AECL EACL

Annual Performance Report

AECL ANNUAL ENVIRONMENTAL PERFORMANCE REPORT FOR 2004

AECL MISC 387-04
Revision 0

2005 December

UNRESTRICTED

Chalk River Laboratories
Chalk River, Ontario
Canada K0J 1J0

Décembre 2005

ILLIMITÉ

Laboratoires de Chalk River,
Chalk River, (Ontario)
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EXECUTIVE SUMMARY

This report summarizes the environmental performance of AECL's operations and activities at its Canadian sites during 2004. Operations during 2004 were in compliance with applicable environmental regulations. Audits and assessments conducted during the year revealed that AECL's verification and compliance monitoring programs continue to be effective. Several environmental initiatives were underway at the various sites, including the Port Hope Area Initiative, which was completed in 2004.

AECL continued to work towards continual improvement of its environmental performance and management system in 2004, and to implement the Environmental Protection Program requirements at the facility and activity level, leading to successful ISO-14001 registration of the Chalk River Laboratories (CRL) Site.

AECL completed the assessment of the environmental aspects, and their significance related to operations and activities at the CRL and Whiteshell (WL) sites. Based upon these assessments, updated environmental objectives and targets have been developed and incorporated into AECL's Environmental Plan for 2003-2005 and CRL and WL Environmental Protection Program Indexes (EnvPPI).

Radioactive emissions from AECL sites and facilities were monitored and remained below applicable Derived Release Limits (DRLs) in 2004. The sum of the average airborne weekly releases of all radionuclides from all monitored sources at the Chalk River Laboratories (CRL) site was 13.3% of the DRL, a value slightly above the 5-year average of 12.7%. Emissions of argon-41 to the atmosphere from the CRL site remained the dominant radioactive emission from AECL sites, averaging 10.4% of the DRL (argon-41 DRL for the CRL site is 2.93E+15 Bq/wk), but below the 5-year average of 11.3% of the DRL. Mixed fission product noble gases from the Mo-99 Production Facility increased due to continued needs for solidification of radioactive waste from the process, averaging 2.64% of the DRL in 2004. All of the other airborne and liquid emissions were much lower.

Emissions of non-radioactive substances from AECL sites and facilities were monitored or estimated. Airborne emissions of acid gases at CRL, mainly from combustion of oil for building heating, were below the previous 5-year average. The WL value was comparable to the previous 5-year average. Emissions of greenhouse gases were comparable to the previous 5-year average.

Non-radioactive liquid emissions, including the mean effluent temperature rise of process water, remained comparable with previous years. The number of times parameters exceeded AECL monthly guidelines (26 exceedances at WL, and 21 exceedances at CRL) are trending towards achieving the benchmark of zero exceedances by 2015. Waste Treatment Centre (WTC) effluents periodically exceeded AECL daily guidelines for mercury in 2004, however, the concentrations and overall mercury loading decreased in 2004 compared to the previous four years.

An Ecological Effects Review (EER), completed in 2004 (see Section 2.3.5.3), concluded that

based on benchmark values, there were no observable effects on populations of the most sensitive species on site as a result of releases from the Chalk River site.

Solid radioactive wastes generated at AECL sites, as well as wastes received from external sources, continued to be stored safely in waste management facilities at the sites in accordance with site licences. The CRL site continued to generate and store the largest quantities of radioactive waste. The volume in 2004 was consistent with that generated in 1998 through 2000, but slightly above the 5-year average. Waste diversion programs associated with the operation of the Waste Management Areas at CRL, designed to minimize the quantities of low-level solid waste, operated efficiently in 2004 and have achieved their maximum effectiveness in terms of waste reduction capability.

The total volume of high-level liquid waste generated at AECL and added to current interim tank storage inventories remained small in 2004. However, there was an increase in the volume added to interim drum storage inventories at CRL due to the addition of 29 CAMECO drums of oil contaminated with uranium. Treatment provision for all low-level liquid wastes prior to discharge has been achieved for CRL, but not for WL. However, monitoring programs are in place to ensure that these wastes are below release criteria prior to discharge.

