants of potential concern in the CSR [12] [13].

Parameters relevant to dose/exposure assessments

As part of the CSR, dose assessments were performed for Winnipeg River sediments and contaminant migration from the trenches in the WMA where contaminants of potential ecological concern (COPEC) were identified during the preliminary screening evaluation. These dose assessments considered the total dose from all radionuclides present at any given location, not only the dose from radionuclides identified as COPECs. This information was used to determine that the contaminated river sediments could be left in-situ and that remediation of at least four trenches within the WMA would be required. On-going monitoring of the Winnipeg River sediments and on-going monitoring of the surface waters around the WMA is required.

Verifying the effectiveness of containment and effluent controls

At locations where environmental monitoring is being done to verify the effectiveness of containment and effluent controls, monitoring is for radionuclides that could potentially be present in effluent discharges. These radionuclides were identified using various sources of information, including:

- The results of other environmental monitoring activities (e.g. routine effluent and groundwater monitoring, non-routine monitoring including special investigations, etc.);
- A review of radionuclide inventories and usage on site;
- Process knowledge derived from historical assessment, waste records and staff knowledge; and
- The Significant Environmental Aspects (SEA) database for WL.
- Where there is limited knowledge of contaminants of potential concern, a wide array of parameters are targeted, and as monitoring data become available the suite of parameters can be reduced as appropriate. Guidelines for the reduction of monitoring are given in Section 6.2.

REDACTED

Table 5: Criteria and Justification for Monitoring of Parameters

Environmental Media/Location	Criteria for Parameters to be Monitored							Justification
	(j)	(k)	(l)	(m)	(n)	(o)	(p)	
Air Quality - What is the nature of radioactivity deposited by precipitation and is it consistent with atmospheric dispersion models?								
Wet/Dry Deposition								
Gross Alpha						×		(o) Measurement of radioactivity serves to support atmospheric dispersion models, confirm the absence of effects (i.e. due diligence), and provide information during an emergency. Air inhalation is a dominant dose pathway for alpha emitters. Alpha activity measurement in deposition samples can be used to confirm that absence of effect [15].
Gross Beta						×		
Gamma Emitters[13]						×		
Surface Water[14] - What is the nature of radioactivity in the Winnipeg River and other surface waters on the WL site that could contribute radioactivity to the river if not managed properly? How much of the radioactivity in the river is derived from WL, giving a dose to human receptors by drinking the water?								
Winnipeg River (up and down stream)[15]								
Tritium		×	×			×	×	(k) (shall) The concentration of a contaminant as there is the potential for the contaminant or physical stressor to produce effects in the receiving environment [12] (Section 7). (l) (should) Water ingestion is a relevant pathway for exposure to these radionuclides (tritium, Sr-90, Cs-137 (gamma/gross beta), Am-241 (gamma/gross alpha)) for critical groups that get their drinking water from the river [15]. (o) (may) Measurement of radioactivity serves to support atmospheric dispersion models, confirm the absence of effects (i.e. due diligence), and provide information during an emergency. Water ingestion of HTO, Tc-99 (gross beta) and Np-237 (gross alpha) from air effluent releases is a relevant dose pathway for these isotopes [15]. (p) (should) Parameter is released to the Winnipeg River in measurable quantities from effluent streams at WL. Monitoring is to verify the effectiveness of containment and effluent controls for WL facilities and WMAs [29].
Gross alpha		×	×			×	×	
Gross beta		×	×			×	×	
Strontium-90		×	×			×	×	
Gamma emitters		×	×			×	×	
Uranium		×	×			×	×	
Run-off from WMA (Ditch Water)[16]								
Tritium	×	×					×	(j) (shall) These parameter values are required for the WMA [17] and CCSF [19] annual safety reports. (k) (shall) There is the potential for the contaminant or physical stressor to produce effects in the receiving environment. Ditch water contains contaminants that or are predicted to exceed BVs as per WL CSR Table 2 from [12]. p) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and these contaminants could potentially be present in effluent discharges.
Gross alpha	×	×					×	
Gross beta	×	×					×	

REDACTED

[13] Gamma radionuclides of interest include Am-241, Ce-144, Co-60, Cs-134, Cs-137 (Ba-137md), Eu-152, Eu-154, I-129, Mn-54, Nb-94, Sb-125 (Te-125md), U-235 (Th-231d), Zn-65, Pb-210, K-40, Bi-212, Pb-212, Bi-214, Pb-214, Ra-226, Th-227, Ac-228, Pa-233, Pa-234m, Th-235.

[14] The outfall effluent was reviewed and it was determined [44] that there was no need to expand the Environmental Monitoring program to include non-radiological analysis of Winnipeg River water.

[15] Isotopic Plutonium analysis and C-14 analysis are not required as C-14 is below detection limits from the OFS and plutonium is near detection levels.

[16] Ditch water will be assessed for C-14 in the 2019 field season.

Environmental Media/Location	Criteria for Parameters to be Monitored							Justification
	(j)	(k)	(l)	(m)	(n)	(o)	(p)	
Uranium						×		(o) (may) (iv) Crushed granite from the URL was used as base material for the construction island at the north end of the WMA and also at the south side of the WMA road near the new WMA complex. Uranium added to the parameter list as a result [29].
Gamma Emitters[17]							×	(p) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and these contaminants could potentially be present in effluent discharges as per WL CSR Table 2 from [12].
Carbon-14						×		(o) (may) Measurement of radioactivity serves to confirm the absence of effects (i.e. due diligence). For Terrestrial Animals, exposure to C-14 is a relevant pathway for animals that drink water from ditches/river [15].
Strontium-90, and other possible isotopes or parameters						×		(o) (may) The results for the parameters above are evaluated using the following screening criteria. The beta emitter with the most restrictive MAC in the potential contaminants of concern for WL is Sr-90 (MAC 5 Bq/L). WL EnvP assume Sr-90 is in equilibrium with Y-90 so a screening criteria of 10 Bq/L is used for gross beta. If the sample result is above 10 Bq/L the samples are submitted for Sr-90 analysis (to confirm the theory). Gamma spec analysis provides individual results for (Co-60, Nb-94, Sb-125, Cs-134, Cs-137(Ba-137m), Pm-147, and Am-241). If all of the gross beta is accounted for then the effort is complete. If not, WL staff evaluate the data against the most restrictive isotope not already detected and assume that is what it is (most likely Tc-99). If the value is above the MAC for Tc-99 (200 Bq/L) WL staff confirm that it is present. If it is not that particular isotope staff continue the search (Cl-36, Ni-63, etc). The alpha emitter with the most restrictive MAC and likely to be present is uranium (0.5 Bq/L/20 ppb). Since the groundwater in the WL area contains natural uranium (~2 to 200 ppb) it is the most likely alpha present. The rock surrounding the WL site is slightly enriched in uranium and its decay products including Ra-226. We also know that if uranium is present, then the progeny of uranium can contribute to the alpha and beta activity (0.025 to 0.045 Bq/ppb gross alpha and 0.016 to 0.035 Bq/ppb gross beta, there is higher contributions if the samples is counted right after collection versus one week later). If uranium (and uranium progeny) does not account for the alpha activity (1 ppb uranium is ~ 0.025 Bq/L gross alpha) present staff would review the gamma spec analysis to see if Am-241 is present as it is an indicator of the presence of plutonium isotopes. If the value is above the MAC for Am-241 and/or plutonium, the samples are sent for plutonium analysis. If the value is still above the MAC for that isotope staff would continue the search. Additional analyses (metals, VOCs, SVOCs) if required.
Surface Water – Landfill Dugouts								
Gross alpha						×	×	(o) (may) The choice of contaminants to monitor in the environment was based on the following: (i) The level of risk from an unintended release of contaminants from a facility is unknown and potential of concern as per WL CSR Table 2 from [12].
Gross beta[18]						×	×	
Gamma Emitters[19]						×	×	

[17] Gamma radionuclides of interest include Am-241, Ce-144, Co-60, Cs-134, Cs-137 (Ba-137md), Eu-152, Eu-154, I-129, Mn-54, Nb-94, Sb-125 (Te-125md), U-235 (Th-231d), Zn-65, Pb-210, K-40, Bi-212, Pb-212, Bi-214, Pb-214, Ra-226, Th-227, Ac-228, Pa-233, Pa-234m, Th-235.

[18] A preliminary investigation for Tc-99 and Sr-90 in the landfill dugouts was conducted in 2018 and the results were inconclusive (WL-EM-2019-005 [45]). Additional sampling will take place in 2019 during a wet period and/or after a few days of heavy rainfall.

[19] Gamma radionuclides of interest include Am-241, Ce-144, Co-60, Cs-134, Cs-137 (Ba-137md), Eu-152, Eu-154, I-129, Mn-54, Nb-94, Sb-125 (Te-125md), U-235 (Th-231d), Zn-65, Pb-210, K-40, Bi-

REDACTED

Environmental Media/Location	Criteria for Parameters to be Monitored							Justification
	(j)	(k)	(l)	(m)	(n)	(o)	(p)	
Strontium-90						×	×	(p) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and these contaminants could potentially be present in effluent discharges as per WL CSR Table 2 from [12].
Tritium						×	×	
Uranium (part of total metals)						×	×	
Non-rad parameters listed in see Table 6						×	×	
Surface Water – from B417 Tank catch/containment tray (WMT)								
Gross alpha	×						×	(j) (shall) These parameter values are required by the WMA Facility Authority [28] document states *"Those storage structures for solid wastes that incorporate sumps for in-leakage collection shall be monitored annually, and any accumulated water shall be removed and treated, if required*." The WMA Safety Analysis [17] has a similar statement indicating that sampling of this water is performed. (p) (should) This monitoring is performed to verify the effectiveness of containment of the [redacted] tank. Cesium-137 is detected in the catch/containment tray. Residual gross beta is assumed to be Sr-90/Y-90.
Gross beta	×						×	
Gamma Emitters[19]	×						×	
Surface Water – from SMAGs Sump, SSC Sump, SSC Standing Water, WMA Misc Sumps and WMA standing water (excavations)								
Gross alpha	×					×	×	(j) (shall) These parameter values are required by the WMA Facility Authority [28] document states *"Those storage structures for solid wastes that incorporate sumps for in-leakage collection shall be monitored annually, and any accumulated water shall be removed and treated, if required*." The WMA Safety Analysis [17] has a similar statement indicating that sampling of this water is performed. (o) This monitoring is performed to determine the appropriate disposition pathway for the water. Gross beta is assumed to be Sr-90/Y-90. (p) (should) This monitoring is performed to verify the effectiveness of containment of the WMA storage structures as per WL CSR Table 2 from [12].
Gross beta	×					×	×	
Gamma Emitters[19]	×					×	×	
Tritium	×					×	×	
pH	×					×	×	
Visual Inspection for film, sheen or discolouration, deleterious substances	×					×	×	
Surface Water – from Manholes and Excavations on WL Main Campus and Outer Areas								
Gross alpha		×				×	×	(k) (shall) As per Table 2, the potential effect of *"surface water contamination associated with migration of contamination from the removal of drains and other buried services and remediation".* These parameters would are potentially present. Gross beta is assumed to be Sr-90/Y-90. (o) (may) This monitoring is performed to determine the appropriate disposition pathway for the water [9]. (p) (should) This monitoring is performed to verify the effectiveness of containment of the active drain lines as per WL CSR Table 2 from [12].
Gross beta		×				×	×	
Gamma Emitters[19]		×				×	×	
pH, conductivity		×				×	×	
Visual Inspection for film, sheen or discolouration, deleterious substances		×				×	×	
Surface Water – from Primary Cell of the Sewage Lagoon								
Gross alpha						×	×	(o) (may) This monitoring is performed to determine the appropriate disposition pathway for the water [9].
Gross beta						×	×	

212, Pb-212, Bi-214, Pb-214, Ra-226, Th-227, Ac-228, Pa-233, Pa-234m, Th-235.

REDACTED

Environmental Media/Location	Criteria for Parameters to be Monitored							Justification
	(j)	(k)	(l)	(m)	(n)	(o)	(p)	
Gamma Emitters[21]						×	×	(p) (should) This monitoring is performed to verify the effectiveness of operational controls in place to prevent contaminants from being dumped down the domestic drains [9]. Gross beta is assumed to be Sr-90/Y-90.
Aquatic Biota and Public Health								
Fish (up and down stream - walleye (pickerel), pike, common sucker, and whitefish)[20]								
Gross beta			×			×		(l) (should) Fish ingestion is a relevant pathway for exposure to these radionuclides (Zn-65, Cs-134, Cs-137 (gamma/gross beta) for critical groups that consume fish from the Winnipeg River [15]. (o) (may) The choice of contaminants to monitor in the environment may also be based on the following: iv) There are other business reasons, i.e. stakeholder concerns, due diligence, etc [8].
Gamma Emitters[21]			×			×		
mass	×							(j) shall be measured if required by Annual Fish Permit.
length	×							(j) shall be measured if required by Annual Fish Permit.
Number of each species	×							(j) shall be measured if required by Annual Fish Permit.
River Sediment - <u>What is the nature of radioactivity in Winnipeg River sediments which may contribute to the uptake of radioactivity by the fish consumed by human receptors?</u>								
Gross alpha	×					×	×	(j) (shall) Although the contamination in the Winnipeg River sediments was found to present no risk to human or ecological health [12] [13], annual sampling continues as part of the WL EAFP [8] to ensure that no additional impacts to Winnipeg River sediments as a result of decommissioning operations. These parameters are in the effluent from the site and could be present in the sediment. (o) (may) The choice of contaminants to monitor in the environment may also be based on the following: iv) There are other business reasons, i.e. stakeholder concerns, due diligence, etc. (p) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and these contaminants could potentially be present in effluent discharges as per WL CSR Table 2 from [12].
Gross beta	×					×	×	
Gamma Emitters	×					×	×	
Strontium-90							×	(p) (should) If environmental monitoring is being done to verify the effectiveness of containment and effluent controls, then monitoring should be for those contaminants that could potentially be present in effluent discharges. Strontium-90 included based on current and past liquid effluent. Composite sample for each sampling site [33].
Sediment (depositional cores)								
Gross alpha	×							
Gross beta	×							
Gamma Emitters[22]	×							
Strontium-90	×							

REDACTED

[20] Gross alpha analysis is not performed on fish, the dominant dose pathway is gross beta/gamma emitters.

[21] Gamma radionuclides of interest include Am-241, Ce-144, Co-60, Cs-134, Cs-137 (Ba-137md), Eu-152, Eu-154, I-129, Mn-54, Nb-94, Sb-125 (Te-125md), U-235 (Th-231d), Zn-65, Pb-210, K-40, Bi-212, Pb-212, Bi-214, Pb-214, Ra-226, Th-227, Ac-228, Pa-233, Pa-234m, Th-235.

[22] Gamma radionuclides of interest include Am-241, Ce-144, Co-60, Cs-134, Cs-137 (Ba-137md), Eu-152, Eu-154, I-129, Mn-54, Nb-94, Sb-125 (Te-125md), U-235 (Th-231d), Zn-65, Pb-210, K-40, Bi-212, Pb-212, Bi-214, Pb-214, Ra-226, Th-227, Ac-228, Pa-233, Pa-234m, Th-235.

Environmental Media/Location	Criteria for Parameters to be Monitored							Justification
	(j)	(k)	(l)	(m)	(n)	(o)	(p)	
Metals referenced in [30] and included in Table 6.	×							(j) (shall) If concentration of a contaminant is required by any statute, regulation, licence, or permit that governs the operation of the nuclear facility, or otherwise directed by a regulator, then that location shall be included in the EMP. Although the contamination in the Winnipeg River sediments was found to present no risk to human or ecological health [12] [13], sampling of depositional areas as part of the WL EAFP [8]to ensure that no additional impacts to Winnipeg River sediments as a result of decommissioning operations and to verify the predictions in the CSR. Full parameter list is also included in reference [30].
Terrestrial Biota and Public Health - Does the flesh of local wild and domesticated animals contribute to a WL derived dose to human receptors?								
Game (Deer, Bear, Grouse, Rabbit), Livestock (Beef, Pork, Lamb, Poultry) – flesh (muscle) [23]								
Gross alpha			×			×		(l) (should) The EMP should include contaminants relevant to the exposure/dose assessments that are normally part of an ERA (or equivalent). Meat ingestion is a relevant pathway for exposure to these radionuclides for critical groups. These include C-14[24], gross beta emitters (Cs-134 (also gamma), Cs-137 (also gamma), Fe-55, I-129, Ni-63, Pm-147, Sr-90 (Y-90)), Zn-65 (also gamma), gross alpha emitters, U-234, U-235 (also gamma), U-238) [15]. Contaminant concentrations measured in biota are useful in the ERA in assessing contaminant bioavailability, assessing food-chain exposures at higher trophic levels, and facilitating estimation of organism dose. (o) (may) The choice of contaminants to monitor in the environment may also be based on the following: iv) There are other business reasons, i.e. stakeholder concerns, due diligence, etc. Annual monitoring is part of the EAFP [8]. These parameters are in the site effluent and could be present in game and/or livestock.
Gross beta			×			×		
Gamma Emitters[18]			×			×		
Game Animals (moose, deer) – bone								
Gross beta			×			×		(l) (should) The EMP should include contaminants relevant to the exposure/dose assessments that are normally part of an ERA (or equivalent). Contaminant concentrations measured in biota are useful in the ERA in assessing contaminant bioavailability, assessing food-chain exposures at higher trophic levels, and facilitating estimation of organism dose. These include C-14, gross beta emitters (Cs-134 (also gamma), Cs-137 (also gamma), Fe-55, I-129, Ni-63, Pm-147, Sr-90 (Y-90)), Zn-65 (also gamma), gross alpha emitters, U-234, U-235 (also gamma), U-238) [15]. (o) (may) The choice of contaminants to monitor in the environment may also be based on the following: iv) There are other business reasons, i.e. stakeholder concerns, due diligence, etc. Annual monitoring is part of the EAFP [8]. These parameters could be in the bone of game animals.
Strontium-90			×			×		
Gamma Emitters[18]			×			×		
What is the nature of radioactivity in local natural vegetation and garden crops that could be attributed to WL air and water effluents, and does this contribute to dose via ingestion?								
Native Vegetation (mixed grasses, weeds, and clover, Honey, Canola)								
Gross alpha	×		×				×	(j) (shall) The WMA Facility Authority [28] document and WMA Safety Analysis [17] document states "Samples of vegetation shall be collected annually and analysed for any changes in activity from normal background levels." These parameters allow this analysis.
Gross beta	×		×				×	
Gamma Emitters[25]	×		×				×	

REDACTED

[23] Water ingestion is a dominant dose pathway for air and liquid emissions of tritium so tritium analysis is not required for this media.

[24] Carbon-14 analysis of air effluents are not anticipated to be of significance and will be assessed in 2019 before introducing this pathway analysis.

[25] Gamma radionuclides of interest include Am-241, Ce-144, Co-60, Cs-134, Cs-137 (Ba-137md), Eu-152, Eu-154, I-129, Mn-54, Nb-94, Sb-125 (Te-125md), U-235 (Th-231d), Zn-65, Pb-210, K-40, Bi-

Environmental Media/Location	Criteria for Parameters to be Monitored							Justification
	(j)	(k)	(l)	(m)	(n)	(o)	(p)	
Strontium-90	×		×				×	(l) (should) Terrestrial plant ingestion is a relevant pathway for exposure to Ce-144 (part of gamma/gross beta) [15]. (p) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and these contaminants could potentially be present in effluent discharges as per WL CSR Table 2 from [12].
Tritium (free and OBT)						×		(o) (may) Released to the surface in measurable/significant quantities from WMA. Concentrations may be elevated vegetation. Monitoring serves to confirm the absence of impacts [15].
Garden Vegetables (leaf[26], root, fruit)								
Gross alpha			×				×	(l) (should) Garden Crop ingestion (Sr-90) is a relevant pathway for exposure to these radionuclides for critical groups [15]. Contaminant concentrations measured in biota are useful in the ERA in assessing contaminant bioavailability, assessing food-chain exposures at higher trophic levels, and facilitating estimation of organism dose. Annual monitoring is part of the EAFP [8]. (p) (should) This monitoring is being done to verify the effectiveness of containment and effluent controls, and these contaminants that could potentially be present in effluent discharges as per WL CSR Table 2 from [12].
Gross beta			×				×	
Gamma Emitters[25]			×				×	
Strontium-90			×				×	
Tritium (free and OBT)			x				x	(o) (may) Released to the surface in measurable/significant quantities from WMA. Concentrations may be elevated vegetation. Monitoring serves to confirm the absence of impacts [15].
Soil (Geology) - <u>What is the nature of radioactivity in soil within and close proximity to the WL site that can be attributed to WL operations?</u>								
Soil – WMA								
Gross alpha		×	×			×		(k) (should) As per Table 2, the potential effect of "leaks into surface water from in-situ trenches" was identified. (l) (should) Annual monitoring is part of the EAFP [8]. Ground shine is a relevant pathway for exposure to these gamma emitting radionuclides (Co-60, Eu-152, Eu-154, Mn-54, Nb-94, Sb-125) [15]. (o) (may) The choice of contaminants to monitor in the environment is as a gross trend indicator of contaminant migration.
Gross beta		×	×			×		
Strontium-90		×	×			×		
Gamma Emitters[25]		×	×			×		
Soil – Land clearance								
Gross alpha	×		×					(j) (shall) The concentration of a contaminant, intensity of a physical stressor, or effect on the environment shall be measured if required by any statute, regulation, licence, or permit that governs the operation of the nuclear facility, or as otherwise directed by a regulator. Need for demonstration of no or acceptable impact [34]. (l) (should) Ground shine is a relevant pathway for exposure to these gamma emitting radionuclides (Co-60, Eu-152, Eu-154, Mn-54, Nb-94, Sb-125) [15].
Gross beta	×		×					
Strontium-90	×		×					
Gamma Emitters[27]	×		×					
Non-rad parameters listed in see Table 6	×		×					

REDACTED

212, Pb-212, Bi-214, Pb-214, Ra-226, Th-227, Ac-228, Pa-233, Pa-234m, Th-235.

[26] Leafy vegetables should include local wild mushrooms and fruit should include local wild blueberries.

[27] Gamma radionuclides of interest include Am-241, Ce-144, Co-60, Cs-134, Cs-137 (Ba-137md), Eu-152, Eu-154, I-129, Mn-54, Nb-94, Sb-125 (Te-125md), U-235 (Th-231d), Zn-65, Pb-210, K-40, Bi-212, Pb-212, Bi-214, Pb-214, Ra-226, Th-227, Ac-228, Pa-233, Pa-234m, Th-235.

Environmental Media/Location	Criteria for Parameters to be Monitored							Justification
	(j)	(k)	(l)	(m)	(n)	(o)	(p)	
Sediment/Soil –Lagoon and Lagoon Discharge Path								
Gross alpha	×		×					(j)(shall) The concentration of a contaminant, intensity of a physical stressor, or effect on the environment shall be measured if required by any statute, regulation, licence, or permit that governs the operation of the nuclear facility, or as otherwise directed by a regulator. Need for demonstration of no or acceptable impact [34]. The full list of parameters are also shown in [32] and [43]. (l) (should) Ground shine is a relevant pathway for exposure to these gamma emitting radionuclides (Co-60, Eu-152, Eu-154, Mn-54, Nb-94, Sb-125). (l) (should) These parameters were chose to support the ERA for the closure of the Sewage Lagoon.
Gross beta	×		×					
Strontium-90[28]	×		×					
Gamma Emitters[27]	×		×					
Non-rad parameters listed in see Table 6	×		×					
Sediment - Landfill Dugouts								
Gross alpha	×		×					(j)(shall) The concentration of a contaminant, intensity of a physical stressor, or effect on the environment shall be measured if required by any statute, regulation, licence, or permit that governs the operation of the nuclear facility, or as otherwise directed by a regulator. Need for demonstration of no or acceptable impact [34]. The full list of parameters and locations are also shown in [32] and [43]. (l) (should) These parameters were chose to support the ERA for the closure of the Landfill.
Gross beta	×		×					
Strontium-90[28]	×		×					
Gamma Emitters[27]	×		×					
Non-rad parameters listed in see Table 6	×		×					

Criteria:

j) (shall) The concentration of a contaminant, intensity of a physical stressor, or effect on the environment shall be measured if required by any statute, regulation, licence, or permit that governs the operation of the nuclear facility, or as otherwise directed by a regulator.

k) (shall) The concentration of a contaminant or the intensity of a physical stressor shall be measured if based on the results of an ERA (or equivalent), there is the potential for the contaminant or physical stressor to produce effects in the receiving environment.

l) ((should) The EMP should include contaminants relevant to the exposure/dose assessments that are normally part of an ERA (or equivalent).

m) (m)(should) The radioactive contaminant(s) chosen for monitoring should be those estimated to contribute 1% or more of total radiation dose to members of a critical group.

n) (should) The non-radioactive contaminant(s) chosen for monitoring should be those triggered by the MISA Protocol [1].

o) (may) The choice of contaminants to monitor in the environment may also be based on the following:
   i. The level of risk from an unintended release of contaminants from a facility is unknown or has been determined by the ERA (or equivalent), to be of concern;
   ii. The level of risk from unmonitored releases of contaminants from a facility is unknown or has been determined by an ERA (or equivalent) to be of concern;
   iii. The emission of contaminants is highly variable;
   iv. There are other business reasons, i.e. stakeholder concerns, due diligence, etc.

p) (should) If environmental monitoring is being done to verify the effectiveness of containment and effluent controls, then monitoring should be for those contaminants that could potentially be present in effluent discharges.

[28] If gross beta levels are not accounted for by K-40 and Cs-137 (or other beta/gamma emitters), Sr-90 analysis is performed.

REDACTED

Table 6: Non-Radiological Parameters and Frequencies for Environmental Samples

ATG	*Parameter*	*Landfill Dugout Water*	Surface water[29] (not used as drinking water)	*Soil[30] (Land Clearance)*	*WPG River Sediment[33]*	*Lagoon Sediments[31]*	*Landfill Dugout Sediments[32]*
3	pH	Annual	Prior to relocation	Prior to clearance	--	--	--
	% Moisture	--	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 Year
6	Phosphorus (Total)	Annual	--	--	--	--	--
7	Conductivity	Annual	--	--	--	--	--
	Antimony, Total	--	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
9	Barium, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
9	Beryllium, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
9	Boron, (Total)	Annual	--	--	--	--	--
9	Cadmium, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
	Chromium, (Total)	Annual	--	--	Every 20 years	Every 5 years	Every 5 years
9	Chromium, hexavalent (Cs(VI)) and trivalent (Cr(III))	Annual	--	Prior to clearance	--	--	--
9	Cobalt, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
9	Copper, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
9	Lead, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
9	Molybdenum, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
9	Nickel, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
9	Selenium, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
9	Silicon, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
9	Silver, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
9	Strontium, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
9	Thallium, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
9	Tin, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
9	Titanium, (Total)	Annual	--	--	--	--	--
9	Uranium, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
9	Vanadium, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years

[29] This includes SMAGs Sump, SSC Sump, SSC Standing Water, WMA Misc Sumps and WMA standing water (excavations) and Manholes and Excavations on WL Main Campus and Outer Areas identified in Table 5.

[30] Parameters for analysis are assessed based on the reference hazard of the area being investigated.

[31] Every 5 years starting in 1999 as per WLDP-03704-ENA-005 [32]. The discharge path should be sampled periodically (every 10 years and at closure).

[32] Landfill dugouts soils are to be collected every five years starting in 2007 as per WLDP-03704-ENA-005 [32].

[33] Every 20 years starting 2006 as per EAFP.

REDACTED

ATG	Parameter	Landfill Dugout Water	Surface water[29] (not used as drinking water)	Soil[30] (Land Clearance)	WPG River Sediment[33]	Lagoon Sediments[31]	Landfill Dugout Sediments[32]
9	Zinc, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
9	Zirconium, (Total)	Annual	--	--	Every 20 years	Every 5 years	Every 5 years
9a	Iron, (Total)	Annual	--	Prior to clearance	--	--	--
9a	Magnesium, (Total)	Annual	--	--	--	--	--
-	Sodium , (Total)	Annual	--	--	--	--	--
10	Arsenic, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
12	Mercury, (Total)	Annual	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
16	Volatile, Halogenated (Bromodichloromethane, chloroform, methylene chloride, Trichloroethylene, Carbon tetrachloride)	Annual	--	Prior to clearance	--	--	--
17	Volatiles, Non-Halogenated (includes acetone, BTEX)	--[34]	--	Prior to clearance	--	--	--
-	Total Organic(as HB 40)[35]	Annual	--	--	Every 20 years	--	Every 5 years
-	Total Hydrocarbons[36]	--	--	Prior to clearance	Every 20 years	Every 5 years	Every 5 years
-	PCB	--	--	Prior to clearance	--	--	--
19	Extractables, Neutral di-n-butyl Phthalate (DBP) Di-2-Ethylhexyl Phthalate (DEHP),	One time[37]	--	--	---	--	--
20	Extractables, Acid (Phenolics)	One time	--	--	---	--	--
23	Extractables, Chlorinated (chlorobenzenes)	One time	--	--	---	--	--
25	Solvent Extractables (Oil and Grease)	Annual	--	--	---	--	--
30	Chloride, Sulphate, Nitrate (N) and Nitrite (N)	Annual	--	--	--	--	--
	Visual Inspection for film, sheen or discolouration, deleterious substances	Annual	Prior to relocation	--	--	--	--

REDACTED

5.2.7 Quality Assurance (QA) and Quality Control

In order to ensure that the data collected through the program is valid, the monitoring performing laboratories have strong QA/QC programs as required by the *EnvP Program Radiological and Non-Radiological Monitoring Service Quality Assurance Plan* [46]. These laboratories utilize QC tools such as blanks, spiked blanks, and replicate samples to address precision, accuracy, sensitivity, and to detect errors in the data. The field and laboratory QC programs are described in laboratory specific sampling and analysis procedures as per [47] and

[34] BTEX analysis has been performed on the landfill dugout for many years with no detection of these parameters so this analysis has been discontinued [45].