Radioactive liquid wastes continued to be managed safely at CRL. Efficient operation of the upgraded CRL Waste Treatment Centre, designed to treat Low Level Liquid Wastes (LLLW) prior to discharge to the Ottawa River, continued in 2004. Inventories of medium, high-level, and organic liquid radioactive wastes continued to be safely stored.

Recycling programs for minimizing quantities of non-radioactive wastes requiring disposal, and programs for collection and disposal of hazardous non-radioactive wastes at approved off-site facilities, operated successfully during the year. The percentage of non-radioactive wastes being recycled is steadily increasing over the years and AECL is trending towards achieving its benchmark of recycling 35% of its annual non-radioactive waste generated by 2015.

Inventories of ozone-depleting substances (ODSs) and PCBs in waste storage and in use continued to be well managed, and reduced where possible through phase-out programs. While inventories have remained relatively constant over the past several years, work continued at all sites towards achieving the target of eliminating all ODSs at AECL by 2020.

Quantities of chlorine used for water treatment at CRL in 2004 was consistent with previous years, as a result of earlier improvements made to the chlorination process used at the sanitary wastewater treatment facility. At WL, chlorine use to disinfect the domestic potable water supply was consistent with previous years.

Energy consumption at AECL sites remained relatively constant compared with previous years, partly as a result of continued efficient operation of the new heating boilers in the CRL Power House, and other energy improvements implemented in recent years. The intensity value has remained relatively constant over the past several years, with the value for 2004 slightly above the 5-year average.

In 2004, there were 30 environmental incidents logged for CRL and 1 for Sheridan Park (SP), and none for WL, areas under surveillance of and monitored by the LLRWMO, or as a result of operations at the Gentilly-1 Waste Management Facility, the Nuclear Power Demonstration Waste Management Facility, and the Douglas Point Waste Management Facility. The 31 environmental incidents were correctly reported, investigated when required, mitigated when possible, and corrective actions were taken to prevent recurrence of similar incidents. A total of 21 incidents were reportable to external regulators. The potential impacts to the environment were negligible to moderate. Of the 26 negligible incidents, 19 were leaks from cooling/air conditioning systems that resulted in halocarbon emissions. Through preliminary investigation, it was determined that the leaks stem from aging and inadequate maintenance of halocarbon-containing equipment and systems. Actions aimed at reducing the occurrence of these leaks were identified, and documented in an action plan. Appropriate corrective actions were taken in all cases. None of the incidents represented a significant environmental hazard.

Planning for facility and site decommissioning and for remediation of contaminated areas on AECL sites progressed. Three existing radioactive groundwater plume-interception systems at CRL continued to operate effectively. Decommissioning Plans are in place for all facilities, including the CRL site, as required by the CNSC. A decommissioning licence for the WL site was granted by the CNSC effective 2004 January 1.

AECL communicated regularly with the public regarding environmental issues related to operations and activities at its sites through a variety of methods, including meetings with local community officials, public meetings and displays, internet websites, and various media stories. The AECL Speaker's Bureau was re-established to facilitate and organize presentations on the nuclear industry upon request from interested groups within the community.

1. INTRODUCTION

1.1 AECL Sites in Canada

AECL was established in 1952 as a Canadian Crown corporation, reporting to the Parliament of Canada through the Minister of Natural Resources. AECL develops, markets, and manages the construction of CANDU® power reactors, performs associated research and development, carries out underlying reactor research, supplies CANDU and light water reactor (LWR) support services, and offers radioactive waste management products and services.

AECL owned or operated numerous sites throughout Canada in 2004, including office and engineering sites, research sites, sites of decommissioned nuclear facilities, and sites for interim storage of historic low level radioactive wastes.

AECL's head office site is located in the Sheridan Park Research Community in Mississauga, Ontario. The Sheridan Park (SP) site also includes engineering offices and facilities, and an engineering laboratory. The laboratory operates in accordance with prescribed substance, and radioisotope licences issued by the Canadian Nuclear Safety Commission (CNSC).

The largest and most diverse AECL site is the Chalk River Laboratories (CRL) site at Chalk River, Ontario, including associated engineering offices in Deep River, Ontario. A second large site is the Whiteshell Laboratories (WL) at Pinawa, Manitoba. Both these sites contain numerous nuclear and non-nuclear research and support facilities, and are operated in accordance with licences issued by the CNSC.

The Underground Research Laboratory (URL), located near the Whiteshell Laboratories, is used to conduct geotechnical research into the concept of waste disposal in deep geological formations as part of the Nuclear Fuel Waste Management Program (NFWMP). No radioactive wastes are stored or intended to be stored in this facility. The site is leased from the Province of Manitoba and operates in accordance with the Manitoba Mines Act.

AECL maintains the sites of several shutdown nuclear facilities, including the Nuclear Power Demonstration (NPD) site at Rolphton, Ontario, the Douglas Point (DP) site at Tiverton, Ontario, and the Gentilly-1 (G-1) site at Gentilly, Québec. These sites are maintained in a "shutdown with surveillance" state in accordance with waste management facility operating licences issued by the CNSC. Discussions with the CNSC led to a revision of the licensing strategy. It was agreed that AECL would seek a decommissioning licence for the off-site facilities at some point in the future rather than continuing to operate those sites as waste facilities. The CNSC reviewed the Douglas Point Preliminary Decommissioning Plan and provided some comments. Derived Release Limits for Douglas Point were accepted by the CNSC. AECL also submitted action levels for the off-site facilities to the CNSC and they were accepted on an interim basis. The review of interim end-state reports and storage with surveillance plans for G-1 and NPD by the CNSC continued.

AECL uses the site of the decommissioned heavy-water plant at LaPrade, near Bécancour, Québec, for storage of some heavy water under a CNSC prescribed-substance licence. AECL

also continues to maintain the site of a decommissioned heavy water plant at Glace Bay, Nova Scotia, but this site no longer requires a CNSC licence.

AECL's Low-Level Radioactive Waste Management Office (LLRWMO) carries out assessments and cleanups of various sites contaminated with historic waste on behalf of Natural Resources Canada. In conjunction with these activities, the LLRWMO operated and maintained several sites for the management of the resulting low-level radioactive wastes. Pending establishment of permanent disposal facilities, three sites for the interim storage of wastes continued to be maintained in Port Hope, Ontario, under a Waste Nuclear Substance Licence issued by the CNSC: the Pine Street Extension Consolidation Site, the Strachan Street Consolidation Site, and the Sewage Treatment Plant Temporary Storage Site. The LLRWMO also administered a CNSC Waste Nuclear Substance Licence that allows the LLRWMO to take possession of licensable materials during cleanup operations pending shipment of the materials to a suitable destination.

2. ENVIRONMENTAL MANAGEMENT SYSTEM

2.1 AECL's Environment Policy

The Environment Policy, issued under the authority of the AECL Board of Directors, states AECL's commitment to protecting the environment, and establishes the overall principles and goals for environmental responsibility and performance expected of the organization, its managers and employees.

The following statements are taken from AECL's Environmental Policy:

- "We practice responsible environmental management.
- We are committed to the principle of pollution prevention.
- We set environmental objectives and targets to support continual improvement of our environmental performance.
- We comply with environmental laws, requirements, and recognized standards and guidelines applicable to our activities.
- We review the impacts of our activities, facilities, projects, services and products on the environment.
- We meet all applicable environmental requirements of our customers.
- We will seek to develop and improve technologies to advance environmental protection and clean air solutions.
- We promote public and employee awareness of this policy."

The AECL Environment Policy also commits AECL to the concept of sustainable development.

To help meet this commitment, the sixteen "*Principles for Environmental Management*" contained in the International Chamber of Commerce's Business Charter for Sustainable Development were used as guidance in the development of the EnvP Program.

Additional requirements and expectations of the Board of Directors include the production of an annual environmental plan, incorporating environmental objectives, targets and performance indicators for achieving continual improvement in environmental performance at AECL sites in Canada, and regular reporting by AECL management to a Sub-Committee of the Board of Directors on the implementation of the environmental policy and progress against the annual environmental plan.