[35] HB 40 by UV if GC/MS concentration is over 75 ppm.

[36] CCME PHC CWS (F1-F4) categorized as F2 (C10-C16), F3(C16-C34), and F4 (C34-C50) ranges

[37] A one-time analysis for confirmation of absence purposes.

[36]. Estimating measurement uncertainty arising from measurement and sampling is described in [48].

The quality verification data generated by the laboratories are supplied to the Environmental Specialist who performs an evaluation to confirm that the performance and acceptance criteria in Section 5.5 are met.

5.2.7.1 Field Quality Verification Monitoring

In order to ensure that the data collected through the program is valid, the laboratories performing monitoring for the program have strong QA/QC programs as required by the *EnvP Program Radiological and Non-Radiological Monitoring Services Quality Assurance Plan* [46]. Note: This QA Plan is in line with the requirements of N288.4 [7].

In addition to this, field Quality Verification (QV) monitoring is in place for both the Effluent Verification Monitoring Program and the EMP with the frequency set to accommodate both of the programs. MISA requires that sampling take place annually on one effluent stream but recommends all ATGs be part of the field QV program. The MISA recommended frequencies [1] are outlined in Table 7.

Table 7: Field QV Frequency Recommended by MISA

Sampling Frequency	Field QV Frequency
Daily	Monthly
Weekly	Quarterly
Monthly	Semi-annual
Quarterly	Semi-annual
Semi-annual	Annual

REDACTED

With the current QV monitoring schedule, the WL site exceeds the field QV requirements outlined by MISA and conforms with most the MISA recommendations.

With the current QV monitoring schedule, the WL site exceeds the field QV requirements outlined by MISA and conforms with most the MISA recommendations.

More specifically, the majority of the field QV is completed on one of the *effluent* monitoring points, the Outfall (OFS) as this is the most frequently and widely monitored of all of the monitoring points. However, for those parameters which are not monitored at OFS but are monitored elsewhere, one of the locations with the most frequent monitoring of that parameter was chosen for the collection of field QV samples. The current field quality verification monitoring schedule can be found in [49].

The type of field QV sampling applicable for each of the Analysis Test Groups is outlined in Section 10.0 of the *Protocol for the Sampling and Analysis of Industrial/Municipal Waste Water*

[1]. These include the following types of samples serving different purposes and required in different combinations depending on the parameter:

Types and Purposes:

- Duplicate – Precision
- Travelling Blank – Contamination
- Spiked Blank – Accuracy

5.2.8 Additional Monitoring Details

5.2.8.1 Type of Data to be Collected

For surface water media types requiring non-radiological parameter monitoring, water concentrations are measured and further information can and is calculated (e.g. loading/flux).

NOTE: There have been no environmental concerns identified through contaminant monitoring where toxicity tests (i.e. biological effects monitoring) was deemed necessary. Therefore, there has been no toxicity testing completed at these monitoring locations under the routine non-radioactive EMP.

5.3 Step 3: Boundaries of the EMP

The EMP includes monitoring within the site boundary, to address potential biological effects and exposure pathways for ecological receptors; and in areas outside the boundary of the WL site, to address pathways leading to human exposure.

The boundaries of the EMP are shown in Figure 1. Monitoring starts beyond the final point of control for an airborne or waterborne release, and extends beyond the site boundary to include the locations of all potential critical groups for the WL site.

A more detailed description of locations where potentially impacted areas intersect with ecological receptor habitat within the site boundary is available in the CSR [12] [13] and Affected Lands and Contaminated Structures Detailed Decommissioning plan [50].

This monitoring plan does not address effluent monitoring at WL and it does not address the exposure of workers or visitors to the WL site to nuclear substances, which is controlled by CNL's Radiation Protection Program. A summary of all monitoring activities for the WL site is given in Table 8.

REDACTED

Table 8: Summary of WL Monitoring Activities

Environmental Component	Sampling Location	Parameters	Sampling Frequency
Air	WL Perimeter and Off-Site	γ (Thermoluminescent Dosimeters (TLDs))	Continuous
	WL Site	Dust Particulates (TSP, PM_{10}, Gross α/β, γ-spec)	Continuous during building demolition
		Quantities of fuel combusted for building heating. Diesel burned in their standby generators.	Internal worksheet tools are used to perform the calculations required to report to the NPRI. In addition, Environment Canada provides companies with various calculators (road dust, landfill gas)
		Quantity of Total (filterable) Particulate Matter, particulate below 10 microns (PM_{10}), particulate below 2.5 microns ($PM_{2.5}$)[38]	
		Record of Dust Control Treatments and Site Inspections	
		Halocarbon	All releases of halocarbons are recorded and those over 10 kg are reported to Environment Canada
Air Effluents	WL Facilities [redacted] (WR1), [redacted] and WMA Facilities	Gross α/β, γ-spec, C-14[39] tritium[40]	Continuous
Noise	WL Site	Noise monitoring	During periods of high activity
Topography	Surface drainage areas	Visual inspection of OFS pipe (above ground) for evidence of subsidence Visual Inspection of WMA ditch system and other drainage pathways identified in Storm Water Management plan Visual Inspection of the Winnipeg River Bank in the vicinity of the WL site	Semi-Annually
Surface Water	Winnipeg River	Gross α/β, Sr-90, Tritium, Uranium, γ-spec	Daily to Weekly, monthly composite analyzed
	WMA Ditches[41]	Tritium, Uranium, Gross α/β, γ-spec, C-14[42]	Periodically during ice free periods when ditches flow[43]
	Landfill Dugouts	Gross α/β, Tritium, non-	Annually

REDACTED

[38] As the result of travel on gravel roads, sand blasting activities, use of gas powered vehicles, propane tanks, other CO_2 emissions, burn pile.

[39] Air effluents needs to be assessed in 2019 for the presence of Carbon-14.

[40] Tritium analysis is only required for [redacted] air effluent.

[41] If gross beta levels are above 10 Bq/L the samples are submitted for Sr-90. If the alpha activity is above 0.5 Bq/L and not all alpha is accounted for by uranium and Am-241 is present in the gamma spec, the samples may be submitted for isotopic plutonium analysis. Additional analyses may be performed at the request of Facility Management or EnvP Program Manager.

[42] Ditch water will be assessed for C-14 in the 2019 field season.

[43] Ditch locations are checked and, if water is flowing, are sampled after rain events greater than 5 millimetre of rain in a 24-hour period, preceded by at least 48 hours of no precipitation. Samples should also be taken during the spring (snow) melt and not more than weekly unless there is some operational concern that triggers additional sampling.

Environmental Component	Sampling Location	Parameters	Sampling Frequency
		radiological (total metals including uranium)	
	Primary Cell of the Sewage Lagoon	Gross α/β, γ-spec	Prior to isolation from Secondary Cell and/or Discharge
	Main Campus Miscellaneous (manholes, excavations, sumps)	Gross α/β, γ-spec, pH, visual inspection for film, sheen or discoloration, deleterious substances, and other parameters (Table 6)	Prior to pump-out/relocation
Surface Water	[redacted]Tank catch/containment tray	Gross α/β, γ-spec	Monthly (April to October)
	SMAGs Sump, SSC Sump, SSC Standing Water, WMA Misc Sumps and WMA standing water (excavations)	Gross α/β, γ-spec, tritium, pH, visual inspection for film, sheen or discoloration, deleterious substances, and other parameters (Table 6)	Prior to pump-out/relocation
Atmospheric Deposition	Off-Site	Gross α/β, γ-spec	Monthly
Groundwater [51]	WMA[44]	Gross α/β, tritium, uranium, non-radiological parameters [52], field measurement of pH, conductivity and temperature water level measurements	Semi-Annually
	Landfill, Lagoon[39]	Gross α/β, tritium, uranium, non-radiological parameters [52], field measurement of pH, conductivity and temperature water level measurements	Annually (Spring)
	Main Campus (including locations in the vicinity of, and up and down gradient of, WR1)	Gross α/β, tritium, uranium, non-radiological parameters [52], field measurement of pH, conductivity and temperature Water Level measurements	Semi-Annually (basal and bedrock), Annually (water table and clay-till)
Liquid Effluents [25]	[redacted](WR1) and [redacted] tanks, Outfall Sampling Location Sewage Lagoon, Ditch location 8, 9 and Control	Gross α/β, tritium, γ-spec. Sr-90, uranium, non-radiological, Pu-238, Pu-239/240[45], C-14[46]	Continuous on discharge
Sediments	Winnipeg River	Gross α/β, γ-spec,	Every 20 years starting 2006[47]

[44] If gross beta levels are above 2 Bq/L the samples are submitted for gamma spectrometric analysis, if it exceeds 5 Bq/L the samples are submitted for Sr-90 analysis. If the alpha activity is above 0.5 Bq/L, the samples are submitted for gamma spectrometric analysis and possibly isotopic plutonium analysis. Additional analyses may be performed at the request of Facility Management or EnvP Program Manager.

[45] Plutonium (quarterly composite) analysis (Pu-238, Pu-239/240) is performed out outfall effluent.

[46] C-14 analysis is performed on [redacted] tank discharges and on the Outfall Sampling location.

[47] For Deposition Areas, thirteen cores are collected at each site. More information on sampling locations and sampling method is detailed in

REDACTED

Environmental Component	Sampling Location	Parameters	Sampling Frequency
	(depositional zone cores)	Sr-90 (composite for each sample) and other parameters (Table 6)	
Sediments	Winnipeg River (surface sediment)	Gross α/β, γ-spec, Sr-90 (composite for each sample)	Annually
Fish[48]	Winnipeg River (one upstream location and two downstream)	Gross β, γ-spec	Annually
Wildlife Deer, Bear, Grouse, Rabbit	On-Site, Off-Site	Gross α/β, γ-spec, Sr-90 (bone)	As Available[49]
Garden Crop[50]	Up and Downstream of Whiteshell Laboratories	Gross α/β, γ-spec, and Sr-90, Tritium (free and organically bound)	Annually
Honey/Canola[51]	Off-site local sources	Gross α/β, γ-spec, and Sr-90,Tritium (free and organically bound)	Annually
Beef/Pork/Lamb/Poultry[52]	Off-site local sources	Gross α/β, γ-spec	Annually
Native Vegetation	WL Perimeter ARMs, WMA	Gross α/β, γ-spec, Sr-90, Tritium (free and organically bond)	Annually
Soils	WMA affected areas	Gross α/β, γ-spec	Annually
Soils/sediments	Excavations/Land Clearance[53]	Gross α/β, γ-spec, non-radiological parameters (Table 6)	Pre-clearance
Soils/sediments	Landfill Dugouts[53]	Gross α/β, γ-spec, non-radiological parameters (Table 6)	Every 5 years (starting 2007)
Soils/sediments	Sewage Lagoon Sludge and Discharge Paths	Gross α/β, γ-spec, Sr-90, non-radiological parameters (Table 6)	Every 5 years (starting 1999)
Land Surveys	On-Site, Off-Site	γ-spec	Annually[54]
Species at Risk (Barn Swallows and Bats)	On-Site	Monitor Compensatory Habitat	Semi-Annually

REDACTED

WLDP-03704-REPT-007. Depositional zones are to be samples every 20 years to verify validity of EA conclusions.

[48] Fish netting activities must be in compliance with the annual permit issued under the Fisheries Act (Manitoba). Report of these activities must also be completed as the conditions listed in the permit.

[49] Game are obtained by CNL staff through road kills and/or from local trappers. Animal collection activities must be in compliance with the permit issued under the Wildlife Act. Reporting of these activities must also be completed as per the conditions listed in the permit. Species (normally deer, moose, bear, grouse or rabbit) sex and age should be report to the WL Environmental Specialist along with the radioactivity in Bq/kg, fresh weight for flesh (and bone - for deer/moose).

[50] Leafy vegetables should include local wild mushrooms and fruit should include local wild berries (possible choices - blue berries, Saskatoon berries, raspberries, strawberries, plums, gooseberries, chokecherries, pin cherries) [26].

[51] This is an air deposition pathway, canola, honey, poultry, pork, and beef can be obtained from the local colony near Whitemouth. Background samples can be obtained from local stores that bring in produce from un-impacted areas.

[52] Livestock are obtained by EnvP staff from local farmers/farmer's markets.

[53] If gross beta levels are not accounted for by K-40 and Cs-137 (or other beta/gamma emitters), Sr-90 analysis is performed.

[54] Land Gamma (Road Survey) must be performed in the fall before the first snowfall.

Environmental Component	Sampling Location	Parameters	Sampling Frequency
Wildlife Mortality	On-site (plant road)	Track wildlife mortality (including birds, reptiles and mammals)	Continuous, as reported by staff

5.4 Step 4: How the Monitoring Results will be Used to Meet the Defined Objectives

This section outlines how the monitoring identified in Section 5.2 will be used to meet the program objectives. The process for the interpretation and reporting of the EMP results is outlined in *Environmental Monitoring Program* [6].

5.4.1 Monitoring to Assess the Level of Risk to Human Health

The radioactive data obtained from the EMP are used to assess the level of risk to human health and safety by calculating radiation doses to the most exposed off-site members of the public (i.e. critic groups) as identified in the DRL model for WL [15].

These calculations address the significant exposure pathways and, where available, incorporate local intake fractions based on a site-specific survey of human receptors in the area. Calculations are based on the CSA N288.1 guidelines and the COG Guidance Document (when available, site-specific data on use of local food and water sources are used), and are performed using spreadsheets and/or the IMPACT code [15]. Recent dose reports [33] outline the dose calculation methods in detail.

Annual average contaminant concentrations are used to calculate annual average dose to the public. Human exposure concentrations are corrected for natural background using the results of monitoring at reference locations so that the dose contribution from WL can be compared to the public dose limit. Radionuclides present below the detection level (L_D) are included in the dose calculations. Radionuclides present below the critical level (L_C) are not included in the dose calculations.

Calculated doses are compared to the regulatory limits in Section 5.4.2.1.

5.4.2 Monitoring to Demonstrate Compliance with Limits

The discussion in the Annual EMP Report will mostly be focused on the most significant impacts observed during the monitoring year, as determined by high contaminant concentrations or deviations in contaminant trends. Significant impacts are identified by the use of different types of limits.

Three types of limits are applied in the EMP:

- Regulatory limits;
- Screening criteria, to detect contaminant concentrations above natural background; and
- Ecological effects-based criteria (i.e. Bv) to identify areas where there is a potential for ecological risk.

REDACTED

5.4.2.1 Regulatory Limits

Calculated doses to members of the public, as described in Section 5.4.1, are compared to:

- The public dose limit of 1 msv/a [53]; and,
- The dose triggers for ALARA [54] of 50 µSv/a to individual members of the public, and 1 person-Sv annual collective dose (both occupational and public).

5.4.2.2 Background Screening Criteria

The evaluation process initially involves the application of background screening criteria selected to identify contaminant concentrations that are abnormal.

The screening criteria consist of a combination of generic background concentrations (e.g. background concentrations from the literature, or regionally applicable data on natural background concentrations) and site-specific background concentrations. The site-specific background concentrations are determined by monitoring conditions at one or more reference areas, which are located on or near the WL site but have not been adversely affected by WL operations. The site-specific values usually consist of the upper limit (e.g. mean plus two standard deviations) of the average for the reference location(s). These values are identified and included in Table 9 and Table 10.

The background screening review is used to generate a list of "parameters of interest (key or critical parameters)" that are subject to further evaluation. The evaluation process involves the generation of trend charts, a review of the trends, and discussion in the Annual EMP Report.

Exceedance of a background screening criterion is not considered a non-conformance.

Table 9: Environmental Monitoring Radiological Method Detection Limits (MDL) and Background Values

Environmental Medium	Parameter	Unit	MDL[55]	Background Value	Source
Air Quality and Noise	TLDs	µGy/a	85[56]	< 1200 145-515	[55] [56]
	Land Gamma Survey	nSv/h	10	< 60	[33] (mean plus 2s of background of 2012 to 2017 data)
	Noise	dB	28-42	47	[57]
Wet/Dry Deposition[57]	Gross Alpha	Bq/m^2	1	2	BG is mean plus (n-1) times the standard deviation of 2012 to 2017
	Gross Beta	Bq/m^2	6	14	
	Cesium-137	Bq/m^2	0.1	0.3	
	Potassium-40	Bq/m^2	6	12	

[55] MDLs were calculated using background or blank values as per EPA MDL method 40 CFR Part 136 Appendix B or are from Annual Safety Reports normally based on sample size, count times and counting statistics or value is from Contract Lab analysis sheet.

[56] Detection limit calculated using background values from 2012 to 2017.

[57] The MDL is based on a rain pail (1,320 cm2) or snow sheet sample (1,320 cm2) resulting in 0.2 g of sample ash and counted 100 min for gross beta and Sr-90 analysis, and 400 minutes for gross alpha or 800 min for Cs-137, and K-40 analysis.

REDACTED

Environmental Medium	Parameter	Unit	MDL[55]	Background Value	Source
	Strontium-90[58]	Bq/m^2	0.5	0.7	[33]
Surface water (not used as drinking water)[59]	Gross Alpha	Bq/L	0.30	0.3	BG is geometric mean plus two times the standard deviation of 2009 to 2017 control locations data MAXXAM MDL
	Gross Beta	Bq/L	0.30	0.3	
	Potassium-40	Bq/L	10	0.3	
	Cesium-137	Bq/L	1	< 1	MAXXAM MDL
	Carbon-14	Bq/L	2	< 2	MAXXAM MDL [33]
	Strontium-90	Bq/L	1	< 1	[33] MAXXAM/PACE MDL
	Technetium-99	Bq/L	0.2	< 0.2	
	Americium-241	Bq/L	0.05	< 0.05	MAXXAM MDL [33]
	Tritium oxide	Bq/L	8	< 8	[33]
	Total Uranium	Bq/L (ppb)	0.003 (0.1)	0.025 (< 10[60])	[33]
Surface Water (Sumps, SL1 and Water Relocation Samples within the WMA)[61]	Gross Alpha	Bq/L	10	< 10	[58]
	Gross Beta	Bq/L	10	< 10	[58]
	Tritium	Bq/L	8	< 8	[58]
	Cesium-137	Bq/L	5	< 5	[58]
	Americium-241	Bq/L	10	< 10	[58]
	Potassium-40	Bq/L	100	<100	[58]
Surface water (used as drinking water)	Cesium-137	Bq/L	0.003	0.007	BG is average plus two standard deviations of 2007 to 2017 of upstream (SFD) data [33]
	Gross Alpha	Bq/L	0.023	0.050	
	Gross Beta	Bq/L	0.023	0.090	
	Potassium-40	Bq/L	0.040	0.087	
	Strontium-90	Bq/L	0.003	0.009	
	Americium-241	Bq/L	0.006	< 0.002	
	Total Uranium	Bq/L (ppb)	0.003 (0.1)	0.025 (<10)	
	Tritium oxide	Bq/L	3	7	
Fish	Gross beta	Bq/kg (fresh weight)	5	200	BG is the geometric mean plus 2 times the standard deviation of of 2012 to 2017 upstream data (rounded) [33]
	K-40	Bq/kg (fresh weight)	6	200	
	Cs-137	Bq/kg (fresh weight)	1	1.7	
Game, Livestock	Gross alpha	Bq/kg (fresh weight)	5	<11	[59] [60]

[58] Strontium-90 analysis of atmospheric deposition samples was discontinued in 2019. Tritium analysis was considered due to emissions from WR1 (1.5E+09 Bq/wk) but discounted as the average release of tritium from the site is 9E-05 %DRL.

[59] Control ditch location unaffected by WL operations. These are normally collected as 1 litres samples and are ashed before alpha, beta and gamma counting.

[60] Local well waters within the Canadian Shield contain naturally occurring uranium [78] at concentrations >100 ppb, the presence of uranium and its progeny are not unexpected. The reason for high uranium concentrations can be attributed to the presence of dissolved carbonate which is effective for leaching naturally occurring uranium from minerals under oxidizing conditions.

[61] Normally collected as a one litre samples, gamma MDL is based on counting a 500 mL sample for 30 minutes and three 1 mL samples counted for alpha and beta. These samples include sump water, SL-1 (primary cell grab sample), manhole water and standing water from excavations. Gross alpha is assumed to be Am-241 and gross beta is assumed to be Sr-90.

REDACTED

Environmental Medium	Parameter	Unit	MDL[55]	Background Value	Source
	Gross beta	Bq/kg (fresh weight)	5	Deer – 162 Grouse – 233	BG is the geometric mean plus 2 times the standard deviation of 2001 to 2016 data (outer areas)
	Cesium-137	Bq/kg (fresh weight)	1	Deer - 6 Grouse – 5	
	Potassium-40	Bq/kg (fresh weight)	100	Deer - 149 Grouse – 260	
	Strontium-90 (Deer bone)	Bq/kg (fresh weight)	8	64	
Canola	Tritium (free and OBT)	Bq/kg (fresh weight)	HTO 30 OBT 8	HTO < 40 OBT < 8	[61]
Honey	Tritium (free and OBT)	Bq/kg	HTO 30 OBT 19	HTO < 40 OBT < 19	[61]
Native Vegetation	Gross alpha	Bq/kg (fresh weight)	60	90	[33], BG is geometric mean plus 2 standard deviation of 2012 to 2017 data [59], for BG value in ()
	Gross beta	Bq/kg (fresh weight)	50	822	
	Potassium-40	Bq/kg (fresh weight)	100	960	
	Cesium-137	Bq/kg (fresh weight)	7	13 (4)	
	Americium-241	Bq/kg (fresh weight)	4	< 4	
	Beryllium-7	Bq/kg fresh weight)	6	NA	
	Strontium-90	Bq/kg (fresh weight)	6	7	
	Tritium (free and OBT)	Bq/kg (fresh weight)	HTO 10 OBT 4	HTO < 10 OBT < 4	[61]
Garden Crop	Gross alpha	Bq/kg (fresh weight)	4	Fruit - < 6 Root - < 6 Leaf – < 20	MDLs are from Kinetrics, [33], BG is geometric mean plus 2 times standard deviation of 2012 to 2017 data
	Gross beta	Bq/kg (fresh weight)	13	Fruit - 110 Root - 190 Leaf – 1200	
	Potassium-40	Bq/kg (fresh weight)	10	Fruit – 120 Root - 220 Leaf – 1680	
	Cesium-137	Bq/kg (fresh weight)	1	Fruit - < 1 Root - < 1 Leaf – < 1	
	Americium-241	Bq/kg (fresh weight)	4	Fruit – < 4 Root - < 4	

REDACTED

Environmental Medium	Parameter	Unit	MDL[55]	Background Value	Source
				Leaf – < 4	
	Beryllium-7	Bq/kg (fresh weight)	8	Fruit - 24 Root - 30 Leaf – 110	
	Strontium-90	Bq/kg (fresh weight)	0.1	Fruit - 5 Root - 5 Leaf – 9	
Soil (WMA)	Gross alpha	Bq/kg	40	970	Kinectrics Lab MDL, BG data is mean plus 2s of non-impacted areas [redacted] land clearance samples [59], for BG value for Cs-137
	Gross beta	Bq/kg	150	1800	
	Potassium-40	Bq/kg	5	750	
	Carbon-14	Bq/kg	100	NA	
	Cesium-137	Bq/kg	0.5	20 to 110 Bq/kg	
	Americium-241	Bq/kg	5	< 10	
	Strontium-90	Bq/kg	100	< 100	
Soil (Land Clearance)	Gross alpha	Bq/kg	100	970	Maxxam Lab MDL, BG data is mean plus 2s of non-impacted areas [redacted] land clearance samples [62].
	Gross beta	Bq/kg	100	1800	
	Potassium-40	Bq/kg	3	750	
	Cesium-137	Bq/kg	10	< 10 30 Bq/kg (Pinawa Channel) 10 Bq/kg (Milner Ridge)	
	Americium-241	Bq/kg	10	< 10	
	Strontium-90	Bq/kg	100	< 100	
Sediment	Gross alpha	Bq/kg	100	(1100) 2E+05 [63] 1000 [64] as natural uranium	BG is three times the standard deviation of the 2012 to 2017 data from the upstream locations. BV in () is 3 times (rounded) the geometric mean of 2012 to 2017 data for upstream locations DOE Graded Approach to Evaluating Radiation Doses to Aquatic and Terrestrial Biota [65] NSRDR Unconditional Clearance Level [64]
	Gross beta	Bq/kg	190	(1900) 2E+04 [63]	
	Potassium-40	Bq/kg	50	(1800) 10,000 [64]	
	Cesium-137	Bq/kg	10	(28) 1E+05 [63] 100 [64]	
	Americium-241	Bq/kg	10	(1100) 2E+04 [65] 100 [64]	
	Strontium-90	Bq/kg	100	(1900) 2E+05 [65] 1000 [64]	

REDACTED

Table 10: Non-Radioactive Background Values for the Whiteshell Laboratories Site and their Comparison to Current Laboratory Method Detection Limits (MDL)

ATG	*Parameter*	Unit	LMDL	*Non-Radioactive Background Value*	Ref
Surface Water[62]					
3	pH	pH unit	--	7.6	MAXXAM MDLs BG- Mean plus 2 s of the 2003 to 2017 of Control location data
6	Phosphorus (Total)	µg/L	5	230	
7	Conductivity	µS/cm	1.0	620	
9	Total Aluminum (Al)	µg/L	3.0	73	
9	Total Antimony (Sb)	µg/L	0.50	< 0.50	
9	Total Arsenic (As)	µg/L	0.10	2.6	MAXXAM MDLs BG- mean (2017, 2018) plus 2SD
9	Total Barium (Ba)	µg/L	1.0	75	MAXXAM MDLs BG - Mean plus 2 s of the 2016-2018 of Control location data
9	Total Beryllium (Be)	µg/L	0.10	< 0.10	
9	Total Bismuth (Bi)	µg/L	1.0	< 1.0	
9	Total Boron (B)	µg/L	50	< 50	MAXXAM MDLs BG - Mean plus 2 s of the 2016-2018 of Control location data
9	Total Cadmium (Cd)	µg/L	0.010	< 0.01	
9	Total Chromium (Cr)	µg/L	1.0	< 1.0	
9	Total Cobalt (Co)	µg/L	0.20	0.8	MAXXAM MDLs, BG- Mean plus 2 s of the 2016-2018 of Control location data
9	Total Copper (Cu)	µg/L	0.50	15	BG - Mean plus 2 s of the 2003 to 2017 of Control location data
9	Total Iron (Fe)	µg/L	10	840	MAXXAM MDLs BG - Mean plus 2 s of the 2003 to 2017 of Control location data
9	Total Lead (Pb)	µg/L	0.20	0.3	
9	Total Lithium (Li)	µg/L	2.0	13	MAXXAM MDLs BG- Control (2020)
9	Total Manganese (Mn)	µg/L	1.0	14	MAXXAM MDLs BG- Control (2020)
9	Total Molybdenum (Mo)	µg/L	1.0	4	BG- Mean plus 2 s of the 2016-2018 of Control location data
9	Total Nickel (Ni)	µg/L	1.0	4.6	BG- Mean plus 2 s of the 2003 to 2017 of Control location data
9	Total Selenium (Se)	µg/L	0.10	0.24	MAXXAM MDLs, BG is Mean plus 2 s of the 2016-2018 of Control location data
9	Total Silicon (Si)	µg/L	100	8340	
9	Total Silver (Ag)	µg/L	0.020	< 0.02	
9	Total Strontium (Sr)	µg/L	1.0	350	
9	Total Thallium (Tl)	µg/L	0.010	0.04	
9	Total Tin (Sn)	µg/L	5.0	< 5	

[62] Control Ditch Location data for comparison to ditch water, landfill dugout, catch/containment tray, sump water, manhole water and standing water from excavations.