2.2 Environmental Management in AECL

Overall accountability for environmental protection within AECL lies with the AECL Board of Directors. During 2004, the Board continued to fulfil its responsibilities through a subcommittee receiving and reviewing AECL management's reports on implementation of the Policy, resolution of identified issues, and progress against environmental plans during 2004.

The AECL Safety Review Committee (SRC), an internal committee independent of line management, reviews and approves, on behalf of the AECL President and Chief Executive Officer, the acceptability of proposed and existing facilities and activities at AECL's Canadian sites with respect to protection of the environment, health and safety.

In 2004 March, AECL named a Chief Environmental Officer and a Senior Environmental Committee was formed. The specific mandate of the Committee is to ensure implementation of AECL's Environment Policy, ensure coordination of AECL's response to regulatory requirements on environmental performance, and to ensure fulfilment and continual review of AECL's environmental responsibilities. The Chief Environmental Officer chairs the Senior Environmental Committee.

2.3 Environmental Management at AECL's Sites

2.3.1 Program Responsibility

Functional responsibility for development and maintenance of the environmental management system, processes and procedures that implement the AECL Environment Policy within AECL's Canadian sites lies with the AECL Environmental Protection Program, one of several company wide programs as defined by the AECL Management Manual.

Executive Authority responsibility for the Environmental Protection Program lies with the Vice-President, AECL Nuclear Laboratories Business Unit (NLBU). Functional responsibility for developing, maintaining and implementing the Environmental Protection Program, as Program Authority, is with the Director, Safety and Environment (SED), within the Facilities and Nuclear Operations (FNO) unit of NLBU. The Environmental Panel consists of the General

Managers and Vice-President of the NLBU, the Program Authority and Program Manager, and is chaired by the General Manager of FNO. The Environmental Panel has general responsibility for recommending environmental protection policies and priorities, and reviewing environmental performance within AECL sites, and setting strategic objectives and targets. The Panel approves the Annual Environmental Plan that communicates the environmental objectives and targets and lists the actions planned to address these objectives and targets during the year. In 2004, the 2003-2004 and 2004-2005 Environmental Plan was in effect while the next Environmental Plan was being developed.

A few changes in the EnvP Program organization and resources took place during 2004. Two additional staff were hired for one-year term positions at CRL in 2004 January and February. The need for additional resources within EnvP was identified by the CNSC in their audit of the program in 2002 November, and Part 1 of a staffing needs analysis report identifying the needs of the EnvP Program Support Group was completed in 2004 and submitted to the CNSC.

The four Branches of the LLRWMO were reorganized and renamed to more accurately reflect their functions, such that the Environment Health and Safety Branch is now the Operations and Environmental Services Branch and a new acting Manager was appointed for the branch. The Port Hope Area Initiative, Project Office, now houses the "National Office" of the LLRWMO.

2.3.2 AECL's Environmental Protection Program

The Environmental Protection Program and Environmental Management System (EMS) requirements, responsibilities, processes and procedures are defined in the AECL Environmental Protection Program Manual, RC-2000-021. During 2004, efforts continued towards implementation of the Program within AECL sites, and continued implementation and improvement of the Environmental Management System (EMS), with the intent of achieving greater conformance with the ISO-14001 standard at AECL sites in Canada and achieving registration to the standard for the CRL site. Successful ISO-14001 registration for the CRL site was achieved in 2004 April.

The Environmental Plan for 2003/04 and 2004/05 was completed in 2004 April, and reviewed and approved by the Environmental Panel. The Environmental Plan incorporates the Strategic Objectives and Targets endorsed by the Environmental Panel in consultation with line management and Environmental Protection Program staff, and linked to Significant Environmental Aspects. It is a compilation of information from individual departments' operational plans and specifies projects, routine activities, proponents, estimated resource requirements, and target dates for objectives and targets.

The Environmental Protection Program Performance Model, developed in 2003, documented AECL's four strategic environmental goals in alignment with the Environment Policy:

- Prevent Environmental Protection degradation (including Prevent Pollution);
- Provide Responsible Environmental Protection management;

- Demonstrate compliance to Environmental Protection legislation and regulations; and
- Provide improvement of Environmental Protection systems and technology.