REDACTED

ATG	*Parameter*	Unit	LMDL	*Non-Radioactive Background Value*	Ref
9	Total Titanium (Ti)	µg/L	5.0	10	
9	Total Uranium (U)	µg/L	0.10	0.50	
9	Total Vanadium (V)	µg/L	5.0	<5	
9	Total Zinc (Zn)	µg/L	5.0	18	MAXXAM MDLs, BG- Mean plus 2 s of the 2003 to 2017 of Control location data
9	Total Zirconium (Zr)	µg/L	0.10	1	MAXXAM MDLs, BG - Mean plus 2 s of the 2016-2018 of Control location data
9a	Total Calcium (Ca)	mg/L	0.050	NA	
9a	Total Magnesium (Mg)	mg/L	0.050	84	MAXXAM MDLs BG- mean (2017, 2018) plus 2SD
9a	Total Potassium (K)	µg/L	50	NA	
9a	Total Sodium (Na)	mg/L	0.050	43	MAXXAM MDLs BG- mean (2017, 2018) plus 2SD
9a	Total Sulphur (S)	mg/L	3.0	8	MAXXAM MDLs BG- Control (2020)
9	Chromium, hexavalent (Cs(VI))	µg/L	0.5	To be assessed	MAXXAM MDL
	Chromium, trivalent (Cr(III))	µg/L	1	To be assessed	MAXXAM MDL
12	Mercury, (Total)	µg/L	0.0020	0.098	MAXXAM MDLs BG- Mean plus 2 s of the 2003 to 2017 of Control location data
14	Phenolics (4AAP)	mg/L	0.001	0.005	MAXXAM MDLs, BG - Mean plus 2s of the 2003 to 2017 of Control location data
16	Trichloroethylene (trichloroethene)	µg/L	0.5	< 0.5	MAXXAM MDLs, BG – 2017, 2018 landfill dugout
17	Benzene,	µg/L	0.40	< 0.4	
	Toluene,	µg/L	0.40	< 0.4	
	Ethylbenzene,	µg/L	0.40	< 0.4	
	Xylene	µg/L	0.40	< 0.4	
17	Acetone	µg/L	15	< 15	MAXXAM MDLs, BG is less than MDL
19	Extractables, Neutral di-n-butyl Phthalate (DBP)	µg/L	NA	To be assessed	NA
	Di-2-Ethylhexyl Phthalate (DEHP),	µg/L	NA		
20	Extractables, Acid (Phenolics)	mg/L	0.001	0.005	BG - Mean plus 2s of the 2003 to 2017 of Control location data
23	Extractables, Chlorinated	µg/L	0.50	< 0.5	MAXXAM MDLs, BG – 2017, 2018 landfill dugout

REDACTED

ATG	*Parameter*	Unit	LMDL	*Non-Radioactive Background Value*	Ref
	(chlorobenzenes)				
25	Solvent Extractables (Oil and Grease)	mg/L	1.0	2	Mean plus 2 s of the 2003 to 2017 of Control location data MAXXAM MDLs
30	Chloride	mg/L	1.0	20	
30	Sulphate	mg/L	1.0	110	MAXXAM MDLs,
30	Nitrate (N)	mg/L	0.02	0.07	BG – 2017, 2018 landfill dugout
30	Nitrite (N)	mg/L	0.005	0.04	
Soils[63]					
	pH	NA	NA	6 to 8	MAXXAM MDLs,
9	Antimony	mg/kg	0.5	0.5 (0.11)	
9	Barium	mg/kg	1.0	180 (149)	
9	Beryllium	mg/kg	0.40	1 (0.9)	MAXXAM MDLs,
9	Bismuth	mg/kg	0.20	1.23 (0.2)	BG – mean plus 2s of [redacted] clearance samples [66]
9	Boron	mg/kg	5.0	< 5.0	
9	Cadmium	mg/kg	0.050	0.7 (0.3)	
9	Chromium	mg/kg	1	45 (24.4)	
9	Cobalt	mg/kg	0.30	20 (13.4)	
9	Copper	mg/kg	0.50	35 (19.4)	
9	Lead	mg/kg	0.10	20 (15.2)	MAXXAM MDLs,
9	Magnesium	mg/kg	50	28000	BG – mean plus 2s of [redacted] clearance samples [66]
9	Manganese	mg/kg	0.20	754 (931)	
9	Molybdenum	mg/kg	0.10	1 (0.93)	
9	Nickel	mg/kg	0.80	40 (29.8)	
9	Phosphorous	mg/kg	50	716	MAXXAM MDLs,
9	Potassium	mg/kg	200	4037	BG – mean plus 2s of [redacted] clearance samples [66]
9	Selenium	mg/kg	0.50	1.2 (0.8)	
9	Silver	mg/kg	0.20	0.6	
9	Sodium	mg/kg	1.0	264	
9	Strontium	mg/kg	0.05	69 (33.9)	
9	Thallium	mg/kg	0.10	0.4 (0.16)	
9	Tin	mg/kg	1.0	1.1 (0.44)	
9	Uranium	mg/kg	0.20	1.8 (1.0)	
9	Vanadium	mg/kg	1.0	70 (38)	
9	Zinc	mg/kg	1.0	100 (71.7)	
9a	Iron	mg/kg	50	30,000 (>3%) {30, 330}	MAXXAM MDLs, BG Background Level in WL region of Manitoba [67] and {BG – mean plus 2s of [redacted] clearance samples}
10	Arsenic	mg/kg	0.50	8 (2.1)	MAXXAM MDLs,
12	Mercury	mg/kg	0.050	< 0.07	BG – mean plus 2s of [redacted] clearance samples
17	Benzene	mg/kg	0.0050	< 0.005	MAXXAM MDLs,
	Toluene	mg/kg	0.020	< 0.02	BG- [redacted] clearance samples
	Ethyl Benzene	mg/kg	0.010	< 0.01	

[63] Soil from non-impacted areas

REDACTED

ATG	*Parameter*	Unit	LMDL	*Non-Radioactive Background Value*	Ref
	Xylene	mg/kg	0.040	< 0.04	
	F1 (C6-C10)	mg/kg	10	< 10	
	F2 (C10-C16)	mg/kg	20	23	MAXXAM MDLs, BG-[redacted] and [redacted] clearance samples
	F3 (C16-C34)	mg/kg	20	60	MAXXAM MDLs, BG-[redacted] and [redacted] clearance samples
	F4 (C34-C50)	mg/kg	20	60	
Sediments[64]					
9	Antimony, (Total)	mg/kg	0.5	To be assessed	MAXXAM MDLs
	Barium, (Total)	mg/kg	1.0	To be assessed	MAXXAM MDLs
9	Beryllium, (Total)	mg/kg	0.4	< 1.3	MAXXAM MDLs, CSR [12]
9	Cadmium, (Total)	mg/kg	0.05	< 1.3	
9	Chromium, (Total)	mg/kg	1.0	4.9	
9	Cobalt, (Total)	mg/kg	0.50	2.4	
9	Copper, (Total)	mg/kg	1.0	2.4	
9	Lead, (Total)	mg/kg	0.50	< 1.3	
9	Molybdenum, (Total)	mg/kg	0.40	2.8	
9	Nickel, (Total)	mg/kg	1.0	4.7	
9	Selenium, (Total)	mg/kg	0.50	To be assessed	MAXXAM MDL
9	Silver, (Total)	mg/kg	0.20	< 1.4	MAXXAM MDL, CSR [12]
9	Thallium, (Total)	mg/kg	0.10	To be assessed	MAXXAM MDL
9	Tin, (Total)	mg/kg	1.0	To be assessed	MAXXAM MDL
9	Uranium, (Total)	mg/kg	0.20	To be assessed	MAXXAM MDL
9	Vanadium, (Total)	mg/kg	1.0	3.9	MAXXAM MDLs, CSR [12]
9	Zinc, (Total)	mg/kg	10	10.8	
10	Arsenic, (Total)	mg/kg	0.50	To be assessed	MAXXAM MDL
12	Mercury, (Total)	mg/kg	0.05	0.0034	CNL MDLs, CSR [12]

REDACTED

5.4.2.3 Benchmark Values (BV)

The evaluation process also involves the application of ecological effects-based criteria, i.e. BVs, selected to identify areas where there is a potential for ecological risk.

The BVs consist of a combination of:

- Federal or provincial guidelines for environmental quality [57] [68] [69] [70] [71] [72] [73] [74] [75];
- Predicted levels from WL CSR [12] [13];
- Lowest observable effect levels from the literature [61] [65];
- Radiation Screening Criteria used for identifying COPECs [60] [65]; or
- The geometric mean plus three times the standard deviation of the background values.

[64] From upstream location

Benchmark values are intended to identify significant changes or high concentrations of contaminants at the monitoring locations. Exceedance of a BV does not necessarily indicate that ecological impacts would occur, but instead indicates that there is some potential for ecological impacts.

Note: Not all parameters measured under this program have an associated *Benchmark Value,* in fact, there are a number which do not; these generally consist of measures of environmental indicators (e.g. BOD) instead of pollutants; or they could be pollutants but have not had guidelines developed yet as they have not been federally identified as federal priority pollutants requiring the development of a guideline [70].

The BVs are listed in Table 11 and Table 12.

Exceedance of a BV is considered a non-conformance.

Table 11: Environmental Monitoring Radiological Method Detection Limits (MDL) and Benchmark Values (BV)

Environmental Medium	Parameter	Unit	MDL[65]	Benchmark Value	Source
Air Quality and Noise	TLDs	µGy/a	85 145-515	< 2,000 (WL Main Campus)[66] < 10,000 (WL WMA. Canister Area)	[33][54] BV is the geometric mean plus 3 times the standard deviation of 2012 to 2017 (perimeter fence for main campus and canister area for WMA)
	Land Gamma Survey	nSv/h	10	< 500	[33] [76]
	Noise	dB	28-42	85	[74]
Wet/Dry Deposition	Gross Alpha	Bq/m^2	1	3	[33], BV - average value for this station for 2012 to 2017 plus three standard deviations.
	Gross Beta	Bq/m^2	6	13 (17)	[77], BV in () is average value of results for this station for 2012 to 2017 plus three standard deviations.
	Cesium-137	Bq/m^2	0.1	3 (0.3)	
	Potassium-40	Bq/m^2	6	14	[33], BV - average value for this station for 2012 to 2017 plus three standard deviations.
	Strontium-90	Bq/m^2	0.5	3 (1)	[77], BV in () average value for this station for 2012 to 2017 plus three standard deviations.
	Gross Alpha	Bq/L	0.30	16.2 (20)	

[65] MDLs were calculated using background or blank values as per EPA MDL method 40 CFR Part 136 Appendix B or are from Annual Safety Reports normally based on sample size, count times and counting statistics or value is from Contract Lab analysis sheet.

[66] The benchmark values were assessed against radiological safety zone classifications. The main campus is expected to be very low radiation hazard (< 0.5 microsievert/hour/< 4380 microgray per year) and the WMA and Canister Areas are expected to be low radiation hazard (> 0.5 but less than 10 microsievert/hour/< 87600 microgray per year)

REDACTED

Environmental Medium	Parameter	Unit	MDL[65]	Benchmark Value	Source
Surface water (not used as drinking water)[67]	Gross Beta	Bq/L	0.30	666 (10)	BV based on Control Ditch Location data 2009 to 2018 [63][65]
	Cesium-137	Bq/L	1	291 3 (for WMA catch/containment tray[68])	[65]
	Potassium-40	Bq/L	10	NA	MAXXAM MDL NA
	Carbon-14	Bq/L	2	200	MAXXAM MDL [69]
	Strontium-90	Bq/L	1	666 (10)	MAXXAM/PACE MDL [63] [65]
	Technetium-99	Bq/L	0.2	200	MAXXAM/PACE MDL [69]
	Americium-241	Bq/L	0.05	16.2 (20)	MAXXAM MDL [63] [65]
	Tritium oxide	Bq/L	8	1.27E+07 (1E+07)	MDL based on Control Ditch Location data 2009 to 2018 [63] [65]
	Total Uranium	Bq/L (ppb)	0.003 (0.1)	2.5 (100[69])	[78]
Surface Water (Sumps and Water Relocation Samples within the WMA)[70]	Gross Alpha	Bq/L	10	16.2	[65]
	Gross Beta	Bq/L	10	666	[65]
	Tritium	Bq/L	8	7000 (12.7 MBq/L)	[65] [68]
	Cesium-137	Bq/L	5	291	[65]
	Americium-241	Bq/L	10	16.2	[65]
	Potassium-40	Bq/L	100	NA	NA
Surface water (used as drinking water)[71]	Cesium-137	Bq/L	0.003	10	[68]
	Gross Alpha	Bq/L	0.023	0.5	[68]
	Gross Beta	Bq/L	0.023	5	[68]
	Potassium-40	Bq/L	0.040	NA	
	Strontium-90	Bq/L	0.003	5	[68]
	Americium-241	Bq/L	0.006	0.7	[69]
	Total Uranium	Bq/L (ppb)	0.003 (0.1)	0.5 (20)	[68]

REDACTED

[67] Normally collected as a one litre samples, gamma MDL is based on counting a 500 mL sample for 30 minutes, gross alpha and gross beta MDL assumes ash of ~100 mg and a 100 minute count time, Sr-90 is 100 mL aliquot radiochemical separation followed by 100 minute count time. These samples include ditch water, landfill dugout and catch/containment tray, sump water, manhole water and standing water from excavations.

[68] Alert Environmental Specialist if the Cs-137 activity in the Catch/Containment Tray exceeds 3.0 Bq/L of at any time (see WLWMA-106030-OP-001 [41]).

[69] Local well waters within the Canadian Shield contain naturally occurring uranium [78] at concentrations >100 ppb, the presence of uranium and its progeny are not unexpected. The reason for high uranium concentrations can be attributed to the presence of dissolved carbonate which is effective for leaching naturally occurring uranium from minerals under oxidizing conditions.

[70] Normally collected as a one litre samples, gamma MDL is based on counting a 500 mL sample for 30 minutes and three 1 mL samples counted for alpha and beta. These samples include sump water, manhole water and standing water from excavations. Gross alpha is assumed to be Am-241 and gross beta is assumed to be Sr-90.

[71] Normally collected as at least 25 litres samples, separate aliquot for tritium analysis, remainder is evaporated to dryness and the ash is alpha, beta and gamma counted, then processed for Sr-90 counting.

Environmental Medium	Parameter	Unit	MDL[65]	Benchmark Value	Source
	Tritium oxide	Bq/L	3	7,000 (5.0 background level[72])	[68]
Fish	Gross beta	Bq/kg (fresh weight)	5	250	BV is geometric mean plus 5 times the standard deviation of 2012 to 2017 upstream data (rounded)
	K-40	Bq/kg (fresh weight)	6	250	
	Cs-137	Bq/kg (fresh weight)	1	4[73]	[33]
Game, Livestock	Gross alpha	Bq/kg (fresh weight)	5	33	[59] [60]
	Gross beta	Bq/kg (fresh weight)	5	Deer – 193 Grouse – 294	BV is 3 times the geometric mean of 2001 to 2016 data
	Cesium-137	Bq/kg (fresh weight)	1	Deer [74] - 33 Grouse – 45	
	Potassium-40	Bq/kg (fresh weight)	100	Deer - 174 Grouse – 320	
	Strontium-90 (Deer bone)	Bq/kg (fresh weight)	8	80	
Canola	Tritium (free and OBT)	Bq/kg (fresh weight)	HTO 30 OBT 8	HTO [75] 104,000 OBT 45,2000	[61]
Honey	Tritium (free and OBT)	Bq/kg	HTO 30 OBT 19	HTO[62] 2.5E6 OBT 1.3E6	[15] [61]
Native Vegetation	Gross alpha	Bq/kg (fresh weight)	60	130	[33], BV is 3 times the geometric mean of 2012 to 2017 data
	Gross beta	Bq/kg (fresh weight)	50	1550[76]	
	Potassium-40	Bq/kg (fresh weight)	100	1550	
	Cesium-137	Bq/kg (fresh weight)	7	21	
	Americium-241	Bq/kg (fresh weight)	4	NA	

[72] Background levels of tritium taken from Health Canada's Canadian Radiological Monitoring Network – tritium in drinking water (saved as excel file).

[73] The concentration of Cs-137 in fish would have to be 1750 Bq/kg to trigger an ALARA (0.05 mSv/a) review.

[74] The concentration of Cs-137 in game would have to be 240 Bq/kg to trigger an ALARA (0.050 mSv/a) review.

[75] Values from the CNSC Implementation of Recommendations from the Tritium Studies Synthesis Report. It states that the IEMP Screening levels were developed by CNSC staff using the methodology outlined in CSA standard N288.1-14 and conservative assumptions. The screening level for a particular radionuclide in a particular medium (e.g., water, air, foodstuffs) represents the activity concentration that would result in a dose of 0.1 mSv per year, a dose at which no health impacts are expected.

[76] Dose to meadow grass for gross beta as Sr-90 would be 0.02 mGy/d, which is well below the benchmark values of 100 µGy/h (2.4 mGy/d) for doses to terrestrial biota [60].

REDACTED

Environmental Medium	Parameter	Unit	MDL[65]	Benchmark Value	Source
	Beryllium-7	Bq/kg (fresh weight)	6	NA	
	Strontium-90	Bq/kg (fresh weight)	5	8	[33], BV is 3 times the geometric mean of 2012 to 2017 data
	Tritium (free and OBT)	Bq/kg (fresh weight)	HTO 10 OBT 4	HTO [62] 104,000 OBT 45,2000	[61]
Garden Crop	Gross alpha	Bq/kg (fresh weight)	0.1 to 1	Fruit - 10 Root – 10 Leaf – 20	MDLs are from Kinetrics, BV is geometric mean plus 3 times standard deviation of 2012 to 2017 data [33], or 0.05 mSv/a potential dose (trigger for ALARA review) whichever is less.
	Gross beta	Bq/kg (fresh weight)	13	Fruit - 130 Root - 210 Leaf – 1600	
	Potassium-40	Bq/kg (fresh weight)	10	Fruit – 140 Root - 250 Leaf – 2300	
	Cesium-137	Bq/kg (fresh weight)	0.3 to 0.4	Fruit - 2 Root - 2 Leaf – 1	
	Americium-241	Bq/kg (fresh weight)	4	Fruit - 6 Root - 4 Leaf – 6	
	Beryllium-7	Bq/kg (fresh weight)	8	Fruit - 1000 Root - 1000 Leaf – 1000	BV is based on a <0.005 mSv/a dose to a member of the public
	Strontium-90	Bq/kg (fresh weight)	1	Fruit - 10 Root - 10 Leaf – 20	BV is geometric mean plus 3 times standard deviation of 2012 to 2017 data (rounded), [33]
Soil (WMA)	Gross alpha	Bq/kg	40	1E+05	Kinectrics Lab MDL, BVs from [63] and [65]
	Gross beta	Bq/kg	150	8E+02 [77]	
	Potassium-40	Bq/kg	5	900[78]	
	Carbon-14	Bq/kg	100	4670	
	Cesium-137	Bq/kg	0.5	8E+02	
	Americium-241	Bq/kg	5	1E+05	
	Strontium-90	Bq/kg	100	2E+06	
Soil (Land Clearance)	Gross alpha (as Am-241)	Bq/kg	30	2436 (agriculture land use)	Maxxam Lab MDL, BVs from [79][79]

[77] Gross beta is assessed after K-40 contribution and Cs-137 contributions are removed and residual is assumed to be Sr-90/Y-90.

[78] BV for K-40 is mean plus 3 standard deviations of unaffected area soils.

[79] The soil BV is the soil activity concentration resulting in a 0.1 mSv/a dose for the residential land use identified in Table 3-2 of WL-509420-REPT-001.

REDACTED

Environmental Medium	Parameter	Unit	MDL[65]	Benchmark Value	Source
	Gross beta (as Cs-137)	Bq/kg	100	478[80]	
	Potassium-40	Bq/kg	100	900	
	Cesium-137	Bq/kg	5	478	
	Americium-241	Bq/kg	5	2436 (agriculture land use)	
	Strontium-90	Bq/kg	100	196	
Sediment	Gross alpha	Bq/kg	100	(1100) 2E+05 [63] 1000 [64] as natural uranium	BV is three times the standard deviation of the 2012 to 2017 data from the upstream locations. BV in () is 3 times (rounded) the geometric mean of 2012 to 2017 data for upstream locations DOE Graded Approach to Evaluating Radiation Doses to Aquatic and Terrestrial Biota [65] NSRDR Unconditional Clearance Level [64]
	Gross beta	Bq/kg	190	(1900) 2E+04 [63]	
	Potassium-40	Bq/kg	50	(1800) 10,000 [64]	
	Cesium-137	Bq/kg	10	(28) 1E+05 [63] 100 [64]	
	Americium-241	Bq/kg	10	(1100) 2E+04 [65] 100 [64]	
	Strontium-90	Bq/kg	100	(1900) 2E+05 [65] 1000 [64]	

REDACTED

5.4.3 Short-Term Evaluation of EMP Data

The following 3-Step process is followed to determine whether the program's monitored results are of ecological concern.

Step 1: Calculate the annual average concentration[81]: Caution should be exercised in the treatment of outliers. Statistical tests that can be used for identifying outliers are described in Section 4.4 of EPA QA/G-95 [80]. The process for determining significant figures is described in Section 6.10 of WL-509253-PRO-001 [48]. Estimating measurement uncertainty arising from measurement and sampling is described in [48].

Step 2: Determine if above the *Benchmark Value* (see Table 11 and Table 12).

Note: Not all parameters measured under this program have an associated *Non-Radioactive Benchmark Value*, as discussed in the previous section.

[80] Gross beta is assessed after K-40 contribution and Cs-137 contributions are removed and residual is assumed to be Sr-90/Y-90.

[81] Annual average (as opposed to annual maximums) is appropriate for comparison to *Non-radiological Benchmark Values* as these guidelines are based on long-term no-effects concentrations.

Nevertheless, it is possible that the generic CWQGs and PWQGs are over or under-protective at sites with unique conditions. For example, at the Control Ditch location, certain substances (iron) are naturally present in the environment at concentrations above the guidelines.

Therefore, CNL needs to take this background information into consideration when interpreting results as discussed below in Step 3.

Step 3: Determine if measured concentrations are above local background values. In order to do this, an upper limit of background is calculated for each associated background monitoring location using the 1989 Dunn method of the annual mean + 2SD value for the association between the Whiteshell site's background monitoring locations (Control Location Ditch and Intake) and monitoring locations.

The highest upper limit over a number of years is used where data is available. Annual averages of monitoring results per monitoring station are then compared to the watershed's upper limit of background. If the annual mean exceeds both the Benchmark Value and the upper limit of background, there is a potential for ecological concern and close attention should be paid to the situation which might include further sampling/ investigation. In the instance where the monitoring results are above the Benchmark Value but not above the background limit, there is no ecological concern. Figure 2 illustrates this 3-Step Process.

REDACTED

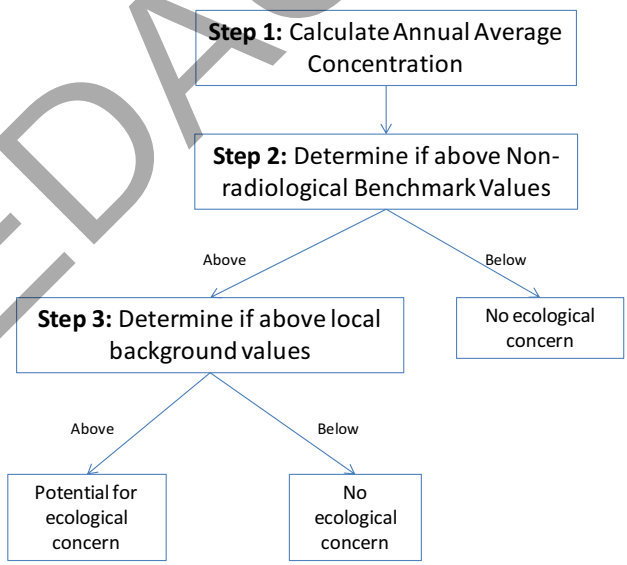


Figure 2: Short-Term Evaluation of Surface Water Monitoring Data

Table 12: Non-Radioactive Benchmark Values for the Whiteshell Laboratories Site and their Comparison to Current Laboratory Method Detection Limits (LMDL)

ATG	*Parameter*	Unit	LMDL	*Non-Radioactive Benchmark Value*	Ref
Surface Water[82] (not used for drinking water)					
3	pH	pH unit	--	6.5-9.0	[70]
6	Phosphorus (Total)	µg/L	5	270	MAXXAM MDLs
7	Conductivity	µS/cm	1.0	740	BV Mean (2003 to 2017) plus 3s (ditch control location data)
9	Barium, (Total)	µg/L	1.0	1000	MAXXAM MDLs, [68]
9	Beryllium, (Total)	µg/L	0.10	100	MAXXAM MDLs, [72]
9	Boron, (Total)	µg/L	50	500	MAXXAM MDLs, [72]
9	Cadmium, (Total)	µg/L	0.01	0.09	MAXXAM MDL, [70]
9	Chromium, hexavalent (Cs(VI))	µg/L	0.5	1.0	MAXXAM MDL, [70]
	Chromium, trivalent (Cr(III))	µg/L	1	8.9	MAXXAM MDL, [70]
9	Cobalt, (Total)	µg/L	0.2	0.9	MAXXAM MDL, [71]
9	Copper, (Total)	µg/L	0.5	20	MAXXAM MDL, BV Mean (2003 to 2017) plus 3s (ditch control location data)]
9	Lead, (Total)	µg/L	0.2	6	
9	Molybdenum, (Total)	µg/L	1.0	25	MAXXAM MDLs, [70]
9	Nickel, (Total)	µg/L	1.0	7	MAXXAM MDLs, (2003 to 2017) plus 3s (ditch control location data)]
9	Selenium, (Total)	µg/L	0.10	1.0	MAXXAM MDLs, [72]
9	Silicon, (Total)	µg/L	100	9950	MAXXAM MDLs, BV mean (Ditch Control location- 2017, 2018) plus 3SD
9	Silver, (Total)	µg/L	0.020	0.25	MAXXAM MDLs, [70]
9	Strontium, (Total)	µg/L	1.0	7000	MAXXAM MDLs, [68]
9	Thallium, (Total)	µg/L	0.10	0.8	MAXXAM MDLs, [70]
9	Tin, (Total)	µg/L	5.0	30	MAXXAM MDLs, BV mean (2017, 2018) plus 3SD
9	Titanium, (Total)	µg/L	5.0	30	MAXXAM MDLs, BV mean (2017, 2018) plus 3SD
9	Vanadium, (Total)	µg/L	5.0	30	MAXXAM MDLs, BV mean (2017, 2018) plus 3SD
9	Zinc, (Total)	µg/L	5.0	1000	MAXXAM MDLs, [72]
9	Zirconium, (Total)	µg/L	0.10	37	MAXXAM MDLs, [70]
9a	Iron, (Total)	µg/L	10	1000	MAXXAM MDLs Mean plus 3s of the 2003 to 2017 of Control location data
9a	Magnesium, (Total)	µg/L	1.0	110,000	MAXXAM MDLs BV - Mean plus 3s of the 2016 to 2018 of Control location

[82] Includes landfill dugout waters and can be used for water relocation samples (where applicable), and as benchmarks for WMA, Lagoon and Landfill wells.

REDACTED

ATG	*Parameter*	Unit	LMDL	*Non-Radioactive Benchmark Value*	Ref
					data
-	Sodium, (Total)	mg/L	0.05	200,000	MAXXAM MDLs, [68]
10	Arsenic, (Total)	µg/L	0.10	5	MAXXAM MDLs, [70]
12	Mercury, (Total)	µg/L	0.0020	0.13	MAXXAM MDLs Mean plus 3s of the 2003 to 2017 of Control location data
14	Phenolics (4AAP)	mg/L	0.001	0.007	MAXXAM MDLs BV - Mean plus 3s of the 2003 to 2017 of Control location data
16	Trichloroethylene (trichloroethene)	µg/L	0.5 to 2	21	MAXXAM MDLs, [72]
17	Benzene,	µg/L	0.40	370	MAXXAM MDLs, [70]
	Toluene,	µg/L	0.40	2	MAXXAM MDLs, [70]
	Ethylbenzene,	µg/L	0.40	90	MAXXAM MDLs, [70]
	Xylene	µg/L	0.40	300	MAXXAM MDLs, [72]
17	Acetone	µg/L	15	>45	MAXXAM MDLs, BV is three times MDL
19	Extractables, Neutral di-n-butyl Phthalate (DBP)	µg/L	NA	19	[70]
	Di-2-Ethylhexyl Phthalate (DEHP),	µg/L	NA	16	
20	Extractables, Acid (Phenolics)	µg/L	1	4	MAXXAM MDLs, [70]
23	Extractables, Chlorinated (chlorobenzenes)	µg/L	0.50	1.8	MAXXAM MDLs, [70]
25	Solvent Extractables (Oil and Grease)	mg/L	1.0	2.5	Mean plus 3s of the 2003 to 2017 of Control location data MAXXAM MDLs
30	Chloride	mg/L	1.0	640	MAXXAM MDLs, [70]
30	Sulphate	mg/L	1.0	500	MAXXAM MDLs, [68]
30	Nitrate (N)	mg/L	0.02	550	MAXXAM MDLs, [70]
30	Nitrite (N)	mg/L	0.005	60	MAXXAM MDLs, [70]
Soils[83]					
	pH	NA	NA	6 to 8	MAXXAM MDLs, CCME [73]
9	Antimony	mg/kg	0.5	20 (agriculture)	MAXXAM MDLs, CCME [73]
9	Barium	mg/kg	1.0	750 (soil, agriculture)	MAXXAM MDLs, CCME [73]
9	Beryllium	mg/kg	0.40	4 (8)	MAXXAM MDLs, CCME [73]
9	Cadmium	mg/kg	0.050	1.4 (22)	MAXXAM MDLs, CCME [73]
9	Chromium	mg/kg	1	64 (87)	MAXXAM MDLs, CCME [73]
9	Cobalt	mg/kg	0.30	40 (300)	MAXXAM MDLs, CCME [73]
9	Copper	mg/kg	0.50	63 ((1)	MAXXAM MDLs, CCME [73]
9	Lead	mg/kg	0.10	70 (600)	MAXXAM MDLs, CCME [73]
9	Molybdenum	mg/kg	0.10	5 (40)	MAXXAM MDLs, CCME [73]
9	Nickel	mg/kg	0.80	45 (89)	MAXXAM MDLs, CCME [73]

REDACTED

[83] Soil Quality Guidelines for the Protection of Environmental and Human Health, Agricultural Limit (Industrial Limit)

ATG	*Parameter*	Unit	LMDL	*Non-Radioactive Benchmark Value*	Ref
9	Selenium, (Total)	mg/kg	0.50	1 (agriculture), 6	MAXXAM MDLs, CCME [73], BV- mean plus 3s of [redacted] clearance samples
9	Silver, (Total)	mg/kg	0.20	20 (agriculture)	MAXXAM MDLs, CCME [73]
9	Thallium, (Total)	mg/kg	0.10	1 (agriculture)	MAXXAM MDLs, CCME [73]
9	Tin, (Total)	mg/kg	1.0	5 (agriculture)	MAXXAM MDLs, CCME [73]
9	Uranium, (Total)	mg/kg	0.20	23 (soil, agriculture)	MAXXAM MDLs, CCME [73]
9	Vanadium, (Total)	mg/kg	1.0	130 (soil, agriculture)	MAXXAM MDLs, CCME [73]
9	Zinc	mg/kg	1.0	200 (360)	MAXXAM MDLs, CCME [73]
9a	Iron	mg/kg	50	30,000 (>3%)	MAXXAM MDLs, BV Background Level in WL region of Manitoba [67]
10	Arsenic	mg/kg	0.50	12 (12)	MAXXAM MDLs, CCME [73]
12	Mercury	mg/kg	0.050	6.6 (50)	MAXXAM MDLs, CCME [73]
17	Benzene	mg/kg	0.0050	0.0068	MAXXAM MDLs, CCME Tier 1 Levels [75]
	Toluene	mg/kg	0.020	0.08	MAXXAM MDLs, CCME Tier 1 Levels [75]
	Ethyl Benzene	mg/kg	0.010	0.018	MAXXAM MDLs, CCME Tier 1 Levels [75]
	Xylene	mg/kg	0.040	2.4	MAXXAM MDLs, CCME Tier 1 Levels [75]
	F1 (C6-C10)	mg/kg	10	210 (320)	MAXXAM MDLs, CCME Tier 1 Levels [75]
	F2 (C10-C16)	mg/kg	20	150 (260)	MAXXAM MDLs, CCME Tier 1 Levels [75]
	F3 (C16-C34)	mg/kg	20	1300 (2500)	MAXXAM MDLs, CCME Tier 1 Levels [75]
	F4 (C34-C50)	mg/kg	20	5600 (6600)	MAXXAM MDLs, CCME Tier 1 Levels [75]
Sediments[84]					
9	Antimony, (Total)	mg/kg	0.5	20 (soil, agriculture)	MAXXAM MDLs, CCME [73]
	Barium, (Total)	mg/kg	1.0	750 (soil, agriculture)	MAXXAM MDLs, CCME [73]
9	Beryllium, (Total)	mg/kg	0.4	4 (soil, agriculture)	MAXXAM MDLs, CCME [73]
9	Cadmium, (Total)	mg/kg	0.05	0.6	MAXXAM MDLs, [81]
9	Chromium, (Total)	mg/kg	1.0	37.3	MAXXAM MDLs, [81]
9	Cobalt, (Total)	mg/kg	0.50	40 (soil, agriculture)	MAXXAM MDLs, CCME [73]
9	Copper, (Total)	mg/kg	1.0	35.7	MAXXAM MDLs, [81]
9	Lead, (Total)	mg/kg	0.50	35	MAXXAM MDLs, [81]
9	Molybdenum, (Total)	mg/kg	0.40	5 (soil, agriculture)	MAXXAM MDLs, CCME [73]
9	Nickel, (Total)	mg/kg	1.0	45 (soil, agriculture)	MAXXAM MDLs, CCME [73]
9	Selenium, (Total)	mg/kg	0.50	1 (soil, agriculture)	MAXXAM MDLs, CCME [73]
9	Silver, (Total)	mg/kg	0.20	20 (soil, agriculture)	MAXXAM MDLs, CCME [73]
9	Thallium, (Total)	mg/kg	0.10	1 (soil, agriculture)	MAXXAM MDLs, CCME [73]
9	Tin, (Total)	mg/kg	1.0	5 (soil, agriculture)	MAXXAM MDLs, CCME [73]
9	Uranium, (Total)	mg/kg	0.20	23 (soil, agriculture)	MAXXAM MDLs, CCME [73]
9	Vanadium, (Total)	mg/kg	1.0	130 (soil, agriculture)	MAXXAM MDLs, CCME [73]
9	Zinc, (Total)	mg/kg	10	123	MAXXAM MDLs, CCME [73]

[84] Soil quality guideline used where no aquatic value was available.

REDACTED

ATG	*Parameter*	Unit	LMDL	*Non-Radioactive Benchmark Value*	Ref
10	Arsenic, (Total)	mg/kg	0.50	5.9	MAXXAM MDLs, [81]
12	Mercury, (Total)	mg/kg	0.05	0.17	MAXXAM MDLs, [81]
-	Total Organic(as HB 40)	mg/kg	1	75	CNL MDLs, CSR [12]

5.4.3.1 Short and Long-Term Evaluation of EMP Data

The monitoring results are routinely reviewed looking for anomalous results and trends within the given monitoring year or over a number of years. Graphical analysis can be used to detect any trends in data or other statistical techniques. Guidance on statistical techniques can be found in EPA QA/G-9S [80]. The MISA process [1] can be followed for determining which values to include in data calculations. It should be noted that concentrations of non-radioactive results tend to be variable in surface waters due to natural occurrences (e.g. rain fall events etc.) and therefore changes in monitoring results over time are not necessarily a direct result of anthropogenic activities.

5.4.3.2 Long-Term Evaluation of EMP Data

The program itself is routinely reviewed to ensure the monitoring in place is appropriate, as the program is dynamic in nature. The types and frequencies of these reviews are shared among the Integrated Environmental Monitoring Program and are therefore outlined in *Whiteshell Laboratories Integrated Environmental Monitoring Program Framework* [5].

5.4.4 Monitoring to Confirm the Effectiveness of Containment/Effluent Controls

Emissions based on effluent monitoring are compared to those inferred from the results of environmental monitoring to see how well they agree:

- The control of radionuclide releases to the Winnipeg River is determined by monitoring radionuclides in the effluent streams (e.g. Process Outfall and Sewage Lagoon) that discharge to the river. An approximate check on the accuracy of this effluent monitoring can be obtained by concurrent measurements of radionuclide concentrations in the river downstream of the discharges. The emissions data are used together with hydrological data reference water quality data to model water concentrations to confirm that the measured concentrations in the Winnipeg River are reasonable.
- The containment of active waste within the WMAs can be confirmed by monitoring surface water at upstream and downstream locations. The EMP will identify if any concentrations are increased downstream, indicating loss of containment.

If there is a discrepancy between the results of effluent monitoring and environmental monitoring, for example if certain radionuclides begin showing up in environmental samples that were not there previously, this is an indication that the present effluent monitoring and/or control measures are lacking. As new measures are instituted, progress is monitored by watching for those nuclides in future environmental samples.

REDACTED

5.4.4.1 Relocation of Water from Sumps, Standing Water and/or Excavations within the WL WMA

Discharges shall not be directed to WMA ditch or released to the ground in the WMA, unless otherwise approved by the EnvP Program, in circumstances where the liquid has the following characteristics:

- A pH less than 6 or greater than 9;
- A temperature greater than 40°C; or,
- A visible film, sheen or discolouration.
- The risk for high levels of metals, TSS, organic content is assessed.

The liquid contains any of the following:

- Animate products of biotechnology,
- Concrete mixtures,
- Floating debris,
- Food waste,
- Fuel, Motor oil,
- Paint and organic solvents,
- Sewage of any kind,
- Solvent extractable matter of animal, vegetable, mineral or synthetic origin.

Radiological contaminants in excess of the limits specified below;

- Gross Beta 10 Bq/L;
- Gross Alpha 10 Bq/L;
- Tritium 7000 Bq/L;
- Any gamma isotopes detected are above the applicable water quality guideline.

If the radioactivity is above these levels and the decision is to discharge to the ditch system or ground in the WMA the value is assessed against the Radiation Screening Criteria [65]. There must be assurance that this surface water is not used as drinking water and is not being discharged near a drinking water well. Any water higher than these levels shall be assessed for treatment and/or disposal through the processed, storm or domestic drain. If the calculated levels are below admin levels for the OFS, the water can be put to the storm drain or process drain and discharged through the [redacted] and/or [redacted] LLLW systems. If the calculated levels would result in a site release above the Admin Levels the water can be further assessed to determine if there is a risk of exceeding the Action Levels for the site. If there is no risk that the level will approach the Action Level then the water can be discharged through the process drain to the [redacted] and/or [redacted] LLLW systems. This allows the discharge to be isolated if the levels are higher than calculated. If there is a risk the water will go over the Action Levels for the site, it should be evaporated in the [redacted] Shielded Facility and disposed of as solid waste.

REDACTED

Table 13: Radiation Screening Criteria

Americium-241	Bq/L	16.2
Cesium-137	Bq/L	291
Strontium-90	Bq/L	666
Tritium oxide	MBq/L	12.7

The water is normally run through a 5 micron filter prior to discharge. If the pH is not between 6 to 9, it should be adjusted before release.

5.4.4.2 Relocation of Water from Manholes and/or Excavations on the WL Main Campus

Discharges shall not be directed to the process, domestic or storm drain, or released to the ground, unless otherwise approved by the EnvP Program, in circumstances where the liquid has the following characteristics:

- A pH less than 6 or greater than 9;
- A temperature greater than 40°C; or,
- A visible film, sheen or discolouration.
- The risk for high levels of metals, Total Suspended Solids (TSS), organic content is assessed.

The liquid contains any of the following:

- Animate products of biotechnology,
- Concrete mixtures,
- Floating debris, Food waste,
- Fuel, Motor oil, Paint and organic solvents,
- Sewage of any kind,
- Solvent extractable matter of animal, vegetable, mineral or synthetic origin.

Radiological contaminants in excess of the limits specified below;

- Gross Beta 5 Bq/L;
- Gross Alpha 0.5 Bq/L;
- Any gamma isotopes detected are above the applicable water quality guideline
- If tritium is potential present – 7000 Bq/L

If the radioactivity is above these levels and the decision is to discharge to the process drain system or storm drain system, a comparison of the activity level to be discharged must be made against the site Admin Levels. If the calculated levels are below admin levels for the OFS the water can be put to the storm drain or process drain and discharged through the [redacted] and/or [redacted] Low Level Liquid Waste (LLLW) systems. If the calculated levels would result in a site release above the Admin Levels the water can be further assessed to determine if there is a risk of exceeding the Action Levels for the site. If there is no risk that the level will approach the Action Level then the water can be discharged through the [redacted] and/or [redacted] LLLW systems.

REDACTED

This allows the discharge to be isolated if the levels are higher than calculated. If there is a risk the water will go over the Action Levels for the site, it should be evaporated in the [redacted] Shielded Facility and disposed of as solid waste.

If there is concern about high TSS in addition to the level of activity, the water can discharged through the domestic drain provided that the level of activity is below the Ecological Effect Concentration levels in Table 13.

For all discharges, it is best if the water is run through a 5 micron filter prior to discharge. If the pH is not between 6 to 9, it should be adjusted before release. If it is impractical to adjust the pH the water should be directed to the [redacted] or [redacted] LLLW system.

If there is a need to discharge the water to the ground and it is above the rad limits, an assessment of the potential radiological contaminants should be made using the following guidance and assessment of potential risk.

Each potential contaminant of concern will be part of either the Gross Beta or Gross Alpha analysis result. Of these, some can be detected individually by gamma spec analysis or alpha spec analysis. The beta emitter with the most restrictive Maximum Acceptable Concentration (MAC) in the potential contaminants of concern for WL is Sr-90 (MAC 5 Bq/L). WL EnvP assume Sr-90 is in equilibrium with Y-90 so a screening criteria of 10 Bq/L is used for gross beta. If the sample result is above 10 Bq/L the samples are submitted for Sr-90 analysis (to confirm the theory). Gamma spec analysis provides individual results for (Co-60, Nb-94, Sb-125, Cs-134, Cs-137(Ba-137m), Pm-147, and Am-241). If all of the gross beta is accounted for then the effort is complete. If not, WL staff evaluate the data against the most restrictive isotope not already detected and assume that is what it is (most likely Tc-99). If the value is above the MAC for Tc-99 (200 Bq/L) WL staff confirm that it is present. If it is not that particular isotope staff continue the search (Cl-36, Ni-63, etc). The alpha emitter with the most restrictive MAC and likely to be present is uranium (0.5 Bq/L/20 ppb). Since the groundwater in the WL area contains natural uranium (~2 to 200 ppb) it is the most likely alpha present. The rock surrounding the WL site is slightly enriched in uranium and its decay products including Ra-226. We also know that if uranium is present, then the progeny of uranium can contribute to the alpha and beta activity (0.025 to 0.045 Bq/ppb gross alpha and 0.016 to 0.035 Bq/ppb gross beta, there is higher contributions if the samples is counted right after collection versus one week later). If uranium (and uranium progeny) does not account for the alpha activity (1 ppb uranium is ~ 0.025 Bq/L gross alpha) present staff would review the gamma spec analysis to see if Am-241 is present as it is an indicator of the presence of plutonium isotopes. If the value is above the MAC for Am-241 and/or plutonium, the samples are sent for plutonium analysis. If the value is still above the MAC for that isotope staff would continue the search.

5.4.5 Monitoring to Provide an Indication of Unusual or Unforeseen Circumstances

The EMP serves as a second line of defence by detecting unusual levels in the environment in the event of an unknown release of activity that was not detected by other early warning systems (e.g. leak detection, administrative/action levels).

REDACTED

The detection of significant deterioration in the quality of surface water in the course of tracking the environmental performance of facilities leads to follow-up investigations of the cause of that deterioration.

5.4.6 Verify Model Predictions, Refine Models, and Reduce Uncertainty in Model Predictions

Monitoring at all potential critical group locations generates results that can be used to verify the predictions and reduce the uncertainty made by the DRL model, as well as to refine the DRL model.

Aquatic emissions data concurrent with water sampling will be available from the effluent monitoring program. The emissions can be used with hydrological data to model water concentrations to verify aquatic dilution factors.

5.4.7 Monitoring to Demonstrate Due Dilligence

One objective of environmental monitoring is to increase the credibility of the image of a facility in the eyes of the public. CNL has adopted the approach that they will maintain a more extensive EMP than the minimum specified in the regulations.

Since the DRL model has not suggested any likelihood of human health effects from radionuclides released from WL, and since CNSC RegDoc-3.1.1 [82] requires reporting of doses for persons at critical group or groups locations, monitoring at other locations demonstrates due diligence. Similarly, since the monitoring to check on effluent control and continuing containment is precautionary, it also serves to demonstrate due diligence.

5.5 Step 5: Performance and Acceptance Criteria

5.5.1 Performance Criteria

Performance criteria for the EMP are defined in terms of:

- The percent of planned samples obtained; and
- The percent of samples within data acceptance criteria (Section 5.5.4).

It is expected that a certain number of samples each year will be unavailable due to sampling equipment malfunction, garden crop failures, or other logistical reasons. The minimum targets for the number of planned samples to be obtained for acceptable EMP performance are listed in Table 14, with all parameters meeting data acceptance criteria.

The 90% and 75% targets are based on the potential effect that missing a monthly or quarterly sample would have on the annual average concentrations. In both cases, based on expected variability among samples, one missing sample would not significantly affect the annual average, or unacceptably reduce the precision in dose assessments based on average concentrations.

REDACTED

Table 14: Targets for Percentage of Planned Samples to be Obtained in all Environmental Media

Collection frequency	Minimum target for % of planned samples obtained
Weekly	90%
Monthly	90%
Quarterly	75%
Semi-annual	100%
Annual	100%

5.5.2 Acceptance Criteria

1. **QV Limits**: The acceptance criteria in place on Quality Verification (QV) measurements for WL are established and documented in the lab level quality verification procedures as listed in [36]: The handling of sample data for those samples is included in the program's Environmental Monitoring Program procedure [6].
2. **Sample Unavailability**: Sample unavailability for the Effluent Verification Monitoring Program (EVMP) could be the result of a number of circumstances; for example sampling according to the monitoring schedule was missed, the collected sample was contaminated or lost, an automatic sampler failure, etc. Acceptance Criteria for such events are shared company-wide and therefore are outlined in *Management and Monitoring of Emissions* [9], along with steps which need be taken to compensate for the missed data.

5.5.3 LMDL's versus WL Monitoring Limits

Table 11 and Table 12 and compares the programs current Laboratory Method Detection Limits (LMDLs) for each parameter to the applicable monitoring limit(s) for that parameter. The program's LMDLs are all well below the benchmark values therefore ensuring that the 5.5.4monitoring results can be used to demonstrate compliance with these values.

5.5.4 Data Acceptance Criteria

The Environmental Management group conducts frequent internal checks of their technical capabilities as they perform their measurements. These are referred to as Quality Verification tests, and are grouped as follows according to purpose;

- Contamination Tests, such as measurement of the reagent blank, establish the level of analyte present resulting from contamination of the analysis system or system components. Acceptance criteria for these performance tests are related to each analyte's method detection limit.
- Reproducibility Tests, such as measurement of sample replicates, establish the relative precision of the method(s). To be acceptable, replicate measurements must agree within limits established by long-term method performance.

REDACTED

- Accuracy Tests, such as blanks or samples, each spiked with known amounts of the analyte(s), establish the presence or absence of any biases due to sample matrix, sample preparation, or instrument function. To meet acceptance criteria, the spike quantity must be recovered within limits established by long-term method performance.

These internal quality verification tests are summarized and reported on each year and assessed against acceptance criteria.

In addition Environmental Management group participates in semi-annual proficiency testing programs and the results of these tests are summarized and included in the Environmental Monitoring report.

Samples sent to contract laboratory for analysis include;

- Animal, Fish and Vegetation samples for gross alpha, gross beta and Gamma Spectrometry,
- Soil sediments for gross alpha, gross beta and Gamma Spectrometry, and,
- Groundwater samples for gross alpha, gross beta, Sr-90, and Gamma Spectrometry.

The data acceptance criteria for specific parameters and environmental media are established by the Quality Assurance group in conjunction with the Environmental Management team. The criteria are applicable to the results of QC samples that are associated with each batch of program samples analyzed.

Quality assurance test results are compared against the acceptance criteria. Failures are grouped in accordance with analytical method used to evaluate them and tracked through CNL's ImpAct system for trending purpose. The failed results are investigated to determine if they have significant effect on the validity of analysis results. Corrective action plans associated with the non-conformances are initiated and all of the associated non-conformances are being tracked through CNL's ImpAct system. All affected results are reviewed and sample aliquots are reprocessed, where required.

A series of annual memos are prepared documenting the lab/field team performance acceptance criteria and a summary is included in the annual Environmental Monitoring report [66].

5.6 Step 6: Detailed Design of the EMP

5.6.1 Planned Samples and Analysis

The detailed design of the EMP, including a schedule of the planned samples and analyses, is provided in the EMP monitoring schedule [10].

6. Modification of the EMP

Periodic reviews and annual performance assessments are the processes for making changes (i.e. reductions or additions) to the media, locations, or parameters being monitored as

REDACTED

part of the EMP. If necessary, changes can also be made during the program year. The decision and rationale for any changes are formally documented as per the requirement in *Environmental Monitoring Program* [6].

6.1 Additions to the EMP

Additions to the EMP are made in the context of the systematic informed planning process described in Section 5.

6.2 Reduction of Monitoring

Deletion of samples from the EMP and reductions in sampling or analysis frequency are appropriate if the changes do not impact the effectiveness of the EMP.

In cases where the absence of anomalous results and/or the absence of results above the detection level are observed over a five year monitoring period, the monitoring frequency may be reduced based on the professional judgment of EMP Staff. Consideration is given to operational experience, the results of the local population survey (e.g. the survey indicates the absence or unavailability of the sample media), and the results of historical monitoring (e.g. the results demonstrate that the contaminants are not present).

If there is a need to reduce the frequency of sample collection or analysis, the justification should include an evaluation showing that the increased sampling interval does not impact the accuracy of the results (e.g. longer analysis intervals may not be appropriate for radionuclides with a short half-life). This can be done by comparing the sample results at the current monitoring frequency with the sample results at the proposed monitoring frequency using appropriate statistical methods.

Reductions in monitoring can be absolute or can be made under the caveat that the parameters be periodically (e.g. every five years) analysed in order to confirm their continued absence. This periodic re-checking is referred to as “confirmational monitoring”. Should the contaminants be detected in anomalous concentrations from the confirmational monitoring, the previous sampling frequency is restored.

REDACTED

7. References

[1] *Municipal/Industrial Strategy for Abatement, Protocol for the Sampling and Analysis of Industrial/Municipal Waste Water*, 1999 January

[2] Ontario Regulation 215/95, *Effluent Monitoring and Effluent Limits – Electric Power Generating Sector.*

[3] *Nuclear Research and Test Establishment Decommissioning Licence, Whiteshell Laboratories*, Licence No. NRTEDL W5-8.00/2024, WLD-NOCN-19-0044-X, 53823005

[4] *Licence Conditions Handbook for Whiteshell Laboratories Nuclear Research and Test Establishment Decommissioning Licence,* NRTEDL-LCH-08.00/2024, WL-508760-HBK-002, 60318180

[5] *Whiteshell Laboratories Integrated Environmental Monitoring Program Framework*, WL-509200-OV-001, 53540176

[6] *Environmental Monitoring Program,* 900-509200-STD-010, 41555346

[7] Canadian Standards Association, *Environmental Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills*, CAN/CSA-N288.4-19, 2019 February.

[8] Environmental Assessment Follow-Up Program for Whiteshell Laboratories, 03704-001, 16660303

[9] *Management and Monitoring of Emissions,* 900-509200-STD-009, 40812070

[10] *Environmental Monitoring Program Schedule for WL*, WL-509200-062-000-000, 62114926

[11] *Environmental Protection,* 900-509200-PDD-001, 40788125

[12] *"Whiteshell Laboratories Decommissioning Project Comprehensive Study Report"*, Volumes 1, Main Report, WLDP-03702-041-000-0008, 12007915

[13] *Whiteshell Laboratories Decommissioning Project Comprehensive Study Report"*,Volume 2, Appendices, 2001 March WLDP-03702-041-000-0009, 12061937

[14] *Whiteshell Laboratories Decommissioning Project Comprehensive Study Report"*,Volume 3, Addendum, 2021 November, WLDP-03702-041-000-0010, 11900150

[15] *Derived Release Limits for AECL's Whiteshell Laboratories*, WL-509211-RRD-001, 53626314

[16] Canadian Standards Association, *Guidelines for Radiological Monitoring of the Environment*, CAN/CSA-N288.4-M90, 1990 November (reaffirmed in 1998)

[17] *Safety Analysis Report for the Whiteshell Laboratories Waste Management Area*, WLWMA-508640-SAR-001, 16651068

[18] *Facility Authorization for the Operation of the Concrete Canister Storage Facility at the Whiteshell Laboratories*, AECL-FA-22, 22324895

[19] *Whiteshell Laboratories Concrete Canister Storage Facility Safety Analysis Report*, RC-983, 14601536

[20] *Storage and Surveillance Plan for Whiteshell Laboratories* [redacted] *Whiteshell Reactor 1,* WLD-508330-SWS-000024, 63092844

[21] *Facility Authorization for the Operation of the Shielded Facilities at Whiteshell Laboratories*, WLSF-00583-FA-001, 16651750

[22] *Whiteshell Laboratories Shielded Facilities Safety Analysis Report*, WLSF-03500-SAR-001, 17217185

[23] *Whiteshell Laboratories Active Liquid Waste Treatment Center Safety Analysis Report*, RC-1021, 14519313

[24] *The WR-1 Reactor Phase 1 Decommissioning Interim Endstate Report*, RC-1290, 14569894

[25] *WL Effluent Verification Monitoring Plan,* WL-509200-PLA-001, 43924121

REDACTED

[26] Sagkeeng Anicinabe Land Use and Occupancy Study Specific to Canadian Nuclear Laboratories' Proposed In Situ Decommissioning of The WR-1 Reactor At Whiteshell Laboratories, WLDP-26000-041-000, 53529527

[27] Whiteshell Reactor #1 Decommissioning: Manitoba Metis Traditional Knowledge, Land Use, and Occupancy Study, WLDP-26000-041-000, 53525958

[28] *Facility Authorization for the Operation of the Waste Management Area at Whiteshell Laboratories*, WLWMA-00583-FA-001, 54900468

[29] *WL Annual Compliance Monitoring Report for 2022*, WL-514300-ACMR-2022, 61141519

[30] Sampling and Analysis of Winnipeg River Bottom Sediments at Three Target Areas: Current Baseline Conditions, WLDP-03705-REPT-007, 11889694

[31] Letter from S. Oue to R. H. McCamis, "*Review of AECL-Whiteshell Laboratories 2007 Annual Reports*", E-Docs# 3321088, 2009 January 12

[32] *Characterization of Shallow and Surface Soil Near the WL Waste Management Area, Lagoon and Landfill*, WLDP-03704-ENA-005, 11848378

[33] *Environmental Monitoring in 2017 at Whiteshell Laboratories*, WL-509243-ASR-2017, 40657641

[34] *WL Closure Land-Use and End-States*, WL-508350-REPT-001, 41552104

[35] *Monitoring Plan for the Ongoing Assessment of the WMA, Lagoon and Landfill Physical and Chemical Hydrogeological Conditions, Dillon Consulting Limited*, WLDP-03705-041-000-0022, 11983328

[36] *Whiteshell Laboratories Environment Management Governing Documentation Index*, WL-514200-GDI-001, 17225030

[37] Canadian Standards Association, *Guidelines for Modelling Radionuclide Environmental Transport, Fate, and Exposure Associated with the Normal Operation of Nuclear Facilities*, CAN/CSA-N288.1:20, 2020 February

[38] D. Hart (EcoMetrix Inc.), "*Derived Release Limits Guidance*", CANDU Owners Group Report No. COG-06-3090-R2-I, 14482743

[39] *Waste Management Area Monitoring & Surveillance*, WLWMA-106000-OP-003, 16660265

[40] *Periodic Inspection Plan for Whiteshell Laboratories Waste Management Area Concrete Bunkers*, WLD-106100-PLA-001, 42078541

[41] *High Level Liquid Waste Storage*, WLWMA-106030-OP-001, 53767568

[42] *Safety Analysis Report: Safety and Hazards Analysis for the Shielded Modular Above-Ground Storage Facilities at Whiteshell Laboratories*, WLDP-36410-SAR-001, 11868386

[43] Memo from K.Ross/T. Donnelly to R.Bilinsky/J. Melillo, *Landfill Dugout – Sediments*, 2018 May. 191-508740-799-000, WL-EM-2018-052, 40793591

[44] Memo from K. Ross to R. Bilinsky/P. Vilks, *Assessment of OFS Non-Rad Results for 2012 to 2017*, 191-508740-799-000, WL-EM-2019-006, 48097865

REDACTED

[45] Memo from K. Ross to J. Martino/R. Bilinsky, *Proposed Changes to Analysis of Landfill Dugout Waters*, 191-508740-799-000, WL-EM-2019-005, 48052214

[46] *EnvP Program Radiological and Non-Radiological Monitoring Service Quality Assurance Plan*, ENVP-01913-QAP-001, 54712345

[47] *Environmental Compliance Quality Assurance Plan*, WL-514200-QAP-001, 44168365

[48] *Estimating Measurement Uncertainty Arising from Measurement and Sampling*, WL-509253-PRO-001, 51052426

[49] *Effluent Field Quality Verification Monitoring Schedule*, WL-509200-062-000-000, 50703518

[50] VOLUME 12 - *Whiteshell Laboratories Licensed Site Supporting And General Infrastructure - Part 5: Site Affected Lands and Contaminated Structures*, WLDP-35000-DDP-001, 11868435

[51] *Groundwater Monitoring Locations and Schedule Groundwater*, WL-509200-062-000-0003, 43924193

[52] *Whiteshell Laboratories Groundwater Monitoring Plan*, WL-509200-PLA-003, 52717895

[53] Canadian Nuclear Safety Commission, *Radiation Protection Regulations*, Section 13, SOR/2000-203, current to December 12, 2018.

[54] Canadian Nuclear Safety Commission, *Keeping Radiation Exposures and Doses "As Low as Reasonably Achievable (ALARA)*, Regulatory Guide G-129, 2004 October

[55] *Preoperational Environmental Survey Report of the Whiteshell Nuclear Research Establishment Area*, WNRE 756, 1988, 14464898

[56] *National Council on Radiation Protection and Measurement, Exposure of the Population in the United States and Canada from Natural Background Radiation, Recommendations to the National Council on Radiation Protection and Measurement, NCRP Report* No. 94, 1987.

[57] US EPA (1974) Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety as recommended by Health Canada (2017b).

[58] 2017 *Progress Report on the Environmental Assessment Follow-up Program for Whiteshell Laboratories*, WL-509246-ASR-2017, 40681050

[59] *Atomic Energy of Canada Limited, Transfer of Fallout Cesium-137 and Natural Potassium-40 in a Boreal Environment, Journal of Environmental Radioactivity*, Volume 10, Pages 19 to 45, 1989

[60] *Sources and Effects of Ionizing Radiation*, Annex E, United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), 2008

[61] CNSC, *Recommendations from the Tritium Studies Synthesis Report*, 2019 January.