The Environmental Protection Program Performance Index (EnvPPI) was developed for the CRL site and included in the 2003/4, 2004/5 Environmental Plan. The EnvPPI consists of four sub-indices, one for each strategic environmental goal: the Environmental (performance) Sub-Index (EnvPI), the Environmental Management Sub-Index (EnvPMI), the Environmental Compliance Sub-Index (EnvPCI), and the Environmental Systems and Technology Improvement Sub-Index (EnvPSTI). Each sub-index identifies detailed objectives to be achieved by 2015 and specific 2004 targets to achieve those long-term objectives. This report focuses primarily on the performance against specific targets and objectives in the EnvPI. During 2004, a similar index was developed for the WL site, consisting of an EnvPI and EnvPMI only. Future endeavours in the EnvP PI will include continued work on the development of WL EnvP-CI and EnvP-STI sub-indexes, a further refinement of the definitions of performance based on operational experience, and development of the indexes for other AECL sites.

2.3.3 2004 Environmental Protection Program Initiatives

Various environmental improvement initiatives were completed in 2004, which support AECL's commitment to continual improvement in environmental performance:

- Ecological Effects Review (EER) for the CRL site[1]. See Section 2.3.5.3 for more detail;
- Fencing of the most significantly contaminated swamps and streams adjacent to CRL Waste Management Areas to prevent large game animal access;
- NRU ALARA study report on argon-41 emissions, detailing the possible causes and opportunities to reduce the emissions;
- Compilation of a CRL site-wide inventory of mercury and mercury products (which led to 628 kg of unused mercury-containing wastes being disposed of); and
- Successful registration of the CRL site to the "ISO-14001:1996" standard for Environmental Management Systems (EMS).
- A total of 23 Environmental Protection Program training sessions were delivered in 2004 to a wide cross-section of AECL employees at CRL, SP, and WL.
- The preliminary decommissioning plan was completed for all listed facilities at CRL, and the CRL site.

[1] The final report detailing an Ecological Effects Review (EER), which quantified the potential ecological effects of operations and activities at CRL, was completed in 2004 and issued in 2005 January.

2.3.4 Environmental Aspects

During 2004, as part of the continuing implementation and improvement of the Environmental Management System (EMS), and with the intent of maintaining ISO-14001 registration for the CRL site[2], AECL continued to actively monitor and evaluate the significance of environmental aspects associated with its facilities and activities, and identify and document the operational controls of identified Significant Environmental Aspects (SEA).

AECL completed the initial identification and significance evaluation of environmental aspects associated with all operations and activities of facilities and activity groups at the CRL site in 2003. However, taking into consideration the requirement for annual review of the environmental aspect assessments, the over-all status of environmental aspect assessment by the end of 2004 was 92% up-to-date. At the end of 2004, 95% of operational control information for SEA was collected and documented.

Initial environmental aspects identification for AECL activities taking place at the WL site, and an assessment of their significance was completed in 2004. Collection of operational control information for WL SEAs was started. The assessment of environmental aspects for the SP site was ongoing as of 2004 December.

2.3.5 Environmental Performance & Compliance Assessments and Reviews

2.3.5.1 Audits

The audits and assessments conducted in 2004 revealed that AECL is maintaining its environmental performance in compliance with applicable legal and other requirements, and taking positive steps in ensuring that all AECL sites are headed for the successful implementation of a revised Environmental Management System. The external audit of the EnvP Program for the CRL site in April 2004 resulted in a successful registration of the CRL site to the ISO-14001:1996 EMS standard. Progress made on actions resulting from audits and assessments conducted in previous years shows improvements in the process of identifying environmental objectives and targets and developing environmental plans, internal communications, environmental awareness training, and assessments of environmental impacts as a result of AECL activities.

2.3.5.2 Environmental Assessments

AECL continued to carry out environmental assessments and reviews of proposed new or modified facilities and activities. AECL performed Environmental Assessments for projects to be carried out at AECL operating sites in Canada. The following Environmental Assessments

[2] Registration of the CRL site to the ISO-14001:1996 Standard for Environmental Management Systems was achieved in 2004 May.

were undertaken:

1. To meet requirements of the Canadian Environmental Assessment Act (CEAA);
2. To secure regulatory approval for the projects; and,
3. For compliance with the AECL policy on protection of the environment.

The Environmental Assessments under CEAA are invoked through regulatory approvals required for projects to proceed. CNSC Staff determine regulatory approval and environmental assessment (EA) requirements. In 2004, Environmental Assessment Screenings for ten projects at CRL sites were in various stages of the EA process. A brief overview of the status of these Environmental Assessments follows.

DECOMMISSIONING OF SHUTDOWN FACILITIES (Six Projects)

Environmental Assessment Screening for the Decommissioning of the Heavy Water Upgrading Plant: The revised technical study report addressing CNSC and Federal Department Comments was issued to the CNSC in November 2004. An Environmental Assessment Decision is expected in 2005.

Environmental Assessment Screening for the Decommissioning of the Building 204A/B Fuel Storage Bays: CNSC issued comments on the draft EA Study Report in January 2004. Meetings were held with CNSC and Federal Reviewers to address additional information requirements. The finalized EA Study Report will be issued to the CNSC early in 2005 with an EA Decision expected in 2005.

Environmental Assessment Screenings for the Decommissioning of Pool Test Reactor, Buildings 220, 223 and 228: The CNSC staff issued draft EA Guidelines for these projects in September 2004. Preparation of the Environmental Assessment Study Report for the Pool Test Reactor is underway.

WASTE REMEDIATION/MANAGEMENT INITIATIVES (Three projects)

Environmental Assessment Screening for the Proposed Construction and Operation of a Liquid Waste Storage System by Atomic Energy of Canada at Chalk River Laboratories: The project will provide a new Storage System designed and constructed to modern standards for liquid wastes currently held in 21 storage tanks on the CRL site. The Environmental Study Report was issued to the CNSC and Federal Departments for review in September 2004. An Environmental Assessment decision is expected in 2005.

Letters of notification and project descriptions for determination of regulatory approvals and Environmental Assessment Requirements were submitted to the CNSC for the Fuel Package and Storage Project and Shielded Modular Above Ground Storage Project (S-MAGS).

The Fuel Package and Storage Project will stabilize older metal fuels currently stored in tile holes and provide a new Storage System for the fuels. The new Storage System will be a part of WMA 'B'. The ***Shielded Modular Above Ground Storage Project*** will provide storage for low level wastes currently stored in underground concrete bunkers in Waste Management Area 'B'. The Shielded Modular Above Grounds Storage Units will be constructed in WMA 'H' and replace the current Modular Above Ground Storage System.

RESEARCH AND OPERATIONS FACILITIES (One Project)

Environmental Assessment Screening Report for the Continued Operation of the NRU Reactor: CNSC staff determined that pursuant to Section 18 of CEAA an Environmental Assessment was required for continued operation of NRU. AECL has submitted supporting reports and information for the preparation of the EA Screening Report to the CNSC. CNSC staff will prepare the Environmental Assessment Screening Report.

2.3.5.3 Ecological Effects Review

The final report detailing an Ecological Effects Review (EER) of the CRL site, which quantified the potential ecological effects of all present and past CRL activities and operations, was completed in 2004 and issued in 2005 January. The EER was conducted based upon available ecological risk assessment guidance from the Canadian Council of Ministers of the Environment (CCME 1996) and the U.S. Environmental Protection Agency (EPA 1998).

The EER report outlined a total of ten recommendations, all of which were included in the 2005-2006 Environmental Plan. Eight of the ten recommendations were started in 2004, and as a result, various activities were initiated:

- An aquatic regional baseline study to confirm the presence of Valued Ecosystem Components (VECs) and identify site-specific transfer parameters for potential contaminants;
- A regional baseline study of concentrations of non-radiological and radiological contaminants of potential environmental concern in surface waters, sediments and biota for areas surrounding the CRL site;
- An Ottawa River sediment study to establish baseline data on various metals and radionuclides in the riverbed near CRL;
- A study to document the importance of road kill to herptofauna during critical periods of the year;
- A study to quantify the cumulative fish impingement into the NRU and MAPLE intake wells, in terms of species composition, abundance, size distributions and gender ratios; and

- The completion of fencing around contaminated swamps and streams adjacent to the CRL WMAs to prevent large game animal access.