[62] S.C. Sheppard, M.I. Sheppard, M. Ilan, J. Tait, and B. Sanipelli, *Primordial Radionuclides in Canadian Background Site: Secular Equilibrium and Isotopic Differences*, Journal of Environmental Radioactivity, 99, 933-946, 2008

REDACTED

[63] Department of Energy (DOE). 2019. *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota.* DOE-STD-1153-2019. U.S. Department of Energy, Washington, D.C

[64] CNSC, *Nuclear Substance and Radiation Devices Regulation*, Section 1 Schedule 2 "*Unconditional Clearance Levels*", NSRDR SOR/2000-207, 2010 May.

[65] Chouhan, S.L., Yankovich, T.L., Davis, P.A., *Generic Environment Concentrations Below which No Effects are Expected on Non-Human Biota in Canada*, CANDU Owners Group Inc., COG-05-3068, 14546485

[66] *Environmental Monitoring in 2014 at Whiteshell Laboratories*, WL-509243-ASR-2014, 17237735

[67] Agriculture and Agri-Food Canada, *Status of Selected Trace Elements in Agriculture Soils of Southern Manitoba*, 1998

[68] Health Canada, *Guidelines for Canadian Drinking Water Quality – Summary Table*, Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and Environment, 2017 February.

[69] *Health Canada, Guidelines for Canadian Drinking Water Quality, Radiological Parameters, Guideline* Technical Document, 2009 May.

[70] CCME, *Canadian Water Quality Guidelines for the Protection of Aquatic Life*, 2007, online.

[71] *Ontario Provincial Water Quality Objective*, online.

[72] *Manitoba Water Quality Standards, Objectives and Guidelines*, 2011 November 28.

[73] CCME, *Soil Quality Guidelines for the Protection of Environmental and Human Health*, online.

[74] *Canadian Center for Occupational Health and Safety*, onLine, https://www.ccohs.ca/oshanswers/phys_agents/exposure_can.html

[75] CCME, *Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil, Canadian Council of Ministers of the Environment*, 2008.

[76] *Radiological Areas and Zones*, Appendix A Table 1, 900-508740-MCP-027, 54327478

[77] *Available Data for Establishing Background Radionuclide Levels in the Vicinities of Canadian CANDU Stations*, RC-1185, Revision 0, 1994 March

[78] Betcher, R.N., M. Gascoyne and D. Brown, *Uranium in Groundwaters of Southeastern Manitoba*, Canada, Canadian Journal of Earth Sciences, Volume 25, pages 2089-2103, 1988

[79] *Whiteshell Laboratories Screening Soil Cleanup Criteria,* Table 3-2, WL-509420-REPT-001, 42077502

[80] EPA QA/G-9S, *Data Quality Assessment: Statistical Methods for Practitioners*, Environmental Protection Agency, 2006

[81] CCME, *Sediment Quality Guidelines for the Protection of Aquatic Life*, on-line.

REDACTED

[82] Canadian Nuclear Safety Commission, *Reporting Requirements for Nuclear Power Plants*, RegDoc-3.1.1, 2016 April.

REDACTED

Appendix A Figures

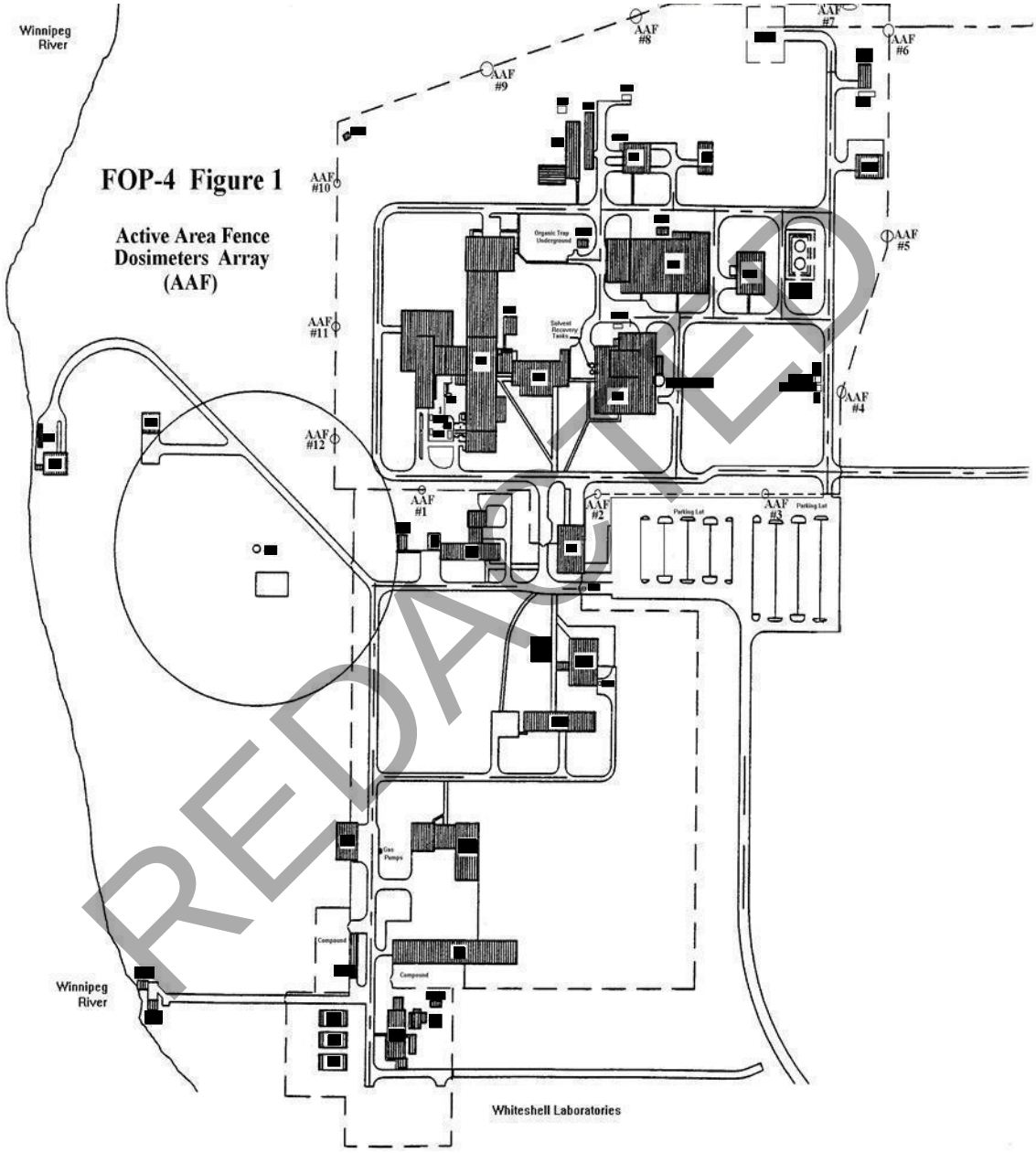


Figure A-1: Main Campus TLD Placement

REDACTED

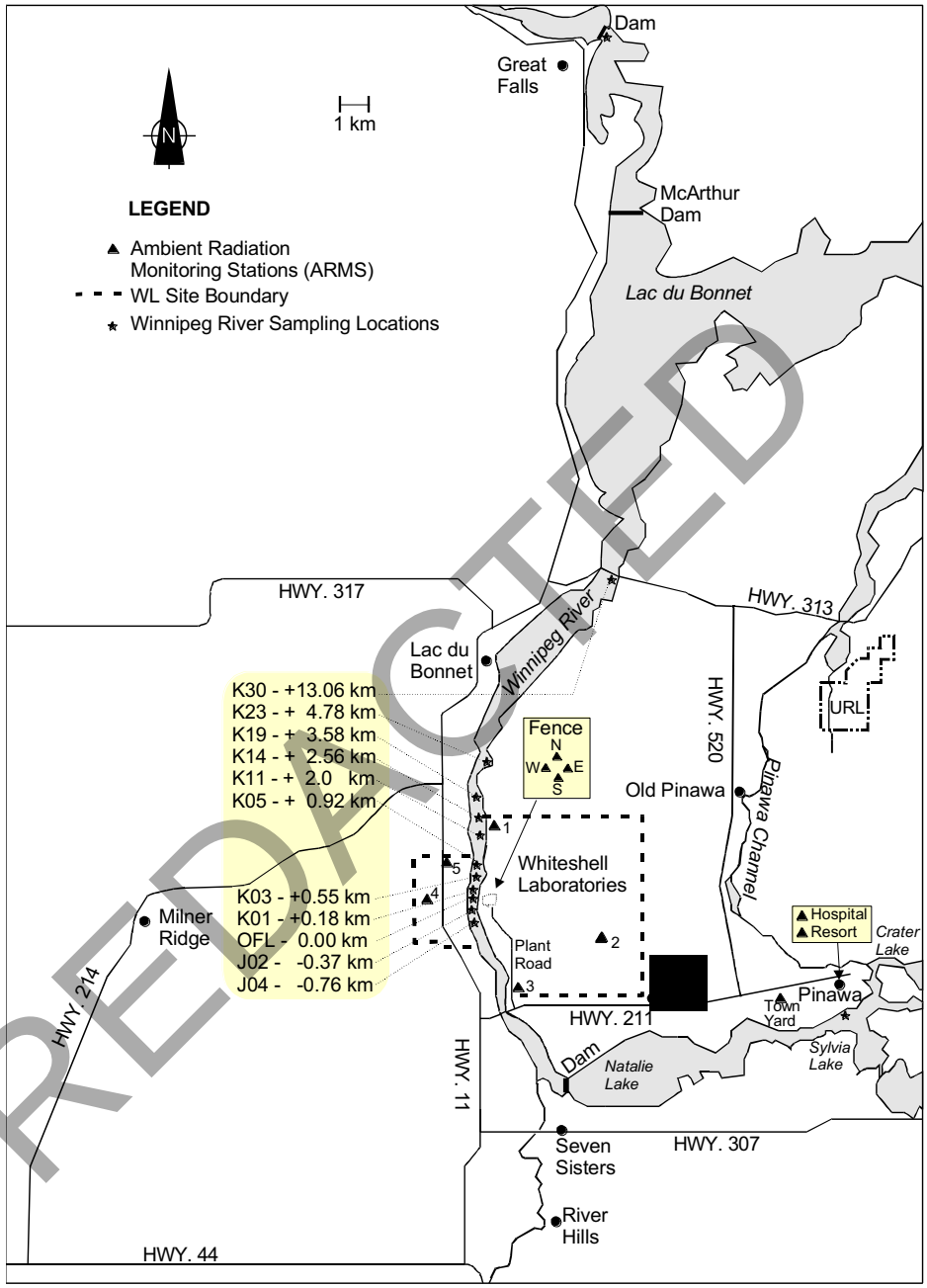


Figure A-2: WL Monitoring Locations

REDACTED

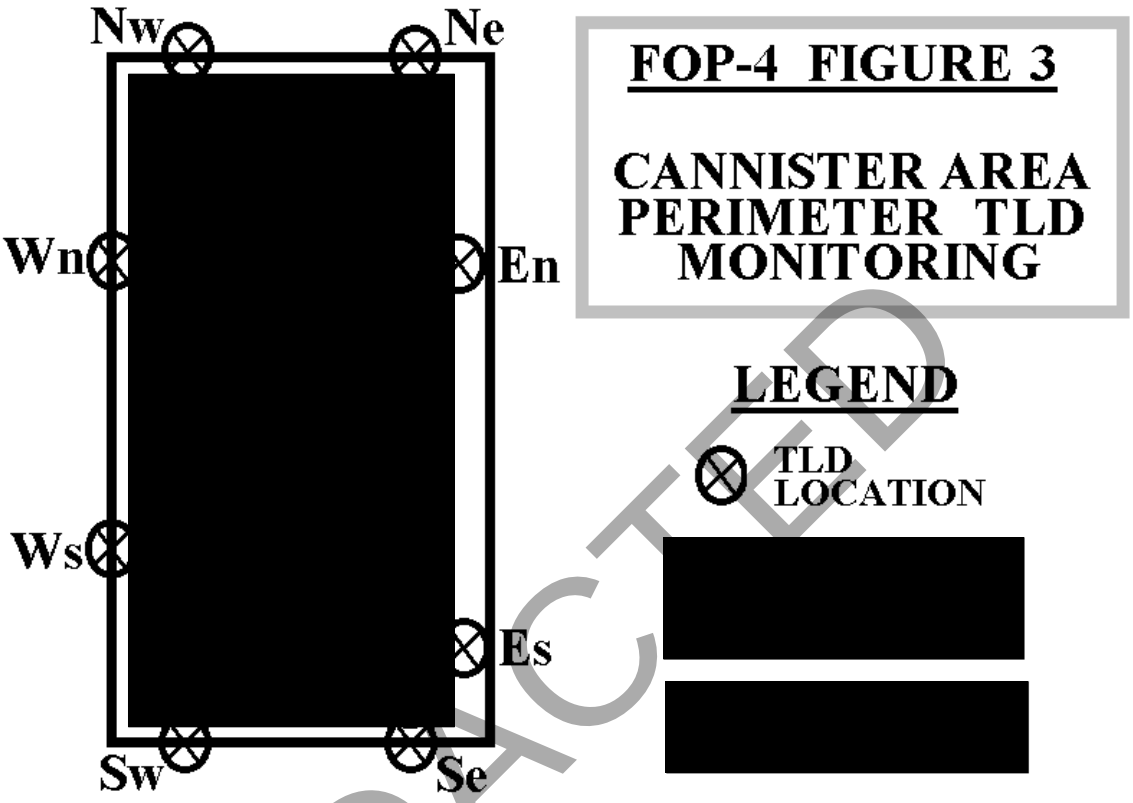
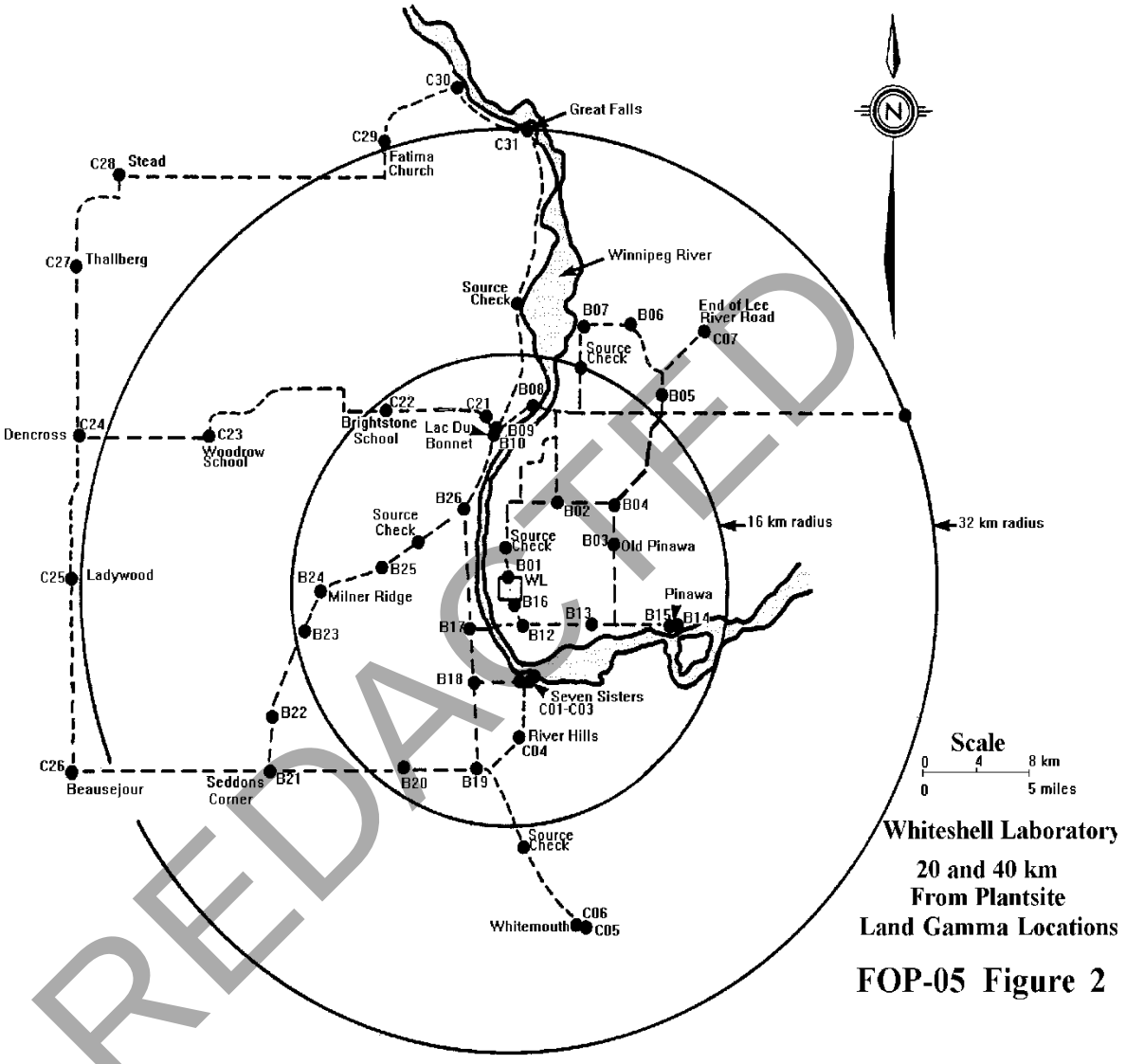


Figure A-3: WL Canioster TLD Monitoring Locations

REDACTED



REDACTED

Figure A-4: WL Land Gamma Outer Area Monitoring Locations

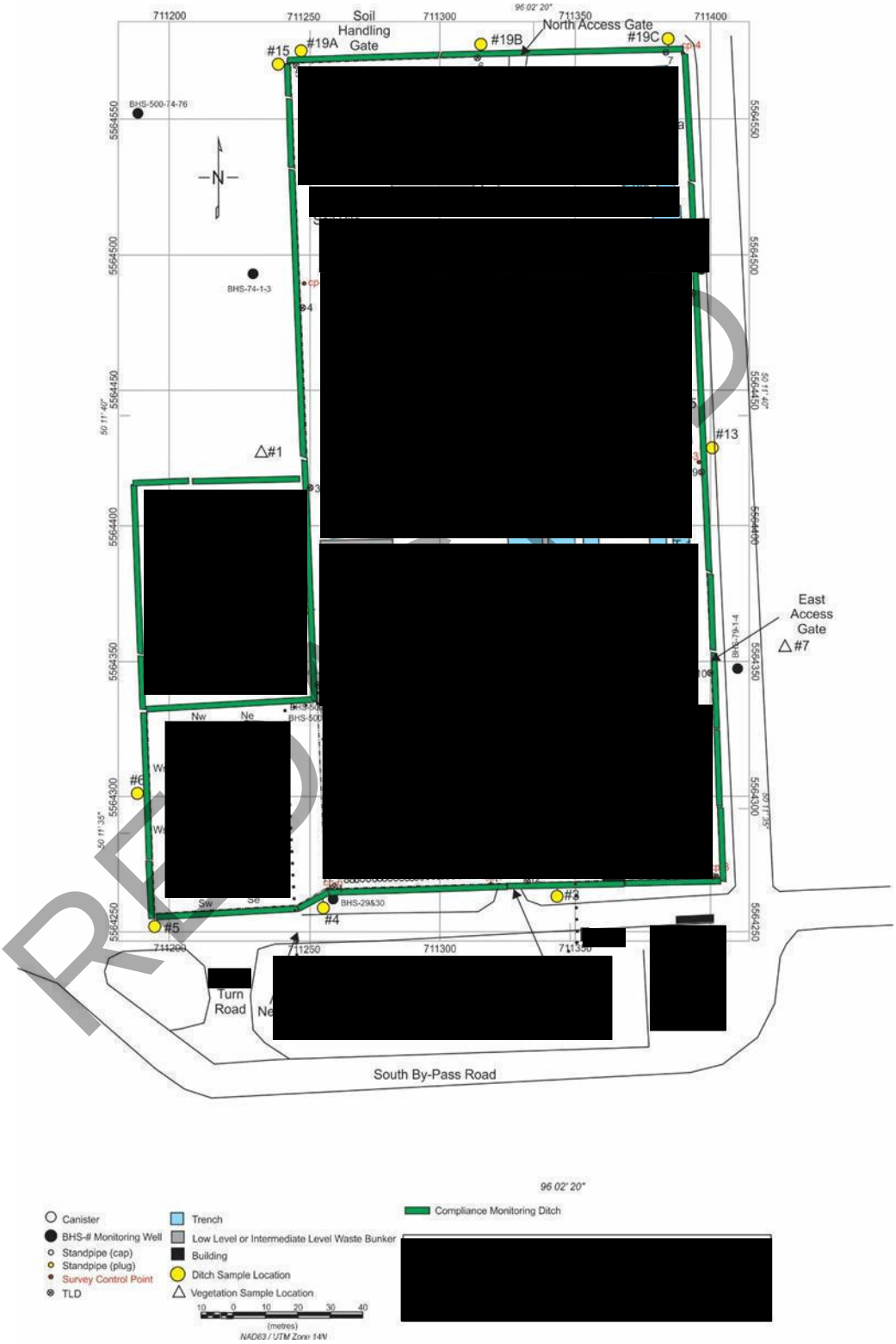


Figure A-5: WL WMA Monitoring Locations

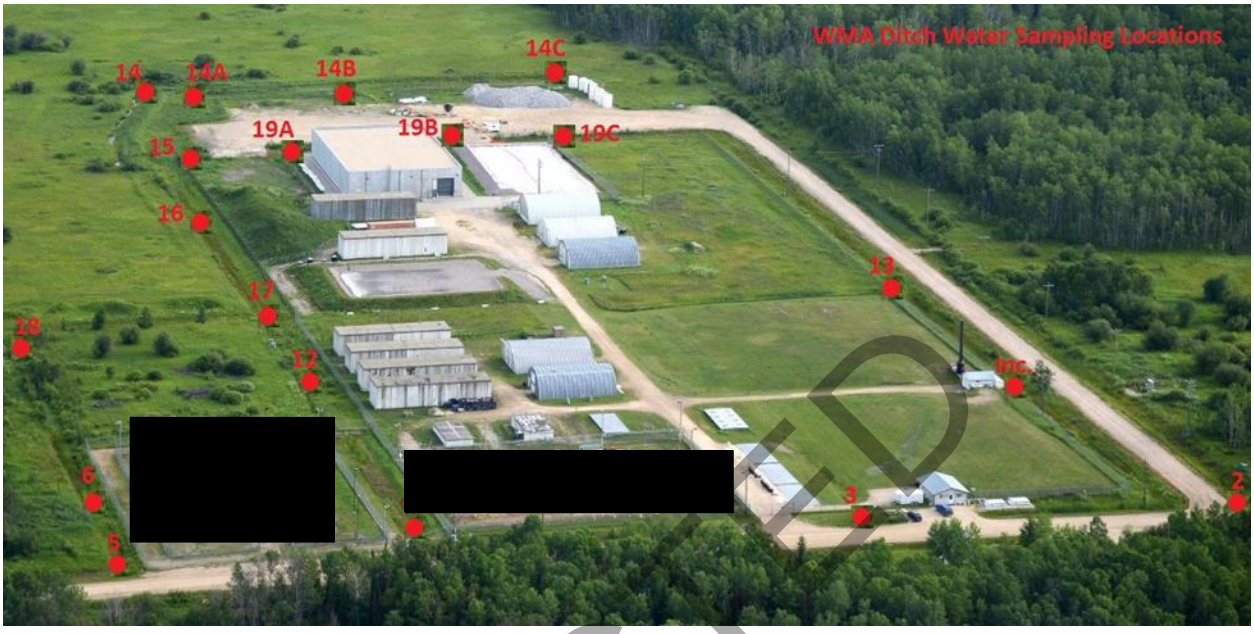


Figure A-6: WL WMA Surface Water Run-off Locations

REDACTED

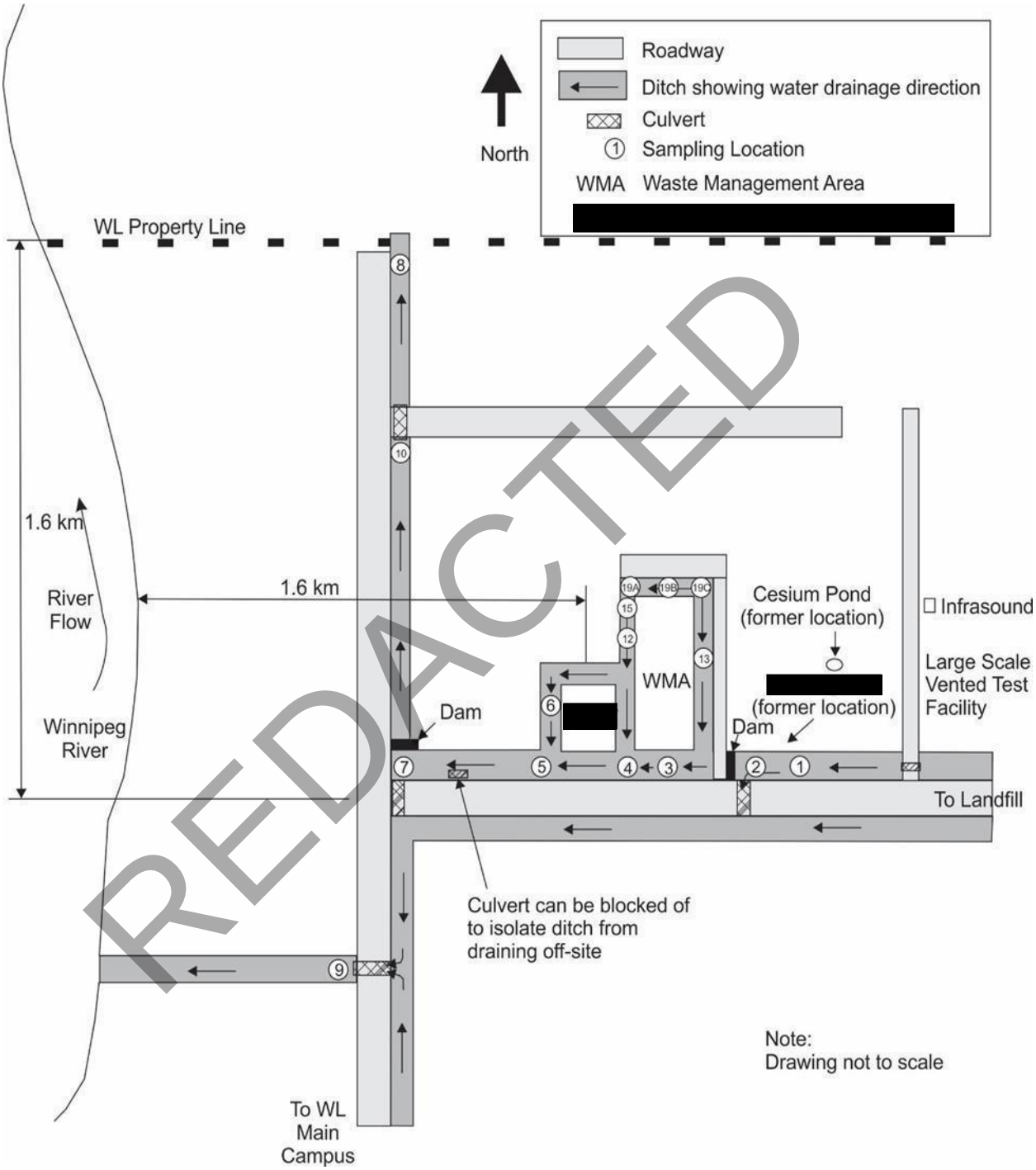


Figure A-7: WL WMA Surface Water Run-off Monitoring Locations

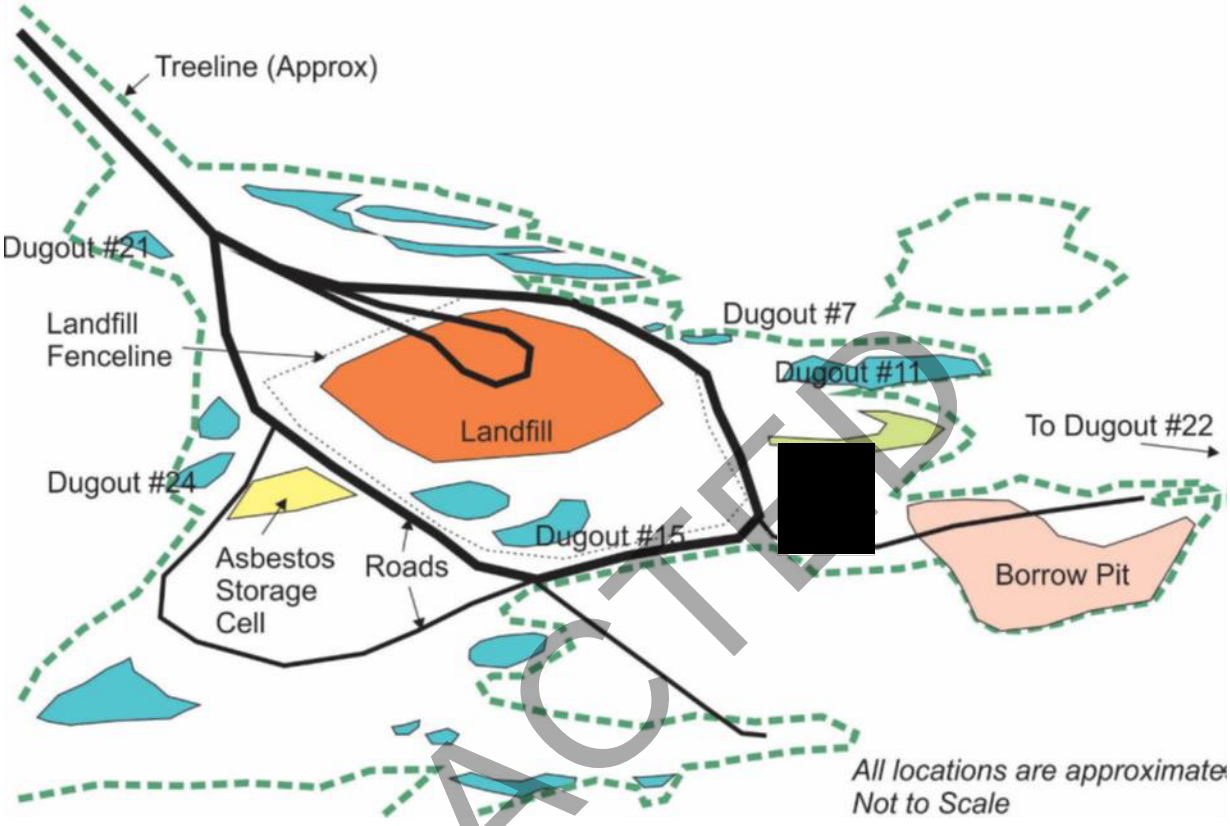


Figure A-8: WL Landfill

REDACTED



Figure A-9: WL Main Campus and Lagoon

REDACTED

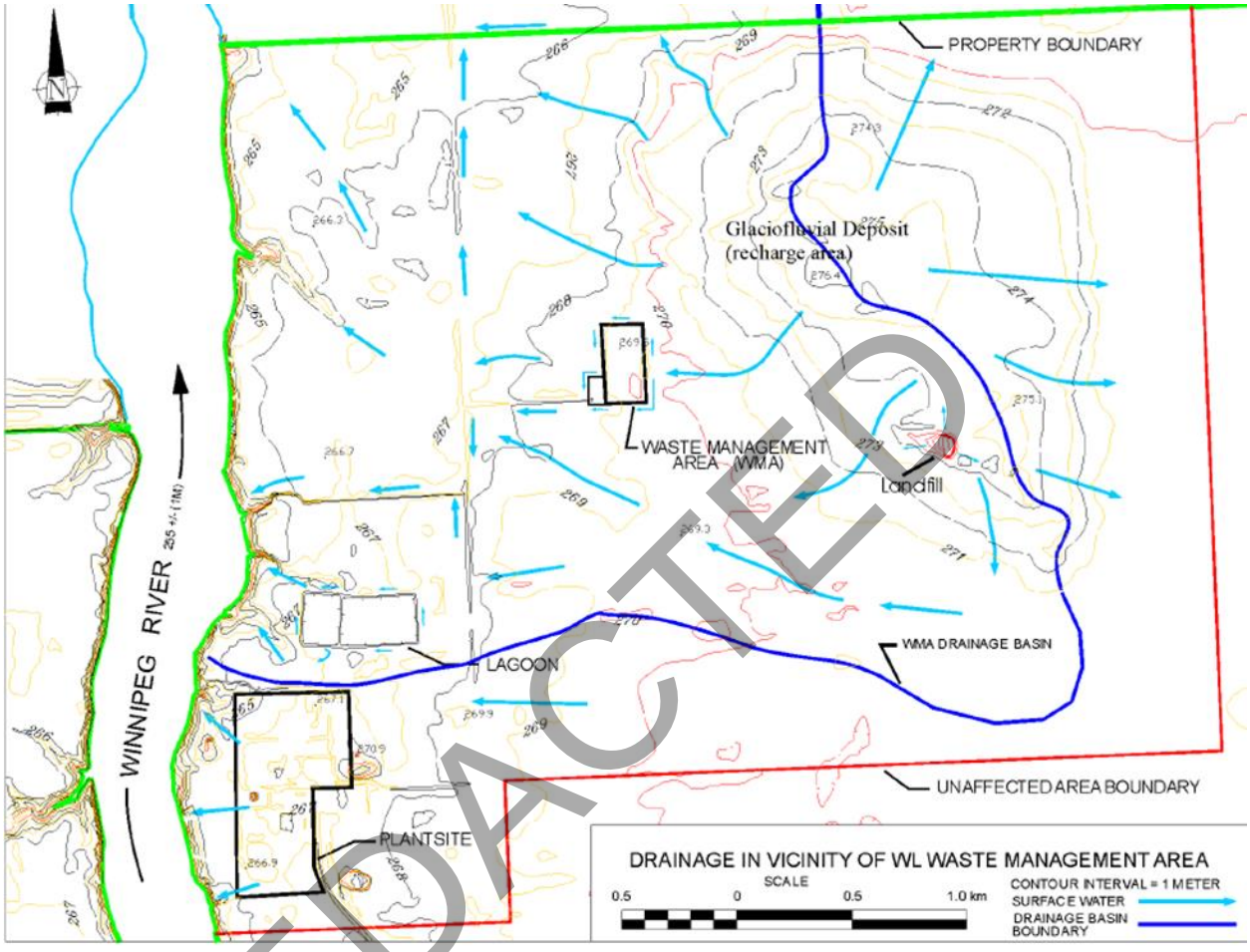


Figure A-10: WL Drainage in Vicinity of WL WMA

REDACTED

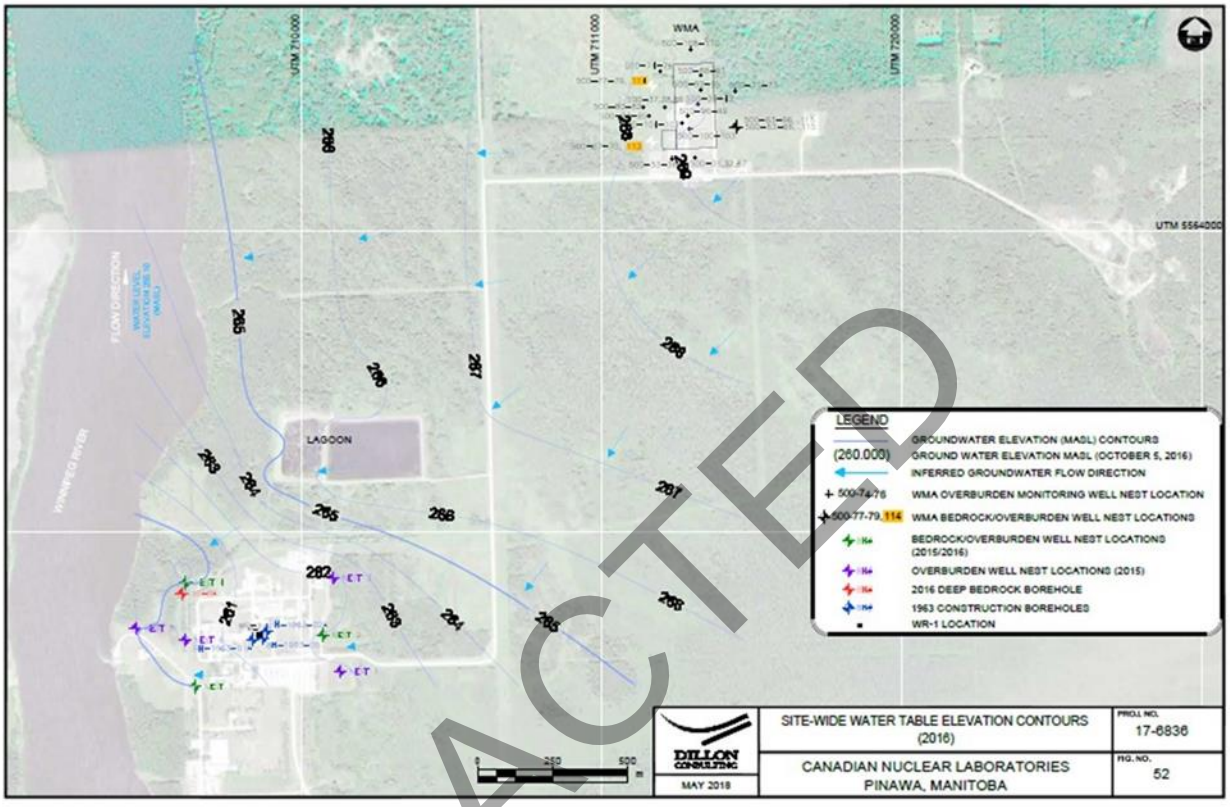
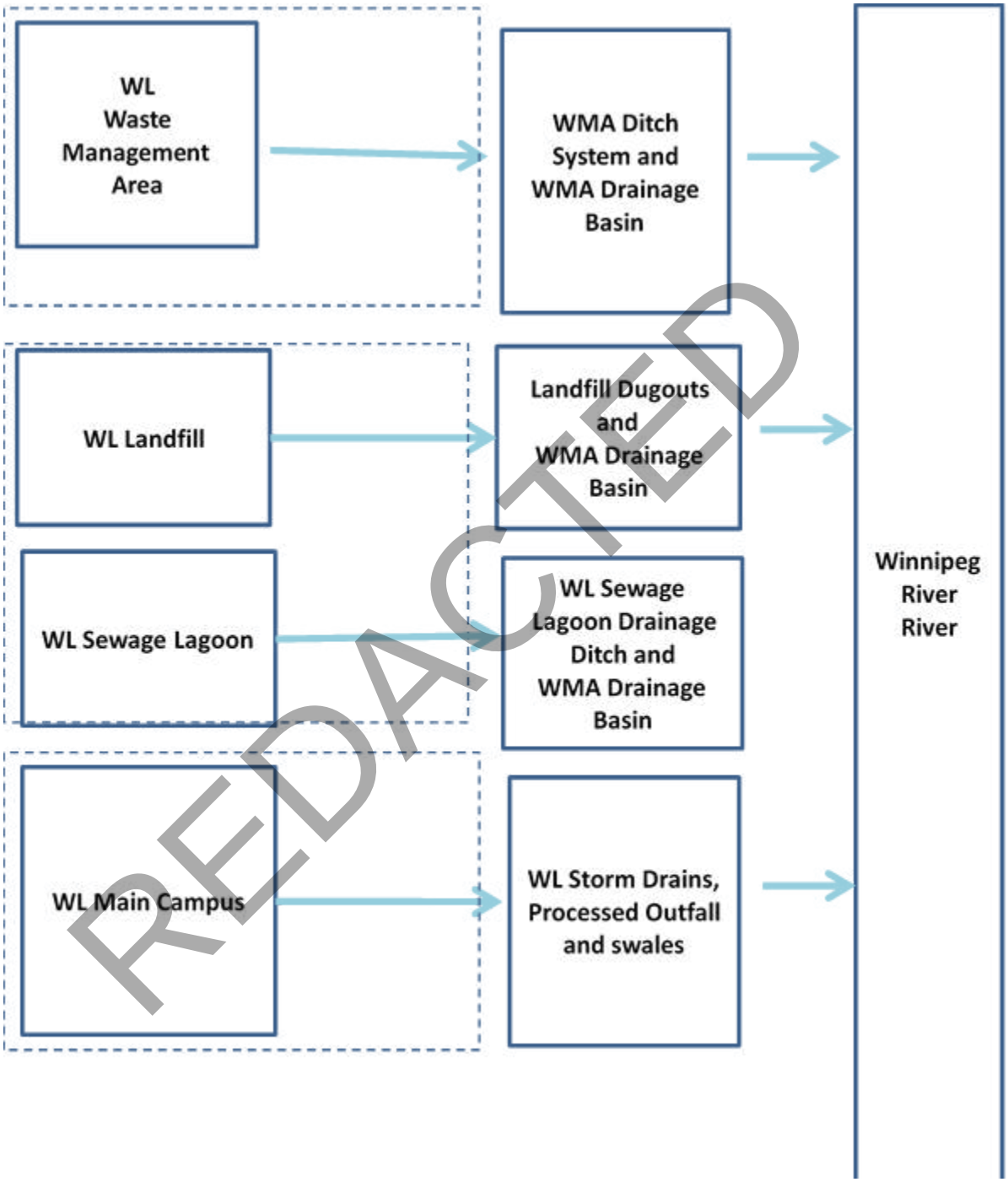


Figure A-11: Site Wide Water Table Elevation Contours

REDACTED



REDACTED

Figure A-12: WL Site Conceptual Model

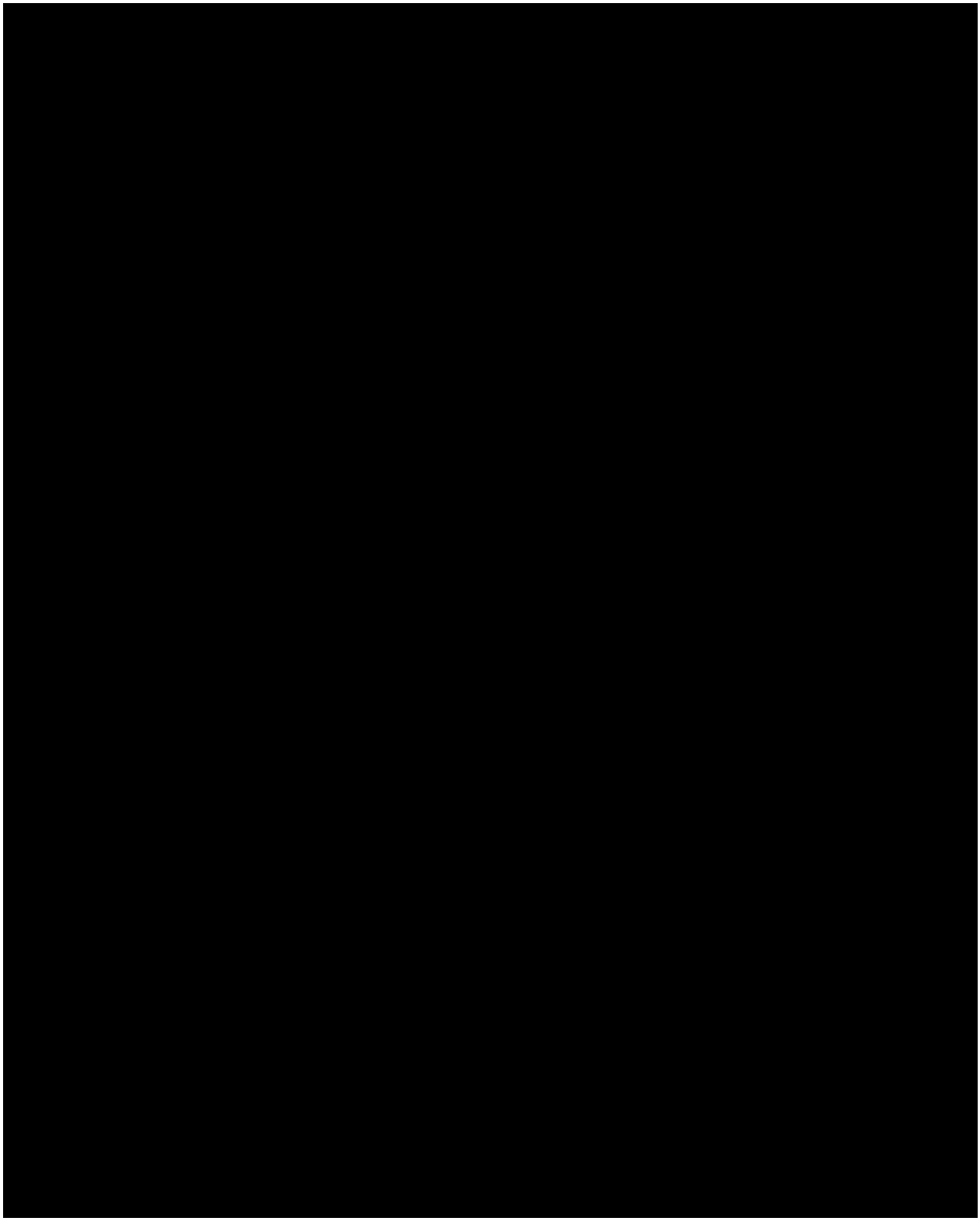


Figure A-13: Sagkeeng Reports Site Specific Medicine, Berries and Other Food Plants

Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

Public Information Program for Canadian Nuclear Laboratories

CW-513430-REPT-001

Revision 10.0

Authored by:	Philip Kompass	2024/09/26
	Director, Corporate Communicat	Date
Reviewed by:	Maureen Pypker	2024/09/26
	Senior Administrative Assistan	Date
	Mitch MacKay	2024/09/26
	Director, Communications & Eng	Date
	George Dolinar	2024/09/26
	Director, Corporate Environmen	Date
	Barbara Scott	2024/09/26
	Section Head, Regulatory Affai	Date
Approved by:	Alexandra Mahabir	2024/10/08
	Deputy Vice President, Corpora	Date

OFFICIAL USE ONLY This Information Asset (IA) and the elements of information contained within it are the property of Atomic Energy of Canada Limited (AECL).

© Atomic Energy of Canada Limited

This page is for Content Controls that apply to this document. If no Content Controls apply, none will be listed.

Revision History

Rev. No.	Date	Details of Rev.	Authored By	Reviewed By	Approved By
10	2024/09/25	"Issued as Approved for Use" Major changing in wording: • Added detail to specifically highlight commitment to disclosure of emissions to the Ottawa and Winnipeg rivers. • Commitment to public disclosure of opportunities for public engagement in significant licencing activities	P. Kompass	M. Mackay N. LeBlanc G. Dolinar B. Scott	A. Mahabir
10D1	2024/09/11	"Issued for Review and Comment"	P. Kompass	M. Mackay N. LeBlanc G. Dolinar B. Scott	
9	2024/01/02	Issued as "Approved for Use" Minor changes in wording: • Inclusion of NSDF references and requirements • Added details regarding Indigenous Nations and Communities • General updates and minor changes throughout to reflect continued progress and align with current program.	P. Kompass	P. Kompass M. Mackay N. LeBlanc	L. Riccoboni
8	2021/01/11	Issued as "Approved for Use" Major Revisions • Section 2.3.3 Target Audiences were added for Douglas Point, Gentilly-1 (G-1) and Nuclear Power Demonstration (NPD) • Section 2.6.6.1 Updated to include all required Reports that are posted to CNL.ca for NPD, G-1 and Douglas Point • Inclusion of Douglas Point, G-1 primary audience maps – Appendix C and Appendix D.	L. Kinghorn	S. Cotnam P. Quinn	P. Boyle L. Riccoboni

7	2020/11/09	Issued as “Approved for Use” Minor changes to wording in section 4.1	L. Kinghorn	S. Cotnam P. Quinn	
6	2020/10/23	Issued as “Approved for Use”	L. Kinghorn	S. Cotnam P. Quinn	P. Boyle L. Riccoboni
5	2019/07/22	Issued as “Approved for Use”	N. LeBlanc	S. Cotnam P. Quinn	P. Boyle L. Riccoboni
4	2019-04-25	Issued as “Approved for Use”	N. LeBlanc	S. Cotnam P. Quinn	P. Boyle L. Riccoboni
3	2019/01/23	Issued as “Approved for Use”	N. LeBlanc	S. Cotnam P. Quinn	P. Boyle L. Riccoboni
3D1	2018/12/19	Issued for “Review and Comment”	N. LeBlanc	S. Cotnam C. Gallagher S. Karivelil M. MacKay P. Quinn R. Swartz	
2	2017/05/03	Issued as “Approved for Use”	N. LeBlanc	S. Cotnam P. Quinn	D. Cox L. Riccoboni
2D1	2016/08/05	Issued for “Review and Comment” Major revisions and the addition of CNL Emergency Preparedness (Section 6.4 and 6.4.1) and Social Media (Section 6.12)	N. LeBlanc	S. Cotnam S. Karivelil M. MacKay P. Quinn R. Swartz M. Thompson	
1	2014/09/30	Issued as “Approved for Use”	S. Rolland	P. Quinn J. Miller	R. Lesco
0	2013/06/28	Issued as “Approved for Use”	S. Rolland	P. Quinn J. Miller	R. Lesco
0	2006/03	Document “Approved” for public release			

Table of Contents

Section **Page**

1. INTRODUCTION 7
1.1 Land Acknowledgement 7
1.2 Commitment to Truth and Reconciliation 7
1.3 CNL Sites 7
1.3.1 Chalk River Laboratories (CRL) 7
1.3.2 Whiteshell Laboratories (WL) 8
1.3.3 Decommissioning Sites 8
1.3.4 Prototype Reactor Sites (Waste Facilities) 9
1.3.4.1 Nuclear Power Demonstration Waste Facility (NPD WF) 9
1.3.4.2 Douglas Point Waste Facility (DPWF) 9
1.3.4.3 G-1 Waste Facility (G1WF) 10
1.3.5 Former Heavy Water Plant Site 10
1.3.6 Port Hope Area Initiative (PHAI) 10
1.4 Scope 10
1.5 Regulatory Requirements and Guidance 11
2. PUBLIC INFORMATION PROGRAM 12
2.1 Purpose 12
2.2 Objectives 12
2.3 Target Audiences 12
2.3.1 Chalk River Laboratories 13
2.3.2 Whiteshell Laboratories (WL) 14
2.3.3 Prototype Reactors 15
2.3.3.1 NPD Closure Project 15
2.3.3.2 Douglas Point 15
2.3.3.3 Gentilly-1 16
2.4 Audience Characterization 17
2.4.1 Employees 17

2.4.2 Alumni 17
2.4.3 Elected Officials 17
2.4.4 Indigenous Peoples 18
2.4.5 General Public 18
2.4.6 Public Interest Groups and Environmentally Focused Organizations and Agencies 19
2.4.7 Environmental Stewardship Council at CRL 19
2.4.8 Community Advisory Panel 20
2.4.9 Public Liaison Committee at Whiteshell 20
2.4.10 Intervenors 20
2.4.11 Atomic Energy of Canada Limited 21
2.4.12 Canadian Nuclear Safety Commission 21
2.4.13 Target Audience Development 21
2.5 Public and Media Opinion 21
2.6 Public Information Strategy and Products 21
2.6.1 Dissemination of Information to the Public 21
2.6.2 Social Media 22
2.6.3 Education and Outreach 23
2.6.4 Supply Chain 23
2.6.5 Gathering comments and feedback from the public 24
2.6.6 Performance Reports 30
2.6.6.1 Environmental Performance 30
3. PUBLIC DISCLOSURE PROTOCOL 30
3.1 Public Information 30
3.2 Public Disclosure 31
3.2.1 Public Disclosure at Chalk River Criteria for Public Disclosure 31
3.2.2 Public Disclosure at Whiteshell Laboratories Criteria for Public Disclosure 32
3.2.3 Public Disclosure of Prototype Reactor Sites 33
3.3 CNL Emergency Preparedness 34
3.3.1 Chalk River Laboratories 34
3.3.2 Whiteshell Laboratories 34

4. PROGRAM EVALUATION PROCESS 34

4.1 Questions and Issus Management 35

4.2 Assessment and Evaluation 35

4.3 Documentation 35

5. CONTACT INFORMATION 35

Appendix A MAP OF CRL AND NPD'S PRIMARY AUDIENCE 36

Appendix B MAP OF WL's PRIMARY AUDIENCE 37

Appendix C MAP OF DOUGLAS POINT PRIMARY AUDIENCE 38

Appendix D MAP OF G-1'S PRIMARY AUDIENCE 39

Appendix E LIST OF EXTERNAL ORGANIZATIONS WHO ARE MEMBERS ON THE ENVIRONMENTAL STEWARDSHIP COUNCIL AS OF 2023 OCTOBER 40

Appendix F LIST OF EXTERNAL ORGANIZATIONS WHO ARE MEMBERS ON THE PUBLIC LIAISON COMMITTEE AS OF 2020 AUGUST 41

Table 1: Public Information Strategy and Products Table 25

1. INTRODUCTION

As Canada's premier nuclear science and technology laboratory, Canadian Nuclear Laboratories (CNL) is a world leader in the development of innovative nuclear science and technology products and services. Guided by an ambitious corporate strategy known as Vision 2030, CNL works under the direction of Atomic Energy of Canada Limited (AECL), a federal Crown corporation, to fulfil three strategic priorities of national importance – restoring and protecting the environment, advancing clean energy technologies, and contributing to the health of Canadians.

By leveraging the assets owned by AECL, CNL also serves as the nexus between government, the nuclear industry, the broader private sector, and the academic community. CNL works in collaboration with these sectors to advance innovative Canadian products and services towards real-world use, including carbon-free energy, cancer treatments and other therapies, non-proliferation nuclear technologies and waste management solutions.

1.1 Land Acknowledgement

CNL operates on sites located on the traditional lands, waterways and ceded and unceded territories of Indigenous peoples. CNL recognizes and affirms all First Nations, Métis communities, and Inuit in this land we now know as Canada. We acknowledge, respect, and seek to better understand Indigenous history, rights, and title on the lands where we work and develop projects. At CNL we wish to honour and respect the importance of the relationship between Indigenous peoples and their lands, waters, and territories.

1.2 Commitment to Truth and Reconciliation

In alignment with the Truth and Reconciliation Commission Call to Action #92 Business and Reconciliation [4], CNL is committed to advancing truth and reconciliation through meaningful actions. CNL continues to enhance its corporate Indigenous relations program, in collaboration with Indigenous Nations, communities and organizations, through the development of a formal reconciliation action plan, and the establishment of an Indigenous procurement policy. All communications, plans and reporting are reviewed to ensure balanced language and acknowledgement of Indigenous rights and Indigenous knowledge, CNL strives to integrate this into all CNL activities.

1.3 CNL Sites

CNL manages and operates the following sites owned by AECL under a Government-owned, Contractor-operated or "GoCo" model.

1.3.1 Chalk River Laboratories (CRL)

The largest of CNL's sites, Chalk River Laboratories (CRL), is in Renfrew County in the province of Ontario, on the southern shore of the Ottawa River, approximately 200 km northwest of Ottawa. Established in 1944 as Atomic Energy of Canada Limited, the site is approximately 3,700 hectares (ha) (9,100 acres). The Ottawa River forms the eastern boundary of the site.

Abutting the CRL property to the southeast is Canadian military base Garrison Petawawa. The Town of Laurentian Hills lies to the southwest of the site and the Town of Deep River to the northwest.

As one of the region's largest employers, CRL retains more than 3,500 administrative, trades, technical, engineering and scientific staff. While most employees work at the Chalk River site, some staff work in the Town of Deep River where there are two offices, remotely from home offices, or a hybrid of on-site and remote.

The Chalk River site houses over 100 unique laboratories or facilities dedicated to the delivery of nuclear science and technology. There is also a significant effort underway to address historic nuclear liabilities through environmental remediation, decommissioning of aging/redundant facilities, and management of historic wastes, and to revitalize and renew the campus through capital investment in buildings and infrastructure.

CNL operates the CRL site in accordance with Canadian Nuclear Safety Commission (CNSC) Nuclear Research and Test Establishment Operating Licence (NRTEOL-01.01/2028). The current licence expires 2028 March 31.

On 2024 January 9 the Canadian Nuclear Safety Commission announced its decision to amend CNL's nuclear research and test establishment operating licence for CRL to authorize the construction of a near surface disposal facility. The amended nuclear research and test establishment operating licence remains valid until 2028 March 31.

1.3.2 Whiteshell Laboratories (WL)

The second largest of CNL's sites, Whiteshell Laboratories (WL), is located near the Local Government District of Pinawa in the province of Manitoba. The main part of the site is located on the east bank of the Winnipeg River, approximately 100 km northeast of Winnipeg. WL, a Class 1B nuclear facility, was established in the early 1960s and covers an area of about 4,375 hectares (ha) (10,800 acres). CNL is currently decommissioning and remediating the site.

WL retains approximately 350 administrative, trades, technical and scientific staff.

CNL operates the WL Closure Project in accordance with CNSC Nuclear Research and Test Establishment Decommissioning Licence (NRTEDL-W5-8.00/2024). The current licence expires 2024 December 31.

1.3.3 Decommissioning Sites

On behalf of AECL, CNL manages Canada's nuclear legacy liabilities at various sites across Canada. These nuclear legacy liabilities are the result of more than 60 years of nuclear research and development conducted by the National Research Council of Canada and AECL on behalf of the Government of Canada. The liabilities consist of outdated and unused research facilities and buildings, buried, and stored radioactive waste, and affected lands.

Since 1952, AECL/CNL has safely, and cost effectively managed Canada's nuclear research facilities and the waste generated by their operation. During this time, CNL improved waste management technologies and developed expertise in best practices.

Continued decommissioning and waste management activities will occur at the Chalk River Laboratories and the Whiteshell Laboratories. CNL also operates other sites across Canada that fall under the CNL Public Information Program (PIP); these are outlined below.

1.3.4 Prototype Reactor Sites (Waste Facilities)

CNL is the licence holder for three permanently shut down prototype CANDU® (CANada Deuterium Uranium) power reactors: NPD Waste Facility (NPD WF), Douglas Point Waste Facility (DP WF) and Gentilly-1 Waste Facility (G1WF). Each facility consists of a permanently shut down, partially decommissioned demonstration CANDU® reactor and associated structures and ancillaries.

1.3.4.1 Nuclear Power Demonstration Waste Facility (NPD WF)

NPD WF is located in the Town of Laurentian Hills, Renfrew County, Ontario, and is now an active site closure project. NPD was the first Canadian nuclear power reactor and the prototype for the CANDU® reactor design. NPD made history in 1962 when it generated electricity from nuclear power for the first time in Canada from a single 20 MWe pressurized heavy water reactor in what was then known as Rolphton, Ontario. The NPD reactor was the prototype and proving ground for research and development that led to commercial application of the CANDU® system for generating electric power from a nuclear plant using natural uranium fuel, heavy water moderator and coolant in a pressure tube configuration with on-power refuelling.

For 25 years NPD produced sustainable, clean energy and operated as a training centre for nuclear operators and engineers from Canada and around the world.

The NPD site is currently managed under a Waste Facility Decommissioning Licence (WFDL-W4-342.00/2034). Operations at NPD ended in 1987, after which the first stages of decommissioning were completed, including the removal of all nuclear fuel from the site and the draining of the systems. The site has been in a safe shutdown state for the last 30 years. CNL is currently undertaking an environmental assessment as part of the licence application to enable the full decommissioning of this facility.

1.3.4.2 Douglas Point Waste Facility (DPWF)

The Douglas Point Waste Facility is within the Bruce Power Site owned by Ontario Power Generation located on the east shore of Lake Huron in the Municipality of Kincardine, Bruce County, Ontario. The facility consists of the permanently shutdown, partially decommissioned prototype CANDU® reactor and associated structures and ancillaries.

Douglas Point was Canada's first full-scale nuclear power plant, with a 200-megawatt (MW) prototype CANDU® reactor. It was known as the Douglas Point Nuclear Generating Station (DPNGS) and was a joint project between AECL as owner, and Ontario Hydro (currently Ontario Power Generation) as operator.

The reactor ran from 1968 to 1984 when it was permanently shut down, having achieved its prototype objectives. By 1986, the fuel had been removed and reactor coolant drained in accordance with regulatory requirements. The fuel was transferred to onsite dry storage by the

end of 1987 and, since then, the facility has been in a safe shutdown state referred to as "Storage with Surveillance."

The Douglas Point site is currently managed under a Waste Facility Decommissioning Licence (WFDL-W4-332.03/2030). CNL is transitioning the facility, now known as the Douglas Point Waste Facility (DP WF) to the next phase of decommissioning. On March 15, 2021, the Canadian Nuclear Safety Commission announced its decision to amend the waste facility decommissioning licence for the DP WF to allow CNL to begin Phase 3 decommissioning activities, including the decommissioning and dismantlement of certain facilities and structures at the facility.

1.3.4.3 G-1 Waste Facility (G1WF)

The G-1 Waste Facility is on the Hydro-Quebec (HQ) site adjacent to the Gentilly-2 Nuclear Generating Station in Bécancour in the province of Quebec and is located on the St. Lawrence River between Montreal and Quebec City. The Gentilly-1 (G-1) prototype CANDU Boiling Water Reactor has been shut down for more than 40 years and is in a safe shutdown state: the reactor is not operating; the fuel has been removed from the facility and is being left in place to allow for radioactivity decay prior to shipment to CRL.

The Gentilly-1 site is currently managed under a Waste Facility Decommissioning Licence (WFDL-W4-331.00/2034). Maintenance activities are conducted on a regular basis to ensure the safety of the facility, the community, and the environment. The current schedule includes plans to secure the regulatory approvals required to permit full decommissioning of the site by 2060.

1.3.5 Former Heavy Water Plant Site

CNL manages the La Prade Heavy Water Plant Site in Bécancour, Québec. The site is not an active heavy water plant; however, heavy water (tritiated and virgin) is stored on the site, which is operated in accordance with the CNSC Nuclear Substance and Radiation Devices Licence 15193-4-26.2. The current licence expires 2026 September 30.

1.3.6 Port Hope Area Initiative (PHAI)

The Port Hope Area Initiative (PHAI) includes the planned cleanup of approximately 1,200 residential properties and involves tailored one-on-one communications with individual residents. As such, communications and engagement are covered by the *Port Hope Area Initiative Public Information Program*, which is executed in alignment with this CNL Public Information Program.

1.4 Scope

This document describes CNL's *Public Information Program* (PIP) and covers activities of public interest that occur at CNL. It has been prepared in accordance with the CNSC Regulatory Document REGDOC-3.2.1, *Public Information and Disclosure*. As noted above, the PHAI project has a separate public information program tailored to the specific needs of the communities in which the project is being implemented.

In the context of Environmental Assessments or Impact Assessments related to major projects and licencing activities, additional outreach may be undertaken that spans a larger geographic area than outlined in the PIP and may include additional Indigenous Nations, communities and organizations, municipalities and interest groups. For more information, please refer to the project-specific reporting in the Annual Compliance and Monitoring Reports or Indigenous Engagement Reports as relevant.

1.5 Regulatory Requirements and Guidance

The following sections describe how the Public Information Program meets regulatory requirements. Each section notes methods used for information dissemination; how information will address information needs related to the anticipated effects of CNL's operations; and how interactions will be tracked.

All parts of this program apply to each CNL site. However, strategies and tactics are customized to the target audiences at each CNL site.

The requirements for public information programs and disclosure protocols are derived from the stated objectives of the CNSC in the *Nuclear Safety and Control Act* (NSCA) (S.C. 1997, c.9) and associated regulations. The relevant provisions are as follows:

- Paragraph 3(j) of the *Class I Nuclear Facilities Regulations* (SOR/2000-204): "…the proposed program to inform persons living in the vicinity of the site of the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons that may result from the activity to be licensed."
- Paragraph 3(r) of the *Class II Nuclear Facilities and Prescribed Equipment Regulations* (SOR/2000-205): "…the program to inform persons living in the vicinity of the site of the general nature and characteristics of the anticipated effects on the environment and the health and safety of persons that may result from the nuclear facility."

Additional regulations and guidance on public information programs are given in CNSC REGDOC-3.2.1, *Public Information and Disclosure*.

The Public Information Program outlines the ways in which the public receives communication from CNL, including the public disclosure protocol regarding events and developments involving facilities and activities. These specific elements include:

- Publication of documents describing the radiological and environmental impacts of CNL sites;
- Interactions with local communities and Indigenous Nations, communities and organizations to convey the specified information; and
- Publication of the results of CNL's monitoring programs on CNL's external website.

While CNL's Public Information Program is comprehensive, opportunities for improvement are continually considered. Public feedback is considered and addressed, and the program is modified when appropriate. In all instances, accessibility to timely information on CNL and its operations is maintained.

The discussion in the following sub-sections demonstrates CNL's compliance with CNSC REGDOC-3.2.1, *Public Information and Disclosure*.

2. PUBLIC INFORMATION PROGRAM

2.1 Purpose

CNL is committed to organizational transparency, ensuring that Indigenous peoples, the general public, local communities, elected and appointed government officials and industry members are properly informed about activities carried out at CNL sites.

This commitment is met through the company's Public Information Program (PIP), a communications program that was developed to build public awareness and trust, encourage transparent and proactive communication with interested parties, and ensure compliance with CNSC Regulatory Document REGDOC-3.2.1: Public Information and Disclosure, though sharing information related to routine activities, radiological and non-radiological emissions, and non-routine items or events at the different sites managed by CNL.

2.2 Objectives

The objectives of the program are to:

- Continue to sustain open and transparent communication about CNL's plans, activities and performance, and of any resulting related health or environmental risks by:
    - Creating opportunities to engage in transparent and proactive two-way dialogue with Indigenous peoples, community members and the general public.
    - Informing the public and Indigenous Nations, communities and organizations about events that have offsite effects or which may raise concern.
    - Positioning CNL as the source of accurate, timely information about its projects and activities.
- Raise public awareness, understanding and a supportive appreciation of CNL's value and relevance to Canadians by:
    - Demonstrating the positive impact of CNL on the community and the nation.
    - Nurturing existing and foster new relationships to advance CNL objectives.
- Provide an opportunity for community input to further enhance the effectiveness of the public information program.
- Meet regulatory requirements for a public information program.

2.3 Target Audiences

For the purpose of the PIP, CNL continues to focus primarily on the communities neighbouring CNL sites concentrated within a 50-kilometer radius of our operations. CNL routinely widens its communications to include interest groups in the S&T and academic communities, youth and

education sectors, industry supply chain, and with others who have identified themselves as interested members of the public outside our standard catchment area.

2.3.1 Chalk River Laboratories

CNL specifically communicates with:

- CNL staff and CRL-based CNL employee unions
- Laurentian Hills-Deep River Nuclear Emergency Preparedness Committee
- Indigenous Nations, communities, and organizations:
    - Algonquins of Pikwàkanagàn First Nation (AOPFN)
    - Métis Nation of Ontario (MNO)
    - Kitigan Zibi Anishinabeg First Nation
    - Kebaowek First Nation
    - Williams Treaties First Nations
        - Alderville First Nation
        - Beausoleil First Nation
        - Georgina Island First Nation
        - Rama First Nation
        - Curve Lake First Nation
        - Hiawatha First Nation
        - Scugog Island First Nation
    - Anishinabek Nation
    - Algonquins of Barriere Lake First Nation
    - Temiskaming First Nation
    - Wolf Lake First Nation
    - Algonquin Nation Secretariat
    - Algonquin Anishinabeg Nation Tribal Council
- Algonquins of Ontario
- Universities and academia
- Nuclear industry and supply chain
- Public interest groups and environmentally focused organizations and agencies (e.g., Concerned Citizens of Renfrew County, Ottawa Riverkeeper, Ducks Unlimited)
- Local government officials and related committees:

- County of Renfrew
- Pontiac Regional County Municipality (MRC Pontiac)
- Town of Deep River
- Town of Laurentian Hills
- Town of Petawawa
- City of Pembroke
- Member of Parliament for Renfrew - Nipissing – Pembroke
- Member of Provincial Parliament for Renfrew - Nipissing – Pembroke
- Member of Parliament for Pontiac
- Local business partners (e.g., Upper Ottawa Valley Chamber of Commerce, Garrison Petawawa, etc.); and,
- The Environmental Stewardship Council (see Section 2.4.7), and Community Advisory Panel (see Section 2.4.8)

Refer to Appendix A for a map of CRL's primary audience located within a 50-kilometre radius of the Chalk River Laboratories. For practical purposes CNL maintains sharing of information with both regional municipalities of Renfrew and Pontiac Counties and as noted, CNL expands communication activities as necessary.

2.3.2 Whiteshell Laboratories (WL)

CNL specifically communicates with:

- WL-based CNL employee unions
- Indigenous Nations, communities, and organizations:
  - Sagkeeng First Nation
  - Black River First Nation
  - Hollow Water First Nation
  - Manitoba Métis Federation
  - Brokenhead Ojibway Nation
  - Wabaseemoong Independent Nations
  - Grand Council of Treaty 3
- Public Liaison Committee (see section 2.4.9)
- Local business partners (e.g., Pinawa Chamber of Commerce and Lac du Bonnet and District Chamber of Commerce)
- Local government officials/committees:

- Local Government District (LGD) of Pinawa
- Town of Lac du Bonnet
- Rural Municipality of Lac du Bonnet
- Community of Whitemouth
- Town of Beausejour
- Town of Powerview Pine Falls
- Rural Municipality of Alexander
- Member of Parliament for Selkirk-Interlake-Eastman
- Member of Parliament for Provencher
- Member of Parliament for Churchill - Keewatinook Aski
- Member of Legislative Assembly for Lac du Bonnet
- Environmental Groups & Organizations (ENGOs) and citizens groups (eg. Concerned Citizens of Manitoba, Whiteshell Cottagers Association, Manitoba Cottagers Association, Eastman tourism
- Whiteshell Community Regeneration Partnership

Refer to Appendix B for a map of WL's primary audience located within a 50-kilometre radius of the WL site. For practical purposes CNL maintains sharing of information with regional municipalities and as noted, expands communication activities as necessary.

2.3.3 Prototype Reactors

As work proceeds with proposed decommissioning plans for the prototype reactor sites, the target audiences for these projects continue to be developed. Additional details are provided in the following subsections.

2.3.3.1 NPD Closure Project

See Section 2.3.1 Chalk River.

2.3.3.2 Douglas Point

CNL specifically communicates with:

- CNL employees and employee unions
- Bruce County Residents
- Public interest groups
- Local Government officials/committees:
    - Municipality of Kincardine
    - Town of Saugeen Shores

- County of Bruce

- Indigenous Nations, communities and organizations:
  - Saugeen Ojibway Nation (Chippewas of the Saugeen First Nation and Chippewas of Nawash Unceded First Nation)
  - Historic Métis of the Saugeen (HSM)
  - Métis Nation of Ontario (MNO)
  - Chippewas of Kettle and Stony Point First Nation

Refer to Appendix C for a map of Douglas Point's primary audience, which is reflective of Bruce Power's target audience. For practical purposes, CNL maintains sharing of information with regional municipalities and as noted, expands communication activities as necessary.

2.3.3.3 Gentilly-1

CNL specifically communicates with:

- CNL employees and employee unions
- Public interest groups and environmentally focused organizations and agencies (e.g. Société du parc industriel et portuaire de Bécancour, Chambre de commerce et d'industrie du Cœur-du-Québec).
- Local Government officials/committees, and residents in the following areas:
  - Bécancour-Nicolet-Saurel, Saint-Maurice-Champlain
  - Bécancour
  - Trois-Rivières
  - Gentilly District
  - Member of National Assembly for Nicolet-Bécancour
  - Member of Parliament for Bécancour-Nicolet-Saurel
  - Member of Parliament for Saint-Maurice-Champlain
  - Member of National Assembly for Trois-Rivières
  - Minister responsible for the Centre-du-Québec region
- Indigenous Nations, communities and organizations:
  - Huron-Wendat Nation
  - Abenaki Band of Odanak
  - Abenaki Band of Wôlinak
  - W8banaki (formerly Grand Conseil de la Nation Waban-Aki)

Refer to Appendix D for a map of G-1's primary audience, which is reflective of Hydro Quebec's target audience. For practical purposes, CNL maintains sharing of information with regional municipalities and as noted, expands communication activities as necessary.

2.4 Audience Characterization

2.4.1 Employees

As ambassadors for the company, it is critical that CNL employees be kept fully apprised of CNL's business on an ongoing basis so they can also share information with their community contacts and professional networks in an informed and timely way. The tactics used to keep employees apprised include:

- Information updates via the President & CEO, and the Executive Committee
- Ongoing all-union/management meetings and Site Safety and Health Committee meetings
- Employee All Staff engagements
- Employee bulletins via the internal intranet and staff email
- Monthly employee newsletter, Voyageur
- Surveys to gauge employee awareness and measure messaging effectiveness
- New Employee Orientation program and tours for new employees
- Onsite electronic messaging boards for important safety messages (site specific)
- Onsite events and features activities (e.g. Safety Pause, Health & Wellness Fair, Building Openings)

2.4.2 Alumni

Former employees of CNL and AECL are both our strongest supporters and sometimes our toughest critics. Furthermore, they have a keen interest in the nuclear industry and in the operations of CNL sites, programs and projects. The Alumni Network was set up in 2011 as a simple email subscription service. Alumni receive a monthly package that includes electronic copies of the employee newsletter, Voyageur, as well as updates on key topics of interest and milestone accomplishments, invitations to events, and opportunities to provide feedback.

2.4.3 Elected Officials

Elected officials at the federal, provincial, county and municipal levels are notified of CNL activities through email and/or phone to ensure timely distribution of information. It is important that their awareness level be maintained so their offices can triage and quickly provide CNL with any concerns identified by their constituents. Tactics for the sharing information with elected officials include:

- Meetings and updates that promote information sharing and provide opportunities for officials to voice their opinions/concerns
- Topic-specific briefings
- Site tours
- Provision of reports, news releases and information related to daily operations, unplanned events and licensing activities
- Annual updates given to Regional Councils on CNL activities
- Invitations to join CNL at milestone events and project updates

2.4.4 Indigenous Peoples

CNL recognizes that the many Indigenous Nations, communities, and organizations with whom we engage have unique needs, resources and interests. The communications with these communities and nations reflect these unique needs and follow agreed-to protocols for information sharing as determined by each community.

Information sharing with Indigenous Nations, communities and organizations may include:

- Presenting information in a format that is easily understood through a variety of communications channels using targeted key messaging.
- Engaging technical experts to communicate information in various formats.
- Accomplishing all required activities in a timely manner; and
- Providing various means for Indigenous Nations, communities, and organizations to access information.

CNL proactively provides information regarding business activities and environmental remediation management projects. Notification is done through email, letter, community, and face-to-face meetings to ensure appropriate distribution of information.

Representatives of the Algonquins of Pikwakanagan First Nation, the Métis Nation of Ontario, and the Kitigan Zibi Anishinabeg First Nation are included in Chalk River Laboratories' Environmental Stewardship Council. Additionally, a representative of the Algonquins of Pikwakanagan First Nation participates in CNL's Community Advisory Panel.

CNL also engages Indigenous Nations, communities, and organizations in support of the Environment Assessment process, per CNSC REGDOC-3.2.2, *Indigenous Engagement*.

2.4.5 General Public

social media, our toll-free line, and through involvement in community events. Communications initiatives include:

- Manage the delivery of the Environmental Stewardship Council (CRL) or Public Liaison Committee (WL) by municipal officials;

- Community meetings and webinars where information on site operations, projects etc., is provided and opportunities to ask questions are encouraged;
- Evaluation of communications efforts, including web analytics and stakeholder feedback review;
- Opinion polling or similar community survey (no less than once every 5 years) to gauge community concerns;
- CNL's Nuclear Education and Outreach Program to school and youth;
- Maintenance of and timely updates to www.CNL.ca;
- Sponsorship and participation in industry events and conferences;
- Execution of tours and visits to the various site for interest groups, school, organizations; and,
- Distribution of a bilingual newsletter CONTACT and Kids CONTACT to residences and businesses in communities surrounding the Chalk River and Whiteshell Laboratories. The newsletter is also posted on CNL's external website.
- Sharing of information through CNL's social media pages; and
- Annual Community Update webinar.

Through participation in local events, fairs, tradeshows etc. CNL is recognized as a strong community partner and is actively involved in a wide range of local events and fundraising initiatives.

2.4.6 Public Interest Groups and Environmentally Focused Organizations and Agencies

CNL continues to proactively provide information to public interest groups and environmentally focused organizations and agencies. Operational announcements and unplanned events are shared; notification is predominantly done through email and via www.CNL.ca. Information on projects that seek public input is provided with letters of advance notification of community meeting dates, venues and times.

As noted previously, CNL respects that members of various agencies outside of the immediate area are also interested in CNL's operations. Where appropriate, a nomination will be facilitated for participation on the Environmental Stewardship Council or Public Liaison Committee.

2.4.7 Environmental Stewardship Council at CRL

To provide Indigenous peoples and the public opportunities for dialogue and feedback, CNL established the Environmental Stewardship Council (ESC) in 2006. The ESC is independently facilitated and comprised of members of public interest groups, Indigenous peoples, and members designated by local councils and representatives from CNL. The council openly discusses a broad range of matters of mutual interest to both CNL and the community, to seek

input for solutions to remediate and/or continually improve CNL's environmental performance and provides ongoing and consistent two-way interactions with interested parties on CNL's business (not just environmental issues). The ESC meets three times a year. Membership, meeting notes and minutes are available to the public on www.cnl.ca.

A list of ESC members can be found in Appendix C.

2.4.8 Community Advisory Panel

The Chalk River Laboratories' Community Advisory Panel (CAP) objective is to bring new voices from the community into the dialogue between CNL and the Renfrew and Pontiac region. Through the CAP, CNL seeks to increase understanding, grow our appreciation of our communities' diverse perspectives, and enable members of the community to access first-hand knowledge about CNL activities. Discussions between CNL and the CAP will focus on the activities that are subject to licensing and environmental regulation as well as activities that may affect the social and economic life of the community.

The CAP consists of a diverse group of community members with varying backgrounds, most of whom are residents of Renfrew or Pontiac County.

CNL hosts regular meetings four times a calendar year. CAP meetings are facilitated by independent third-party facilitators. Meeting notes are taken at each meeting, recording all questions and actions that occurred.

Meeting notes and minutes are available to the public on www.cnl.ca.

2.4.9 Public Liaison Committee at Whiteshell

To provide Indigenous peoples and the public with opportunities for dialogue and feedback, CNL established the Public Liaison Committee (PLC) in 2003. Similarly referred to as a Community Advisory Group by nuclear utilities, the PLC is independently facilitated and comprised of members of public interest groups, members designated by local councils, and representatives from CNL. The council openly discusses a broad range of matters of mutual interest to both CNL and the community and provides ongoing and consistent two-way interactions with interested parties on the decommissioning activities of the Whiteshell Laboratories. The PLC meets two times a year.

A list of PLC members can be found in Appendix D. Information is shared with PLC members through:

2.4.10 Intervenors

CNL values the input from citizens received during regulatory processes (e.g., licensing hearings, Commission appearances, environmental assessments). In this regard, CNL undertakes to advise those intervenors (where contact information is available) of activities through:

- Personal response and an invitation to be added to the relevant projects' mailing list to receive ongoing information on CNL's operations; and,

- Invitations to community meetings that promote information sharing and provide opportunities for interested parties to voice their opinions/concerns.

2.4.11 Atomic Energy of Canada Limited

It is important that our client, Atomic Energy of Canada Limited (AECL), be kept apprised of CNL activities. Communication is ongoing and CNL engages with AECL to provide regular updates to AECL staff on the status of progress on CNL activities.

2.4.12 Canadian Nuclear Safety Commission

CNL recognizes the importance of keeping the CNSC informed on issues that may be important to the CNSC in terms of public communications. CNL is required to notify the CNSC of any public disclosures at the same time or prior to the disclosure.

The CNSC also maintains a site office located at CRL, which is staffed by full-time CNSC staff. This ongoing site presence affords CNSC staff with direct access to all site facilities and activities.

CNSC and CNL interactions are supplemented by regular meetings with regulatory, licensing, project and program staff.

2.4.13 Target Audience Development

There is an ongoing requirement to assess and grow appropriate relationships within all of the identified communities.

At sites where environmental remediation management projects are in their early stages, relationships with local elected officials and Indigenous peoples will continue to be strengthened.

The CNL Public Information Program and public disclosure protocol are proportionate with the public's perception of risk and the level of public interest in the licensed activities as outlined in CNSC REGDOC-3.2.1, *Public Information and Disclosure*.

2.5 Public and Media Opinion

Ongoing and open communications with the media is an important component of CNL's Public Information Program as the media offers a means for information dissemination to the public.

Through the PIP, CNL actively seeks to engage media to ensure access to information, and to provide a balance of information regarding CNL operations and projects. This includes media releases, direct contact, media monitoring, dedicated media visits and media participation in events as security requirements permit.

2.6 Public Information Strategy and Products

2.6.1 Dissemination of Information to the Public

Information is disseminated in a number of ways:

- CNL's corporate website: www.CNL.ca;
- Community Information Bulletins;
- Web postings and media releases;
- CONTACT newsletter (Chalk River and Whiteshell editions);
- Kids CONTACT newsletters (mailed to Port Hope, Chalk River, and Whiteshell catchments)
- Community meetings and events;
- Public engagement activities;
- Topical webinars;
- Social media (multiple platforms);
- Individual discussions by email, phone and in person;
- Visits to the project sites and laboratories;
- Paid advertisement in traditional and social media; and
- Speaking opportunities at conferences and trade events.
- CNL's corporate website, www.CNL.ca is used to post specific environmental information:
    - Reports on site environmental performance are posted quarterly in the Performance Report section of the external website; and,
    - Event Reports for all CNL sites are posted quarterly in the Event Reports section of the external website.

2.6.2 Social Media

The role of social media as a vehicle for communicating with the general public has grown substantially in recent years. Use of social media greatly enhances CNL's ability to deliver against the commitments made in the Public Information Program: regular, open and honest communications with various interested parties.

In addition, CNL endeavours to present itself as a modern, technologically advanced organization. It is expected that organizations of this nature are active participants in social media.

With respect to social media use, Corporate Communications maintains an official Canadian Nuclear Laboratories presence through the following social media tools under the following identifiers:

1. X (formally know as Twitter): CNL_LNC (www.twitter.com/CNL_LNC)
2. LinkedIn: Canadian Nuclear Laboratories (EN) Laboratoires Nucléaires Canada (FR) (https://www.linkedin.com/company/9191967)

3. YouTube: Canadian Nuclear Laboratories / Laboratoires Nucléaires Canada (www.youtube.com/c/CNLCanada)
4. Flickr: Canadian Nuclear Laboratories (https://www.flickr.com/photos/cnl_lnc)
5. Facebook: Canadian Nuclear Laboratories (http://www.facebook.com/CanadianNuclearLaboratories)
6. Instagram: canadiannuclearlaboratories (https://www.instagram.com/canadiannuclearlaboratories/)

2.6.3 Education and Outreach

Since 2008 there has been a steady increase in the outreach activities that have been occurring between CNL and the education communities.

Yearly, CNL actively participates in Take Our Kids to Work Day. Over 100 students participate annually across CNL sites. There are information sessions as well as site visits that students participate in throughout the day.

CNLinvites local high school science classes to the Chalk River Laboratories to participate in a site visit. CNL provides opportunities for two school visits per month of the academic year. CNL staff regularly participate as judges for local Science Fairs. This is further supplemented by in-class and online engagements, averaging two per month across a range of topics.

In 2021, CNL introduced a “Science Camp” targeting ages 9-12. During this week long session (offered twice annually), CNL hosts groups of 20 youth from local communities, introducing them to a range of scientific disciplines and providing them an opportunity to visit the laboratories and interact with the technical leads.

CNL routinely participates in national events such as Nuclear Science Week, International Day of Women and Girls in Science, Let’s Talk Energy Week and Science Odyssey. When requested, CNL staff will make classroom presentations about CNL and about career options. CNL continues to actively grow and develop outreach activities directly related to support Science, Technology, Engineering and Mathematics (STEM) education.

CNL supports youth in exploring careers in the skilled trades and actively participates in activities such as the Renfrew County OPTIONS Skilled Trades Fair and supports local Women in Nuclear (WiN), North American Young Generation in Nuclear (NAYGN) as well as the Canadian Nuclear Society (CNS).

2.6.4 Supply Chain

CNL seeks to maintain a healthy supply base to undertake the diverse range of work the laboratories carry out. To improve line of sight on CNL supply chain opportunities a Vendor Portal and an Indigenous Vendor Portal are maintained.

The purpose of these portals is to provide potential or current suppliers to CNL, with information about how CNL plans and carries out procurement activities for goods, services, equipment, decommissioning and

2.6.5 Gathering comments and feedback from the public

Comments and feedback are received in a number of ways. CNL receives comments and feedback through responses to CNL's active offer during in person, online and external announcements, publications, postings and events. These comments, questions and feedback are typically are related to the content as opposed to the PIP itself. These comments are delivered to CNL though:

- Emails to community email addresses
- Phone calls to the community toll free line
- Phone calls to the media line
- Emails to the media email address
- Paper letters through conventional mail
- Commentary posted to CNL's social media accounts
- Feedback forms collected following in person events
- Questions raised during community events (in person and on line)
- Letters and editorials published in news outlets
- Interventions at public hearings

Comments received are assessed through a variety of methods, both qualitative and quantitative to identify trends and areas for increased focus. They are looked at in a temporal perspective and in totality to understand whether the comments are related to a specific event/moment or reflect a broader concern.

- Email and phone contacts are monitored daily, with automated notification included to ensure a rapid response if needed. This information is logged, and assessed on an ongoing basis.
- Notes are taken at community meetings and actions are tracked as appropriate;
- Community meetings include a feedback form assessing meeting effectiveness and providing comments on improvement;
- ESC, CAP, and PLC meetings include a feedback form assessing meeting effectiveness and providing comments on improvement;
- Newspaper articles and other media reports of CNL's operational and community-based activities are compiled through the assistance of media monitoring
- Website and social media analytics are examined for trends; and
- Opinion polling, undertaken a minimum of every five years.

Table 1: Public Information Strategy and Products Table

Tactics	Products/Activities	Targeted Audiences
Online Communications • Provide information on CNL including descriptions of current and upcoming work, environmental monitoring reports, news releases and community involvement • Provide public disclosure of unplanned project events **Availability** • 24 hour a day access	• Website – www.CNL.ca • CNL Facebook account • CNL Twitter account • CNL YouTube channel • CNL LinkedIn account • CNL Instagram	All
Newsletters • Provide updates on currents projects, descriptions of upcoming work, highlights from ongoing work and community involvement **Availability** • CONTACT (3x per year) • Kids CONTACT (3x per year) • WL CONTACT published annually • Voyageur published monthly	• CRL CONTACT • Kids CONTACT • WL CONTACT • Voyageur	• CONTACT – Regional distribution to all households in surrounding area of both CRL and WL respectively. • Kids CONTACT is distributed to households in CRL, PH and WL regions • Voyageur is distributed across all CNL sites
Community Inquiries/Media Line • Provides direct line of communication • Provides follow-up for non-urgent inquiries **Availability** • 24 hour a day access to send emails/leave messages	• 1-800 Community Line • 1-800 Media Line • Email address	• Public • Media

Tactics	Products/Activities	Targeted Audiences
Presentations • Provide information on current and planned project activities, site operations and environmental programs • Provide an educational tool for schools on different areas of interest to the students **Availability** • Regularly scheduled for interested parties; upon request for others	• PowerPoint slide shows and related handouts • Information Poster Boards • Fact sheets • Interactive touch screens • Informational videos • Online webinars and live streamed sessions	• All
Site Visits • Led by Subject Matter Experts • Facilitate understanding and appreciation for complexity and importance of work at CNL and major projects • Educate about safety, environmental monitoring, and all aspects of how the site operates **Availability** • An Open House is held every five years • Two local school tours per month during school year • Additional upon request (average >40 per year)	• PowerPoint presentations • Guided tours of different facilities and projects • Interactive demonstrations	• All
Citizen Groups • Community Advisory Panel • Environmental Stewardship Council • Public Liaison Committee	• Regularly scheduled meetings in their respective areas • PowerPoint presentations and discussions • Tours of sites and areas	• Local residents • Representatives from interest groups • Representatives from Municipalities • Representatives from Indigenous Nations,

Tactics	Products/Activities	Targeted Audiences
	of interest • Question and answer periods	communities and organizations
Community Notifications • Provide notifications about activities at CNL and/or notable changes to schedules or work to residents and businesses located in close proximity to the site • Provide advance notifications of upcoming work or events that may affect the local community • Provide disclosures of unplanned events • Provide notification of public events and career opportunities **Availability** • Various	• Phone calls and emails to elected officials or community leaders • Website and social media postings • Advertising – print and/or radio	• Public • First responder organizations • Municipal staff
Information Sessions – Public • Inform community about upcoming projects and related monitoring, mitigation and health and safety measures in place to protect people and the environment • Provide updates on planned or changed project activity • Receive feedback from the public and discuss issues and areas of concern for those in proximity to the work sites **Availability**	• Informational Poster Boards • Presentations • Subject Matter Experts to discuss and answer questions • Fact sheets • Visual aids and displays • Fact sheets • Informational videos • Feedback forms	• Communities in close proximity to projects • Media • Elected Officials • Staff

Tactics	Products/Activities	Targeted Audiences
• As required to relay new information, developments and project updates to local communities and interested groups • Upon request		
Media Relations • Brief the media and leverage their reach to inform the community and broader audiences • Reinforce CNL as primary source of accurate, timely information • Demonstrate transparency by disclosing any unplanned events or occurrences **Availability** • Proactively on milestone achievements or major developments • Proactively when current events justify outreach • Upon request	• Media releases • Media engagements • Media interviews with CNL technical experts • Letters to the Editor • Provision of footage and photography • Access to site for filming, walk downs and interviews	• Media • Public • Social Media
Participation in External Events • Provide broader public with information about CNL activities, projects and health and safety measures in place to protect people and the environment • Provide opportunity for CNL staff to act as ambassadors and broaden awareness of CNL **Availability** • Annually • Upon request	**Events include:** • Local Home shows • Community Events • Educational events • Local agricultural fairs • Industry events • Career Fairs • School / In Class	• Public • Schools • Industry

Tactics	Products/Activities	Targeted Audiences
CNL Attitude Study • Gain insights into public opinion and understanding of CNL • Gather feedback on effective/ineffective communications tools, areas of interest and areas to improve	• Delivered through recommendations of external polling firm • Internal staff surveys • Undertaken every 5 years.	• Local Residents (with no ties to CNL) • Local Residents (with ties to CNL) • Staff
County Day • Intensive one day visit to the Laboratories, with the extended elected officials and community councils • Annual event	• Mix of presentations and on site tours • Provides opportunity for updates, performance reporting, and dialogue	• Elected officials and extended council members (CRL)
Annual Community Update Webinar • Live stream through dedicated page, and through social media • Mix of presentations and moderated Q&A • Heavily promoted within the local community and industry members	• Shared opportunity for AECL and CNL to address progress, performance, and plans for the future • Bilingual, a French stream is available	• Chalk River Laboratories • Industry members • Interest groups • Alumni

2.6.6 Performance Reports

2.6.6.1 Environmental Performance

Through CNL's corporate website, information is regularly posted regarding CNL's environmental impact, including results from our environmental monitoring program.

Links can be found for the following policies and documents on www.CNL.ca:

- CNL Environment Policy;
- CRL Environmental Performance Reports (updated quarterly);
- WL Environmental Performance Reports (updated annually);
- CRL Environmental Risk Assessment (updated as required);
- WL Environmental Risk Assessment (updated as required);
- Douglas Point Environmental Risk Assessment (updated as required);
- G-1 Environmental Risk Assessment (updated as required);
- Executive Summary of CRL Annual Compliance and Monitoring Report (updated annually);
- Executive Summary of WL Annual Compliance and Monitoring Report (updated annually);
- Executive Summary of NPD Annual Compliance and Monitoring Report (updated annually);
- Executive Summary of Douglas Point Annual Compliance and Monitoring Report (updated annually);
- Executive Summary of G-1 Annual Compliance and Monitoring Report (updated annually); and
- Executive Summary of Near Surface Disposal Facility Environmental Assessment Follow-up Monitoring Program Report (updated annually).

In addition, CNL has achieved the ISO 14001 Environmental Management System certification, recognized internationally as a key to guiding organizations to environmental responsibility and continual improvement.

3. PUBLIC DISCLOSURE PROTOCOL

3.1 Public Information

Event Reports

CNL provides to the public an up-to-date list of events as reported to the Canadian Nuclear Safety Commission (CNSC). The listing is updated 60 days following the end of the preceding quarter.

Details on these events are available upon request to CNL.

In addition to general information on CNL activities, CNL also has Public Disclosure priorities that differ by locations, a site summary follows.

3.2 Public Disclosure

CNL is committed to maintaining a public information program that includes public access to information related to routine radiological and non-radiological emissions, and non-routine items or events at Chalk River Laboratories, NPD, Douglas Point, G-1 and Whiteshell Laboratories. CNL manages public disclosure related to the following licences:

- Nuclear Research and Test Establishment Operating Licence (Chalk River Laboratories),
- Nuclear Research and Test Establishment Decommissioning Licence (Whiteshell Laboratories),
- The Prototype Waste Facilities – Waste Facility Decommissioning Licence for Nuclear Power Demonstration,
- The Prototype Waste Facilities – Waste Facility Decommissioning Licence for Douglas Point
- The Prototype Waste Facilities – Waste Facility Decommissioning Licence for Gentilly-1

For all sites the primary means for reporting non-routine items or events is CNL's external website, www.CNL.ca, while CNL may elect to notify key local officials and interested parties through direct contact should the event have off-site or community impacts. The reporting timeframe for disclosure items is typically within four business days; however, CNL balances between securing reliable information and ensuring the public and interested parties are kept informed.

3.2.1 Public Disclosure at Chalk River Criteria for Public Disclosure

1. The licensee shall provide the following routine emissions information to the public:
   a) airborne emissions of Nitrogen Oxides (NOx) and Sulfur Oxides (SOx), updated annually;
   b) airborne emissions of tritium, updated quarterly; and
   c) waterborne emissions of tritium, updated quarterly.

   Routine emissions information will be reported through CNL's external website, www.CNL.ca, and updated as necessary. Posting will have a one period lag to allow for processing of the samples, preparation of the information, and verification of the report.

2. The licensee shall periodically review and update the routine emissions report to reflect operational changes and feedback from interested parties.

3. The licensee shall provide information to the public regarding non-routine items or events as specified below:

   a) Exceeding an action level for any radiological emissions where it also exceeds 0.1% of the derived release limit.

   b) Loss of refrigerant as listed under the Federal Halocarbon Regulations greater than 100 kg;

   c) Other events that could have offsite effects or result in media attention including fires, earthquakes, serious vehicle or industrial accidents, non-compliant releases to the Ottawa River, and significant business developments.

   d) Quarterly updates of event reports to the public through website.

   e) Opportunities for public participation in CRL licencing activities.

4. Environmental and Performance Reporting

Note: Licence Applications

Licence renewal applications to the Commission Registrar may be posted on the external CNL website as submitted to the CNSC, at the discretion of the applicable site licence holder.

In addition to quarterly reporting and posting of “routine emissions”, noted in section one (1) above, CNL also prepares and posts an Annual Compliance Monitoring Report summarizing Effluent Verification and Environmental Monitoring for the Chalk River Laboratories.

This report reviews and summarizes the results of the Chalk River Laboratories (CRL) Environmental Monitoring Program (EMP) for a specified calendar year. CNL reports the monitoring results annually to the Canadian Nuclear Safety Commission (CNSC). The report is made available to the public.

These environmental performance reports are available via the Performance Reporting page found at www.CNL.ca.

3.2.2 Public Disclosure at Whiteshell Laboratories Criteria for Public Disclosure

1. The licensee shall provide the following routine emissions information to the public:

   a) airborne emissions, updated semi-annually;

   b) airborne emissions of NOx and SOx, updated annually.

2. The licensee shall periodically review and update the routine emissions report to reflect operational changes and feedback from interested parties.

3. The licensee shall provide information to the public regarding non-routine items or events as specified below:

a) Loss of refrigerant as listed under the Federal Halocarbon Regulations greater than 100 kg;

b) Other events that could have offsite effects or a result in media attention including fires, earthquakes, vehicle or industrial accidents, non-compliant releases to the Winnipeg River, and significant business developments.

c) Opportunities for public participation in Whiteshell Laboratories' licencing activities.

4. Environmental and Performance Reporting

Note: Licence Applications

Licence renewal applications to the Commission Secretariat may be posted on the external CNL website as submitted to the CNSC, at the discretion of the applicable site licence holder.

In addition to reporting and posting of "routine emissions", noted in section one (1) above, CNL also prepares and posts an Annual Safety Report summarizing annual performance data for the Whiteshell Laboratories.

This report reviews and summarizes the results of the Whiteshell Laboratories' annual performance and environmental data for a specified calendar year. CNL reports the monitoring results annually to the Canadian Nuclear Safety Commission (CNSC). The report can be made available to the public.

These Whiteshell Laboratories' performance reports are available via Performance Reporting page found at www.CNL.ca.

3.2.3 Public Disclosure of Prototype Reactor Sites

Criteria for Public Disclosure:

1. The licensee shall provide information to the public regarding non-routine items or events where:

   a) Loss of refrigerant as listed under the Federal Halocarbon Regulations greater than 100 kg;

   b) Other events that could have offsite effects or result in media attention including fires, earthquakes, serious vehicle or industrial accidents, non-compliant releases to the environment, and significant business developments.

   c) Opportunities for public participation in licencing activities.

   Public Disclosure for each Prototype Reactor site will be reviewed prior to starting any physical environmental remediation work.

2. Environmental and Performance Reporting

Annual Compliance Monitoring Reports are prepared for each site and summarize the present status of the Prototype Waste Facilities and notable activities conducted within these facilities for a specific calendar year. The report includes results of operations, the results of monitoring

programs, changes made to key procedures, equipment, or structures, as well as a summary of reports made pursuant to Sections 29 and 30 of the General Nuclear Safety and Control Regulations.

Executive Summaries of the Annual Compliance Monitoring Reports for the Prototype Waste Facilities sites are available via the Performance Reporting page found at www.CNL.ca.

Note: Licence Applications

Licence renewal applications to the Commission Secretariat may be posted on the external CNL website as submitted to the CNSC, at the discretion of the applicable site licence holder.

3.3 CNL Emergency Preparedness

CNL is committed to providing the safest environment for our public and employees. CNL follows the industry and Canadian comprehensive all-hazards approach to safeguard the public from any potential incidents.

In the unlikely scenario that an event does occur, CNL has plans to ensure these events are properly managed and risks to people as well as the environment are minimized. Emergency preparedness is a highly integrated process. Documentation and plans are aligned and the Emergency Operations Centre (EOC) interfaces are clearly established between CNL, the municipalities, the provinces, and the federal government. These preparations include a trained emergency operation team and subject matter experts who are on-call and ready to respond.

3.3.1 Chalk River Laboratories

The primary zone is the areas in which extensive planning and response preparations for an incident or radiological event are required. The size of each primary zone is defined by the province and the response requirement for each zone is defined by our regulators. For CRL, the primary zone, in both Ontario and Quebec, is a nine-kilometre radius from the NRU reactor, which as of 2018 March 31 is no longer an operating reactor.

3.3.2 Whiteshell Laboratories

WL is currently undergoing decommissioning. WL operates an Emergency Preparedness program committed to ensuring the safety and security of our staff and the public. WL currently utilizes a variety of emergency signals for site-wide alerting and provides public alerting through their Emergency Operations Centre processes.

4. PROGRAM EVALUATION PROCESS

The Corporate Communications group coordinates activities and interactions with CNL's interested parties and Indigenous Nations, communities and organizations.

4.1 Questions and Issus Management

For the purposes of the Public Information Program, an issue is defined as something that could positively or negatively impact on CNL's operations, credibility or reputation.

Where questions and issues arise, CNL attempts to identify the issue, determine its basis or cause, assess its implications, and, if possible, identify means to inform on the issue to the satisfaction of the concerned parties and the public. CNL endeavours to acknowledge and address questions and issues within 30 working days.

4.2 Assessment and Evaluation

The Public Information Program is not static. The identified activities are carried out with full intent. The program is reviewed regularly as it progresses and its effectiveness measured, based on public input and other factors. Revisions to the program may be required to incorporate input from the public, to adapt to changing business needs or circumstances, to accommodate new information, or in response to other factors.

4.3 Documentation

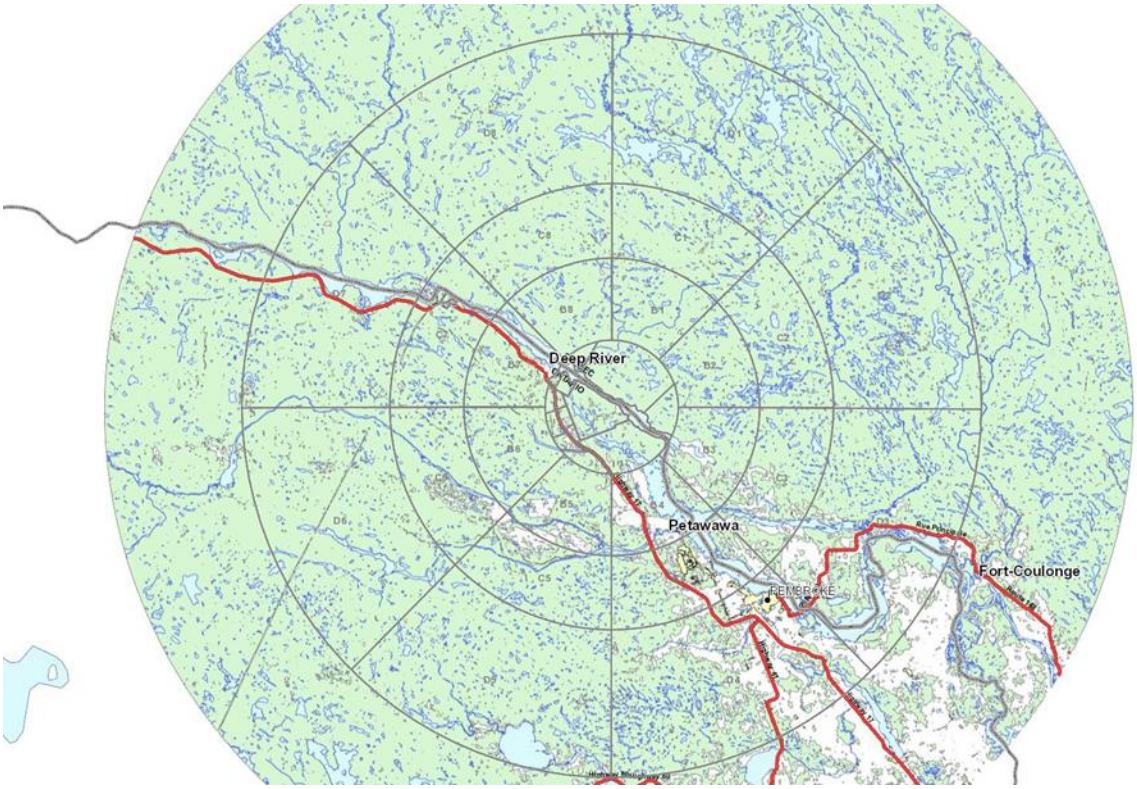
The Public Information Program is available to the public in both official languages through www.cnl.ca. While day-to-day interactions with CNL's many audiences are not stored as records, given the nature of this program, documents which provide evidence of its delivery are widely available; for example, press releases, event listings, and public disclosures are posted online; copies of newsletters are archived on www.cnl.ca; webinars are published to our YouTube channel and available for viewing on demand; records of attendance at site visits are maintained; records of attendance at major public events are stored; records of key public and Indigenous engagements are recorded.

5. CONTACT INFORMATION

Corporate Communications
Canadian Nuclear Laboratories Chalk River Laboratories
286 Plant Road
Chalk River, ON K0J 1J0 Canada

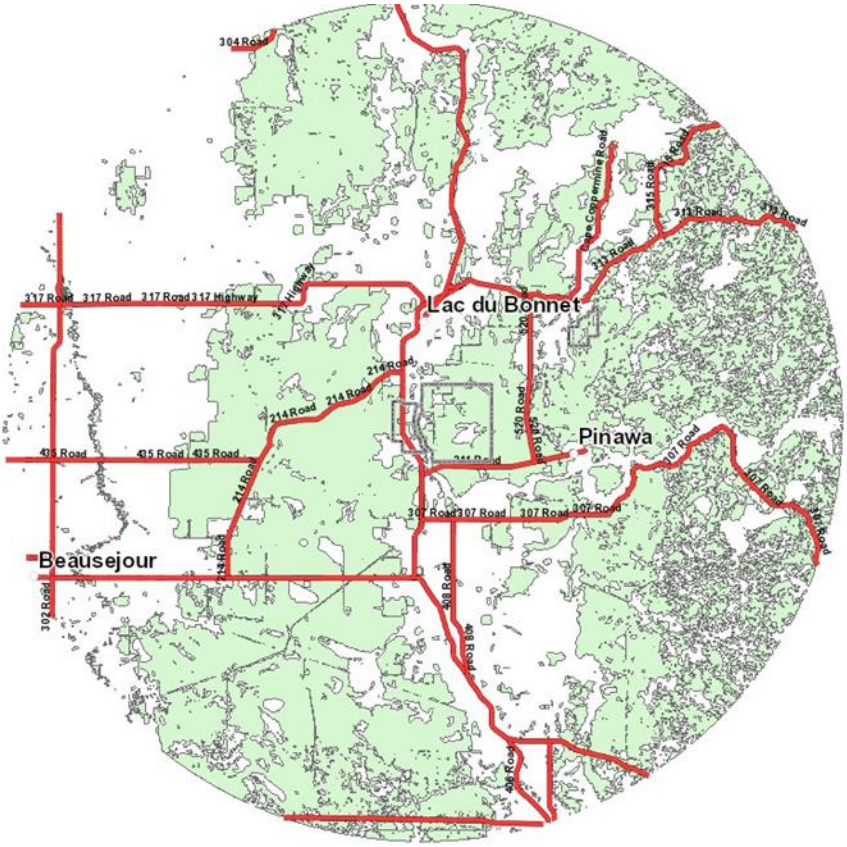
Tel.: (613) 584-8811, ask for Corporate Communications
Fax: (613) 584-8272
Toll free: (800) 364-6989
Email: communications@cnl.ca
Web: www.CNL.ca

Appendix A MAP OF CRL AND NPD'S PRIMARY AUDIENCE



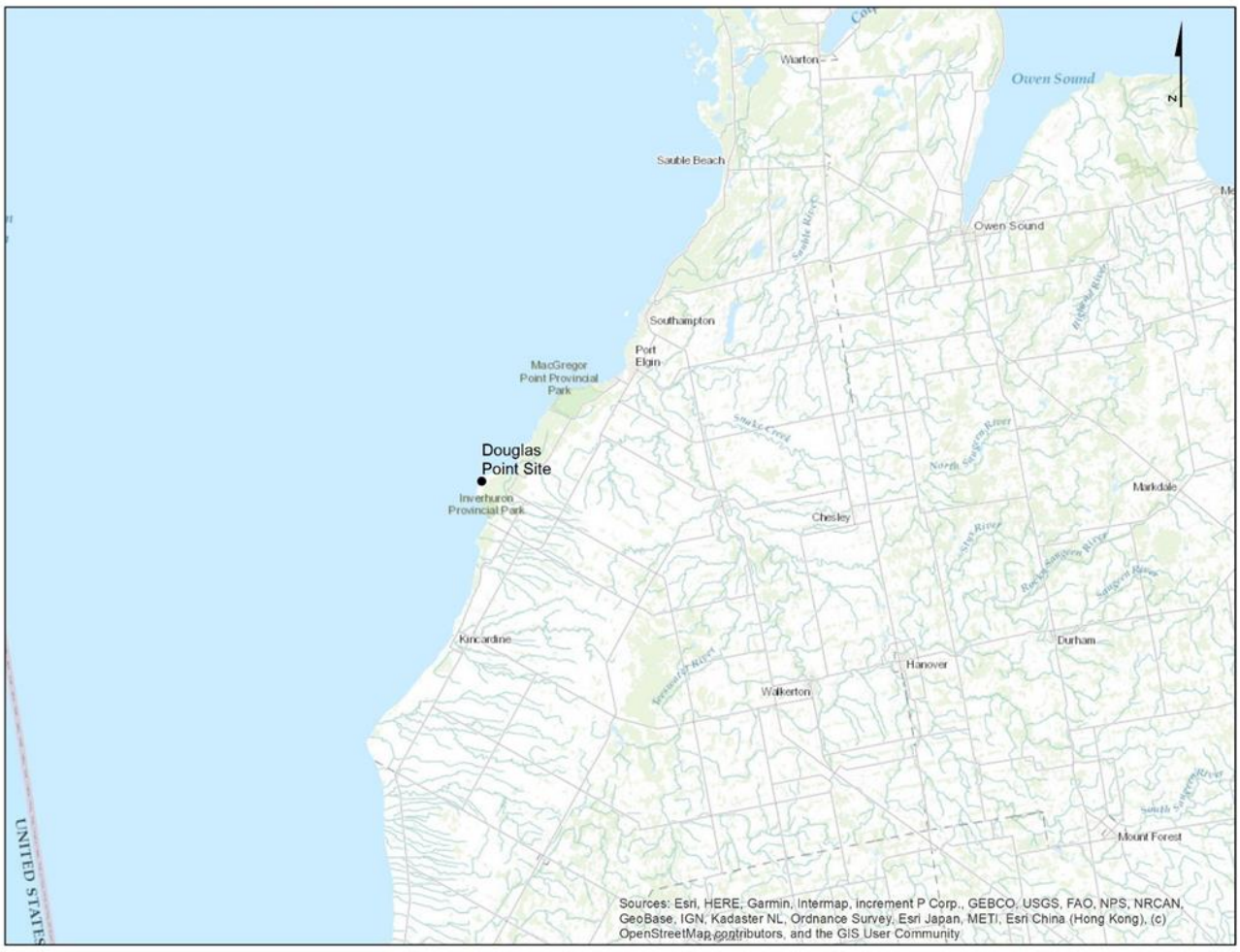
CRL and NPD's primary audience is located within a 50-kilometre radius of the Chalk River Laboratories. For practical purposes CNL maintains sharing of information with both regional municipalities of Renfrew and Pontiac Counties, and as noted previously CNL expands communication activities as necessary.

Appendix B MAP OF WL's PRIMARY AUDIENCE



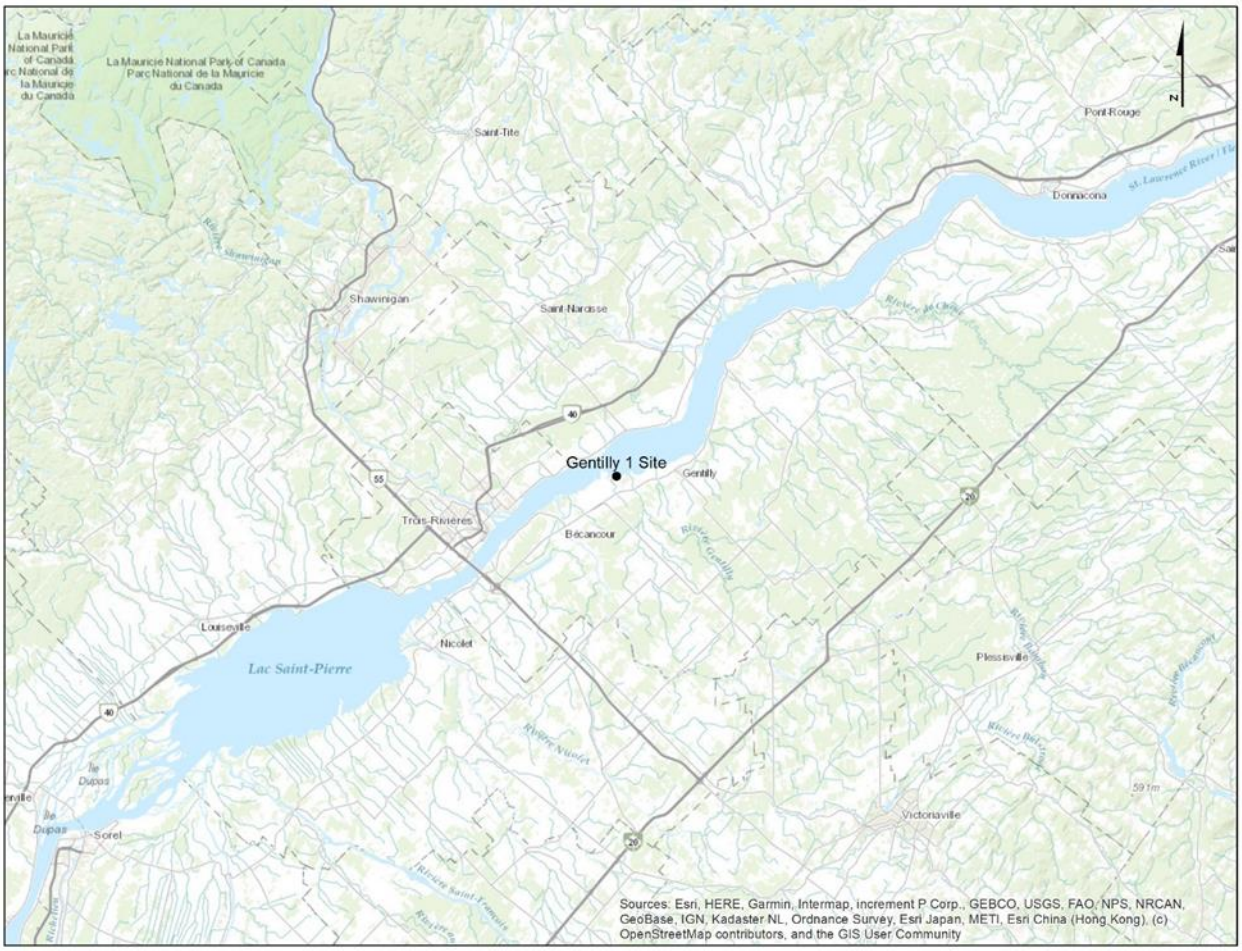
WL's primary audience is located within a 50-kilometre radius of the Whiteshell Laboratories. For practical purposes CNL maintains sharing of information with regional municipalities and as noted previously CNL expands communication activities as necessary.

Appendix C MAP OF DOUGLAS POINT PRIMARY AUDIENCE



Douglas Point's primary audience is reflective of Bruce Power's target audience. For practical purposes CNL maintains sharing of information with regional municipalities and as noted previously CNL expands communication activities as necessary.

Appendix D MAP OF G-1'S PRIMARY AUDIENCE



G-1's primary audience is reflective of Hydro Quebec's target audience, which is made up of neighboring communities of the facilities in the regions of Centre-du-Québec and Mauricie. For practical purposes CNL maintains sharing of information with regional municipalities and as noted previously CNL expands communication activities as necessary.

Appendix E LIST OF EXTERNAL ORGANIZATIONS WHO ARE MEMBERS ON THE ENVIRONMENTAL STEWARDSHIP COUNCIL AS OF 2023 OCTOBER

- Facilitator – Innovation Works
- Member – Canadian Nuclear Laboratories
- Member – City of Pembroke
- Member – Concerned Citizens of Renfrew County
- Member – Deep River Horticultural Society
- Member – Four Seasons Conservancy
- Member – Garrison Petawawa
- Member – Métis Nation of Ontario
- Member – Municipalitié régionale de Comté de Pontiac (MRC)
- Member – Old Fort William Cottagers' Association
- Member – Ottawa River Keeper
- Member – Pembroke and Area Field Naturalists
- Member – Petawawa Research Forest
- Member – Renfrew County Council
- Member – Town of Deep River
- Member – Town of Laurentian Hills
- Member – Town of Petawawa
- Member – City of Ottawa
- Observer – Algonquins of Pikwakanagan First Nation (Note: Expected to move to Member status in 2024.)
- Observer – Atomic Energy of Canada Limited (AECL)
- Observer – Canadian Nuclear Safety Commission (CNCS)

Appendix F LIST OF EXTERNAL ORGANIZATIONS WHO ARE MEMBERS ON THE PUBLIC LIAISON COMMITTEE AS OF 2020 AUGUST

- Local Government District of Pinawa
- Rural Municipality of Lac du Bonnet
- Town of Lac du Bonnet
- Town of Beausejour
- Rural Municipality of Whitemouth
- Manitoba Sustainable Development
- Rural Municipality of Brokenhead
- Rural Municipality of Alexander
- Town of Powerview – Pinefalls
- Manitoba Department of Sustainable Development
- MLA Lac du Bonnet (Observer)
- MP Selkirk (Observer)
- Sagkeeng First Nation (Observer)
- MP Provencher (Observer)
- Canadian Nuclear Safety Commission (Observer)