The implementation of the recommendations complements the current CRL monitoring programs and will serve to guide, as appropriate, a review of the programs.

3. ENVIRONMENTAL PERFORMANCE

As described in Section 2, performance of the Environmental Protection Program is evaluated and measured against key targets. Specific targets for AECL sites for 2004 were specified in the Environmental (performance) Sub-Index (EnvPI). Wherever possible and where applicable, the performance against these targets for the 2004 calendar year has been included in this report.

3.1 Emissions to the Environment

AECL's Environmental Policy states that the Company will set objectives and targets to support continual improvement of our environmental performance. To this end, and as a condition of the site operating licenses, emissions to the environment are continuously monitored and controlled.

3.1.1 Emissions of Radioactive Substances

3.1.1.1 General

In 2004 as in previous years, radioactive emissions from AECL sites and facilities have been regulated by the Canadian Nuclear Safety Commission (CNSC), through site-specific Derived Release Limits (DRLs), that are the legal upper bounds for releases to the environment. The DRLs are calculated using environmental pathway modelling, and are set such that a continuous release of any radionuclide at a rate less than the DRL would result in exposures less than the public dose limit, 1 mSv in a year[3].

Derived Release Limits for Douglas Point were accepted by the CNSC. AECL also submitted action levels for the off-site facilities to the CNSC and they were accepted on an interim basis. The review of interim end-state reports and storage with surveillance plans for G-1 and NPD by the CNSC continued.

To ensure compliance with regulatory and AECL Environmental Protection Program Requirements, both airborne and liquid effluents from AECL sites and facilities that potentially contain radioactive contaminants are monitored. During 2004, there were no radioactive emissions from AECL sites or facilities in excess of regulatory limits.

[3] The public dose limit of 1 mSv in a year came into effect in 2000 with the new Nuclear Safety and Control Act. The earlier public dose limit was 5 mSv in a year.

3.1.1.2 Airborne Emissions

Table 1 summarizes radioactive emissions in airborne effluents from the CRL, WL and NPD sites during 2004, along with values for the five previous years for comparison. The releases are given as the sum of emissions from all sources and all radionuclides for each site, and are expressed as a percentage of the DRLs in effect during 2004. Radioactive emissions from other AECL sites were negligible in 2004. The 2004 target for the CRL and WL sites described in the Environmental Protection Program Index (EnvPPI), specifically the Environmental (Performance) Index (EnvPI) for radioactive emissions to air under normal operating conditions, was 12.6 %DRL for CRL and 0.010 %DRL for WL.

Table 1: Radioactive Airborne Emissions From AECL Sites 1999 to 2004

SITE	Total Airborne Emissions as % DRL						
	1999	2000	2001	2002	2003	5-yr average	2004
CRL*	14.8	13.8	9.5	14.9	10.3	12.7	13.3
WL**	0.00094	0.00083	0.0021	0.0021	0.0016	0.0015	0.00072
NPD***	0.0037	0.00008	0.0020	0.0014	0.0029	0.0020	0.0017

Notes: * The DRLs used for CRL are those in effect as of 2000 November 01.
** The DRLs used for WL are those in effect as of 2002 January 01. All values for WL were corrected for an error in release factor.
*** The DRLs in use at NPD from 1999 to 2003 were based on the old public dose limit of 5 mSv/a. The DRLs accepted by the CNSC in 2003 were implemented in 2004.

In 2004, the CRL site continued to account for the majority of airborne radioactive effluents from AECL. All emissions of radioactive material in CRL airborne effluents during 2004 were below regulatory limits as expressed by the DRLs, and below the regulatory Action Levels. The sum of the average airborne weekly releases of all radionuclides from all monitored sources was 13.3% of the DRL. This was an increase compared with 2003, and the average for the past five years but lower than the value registered in 2002, 14.8% of the DRL. The increase was mainly due to increased Argon-41 emissions from the NRU reactor facility. Figure 1 illustrates the releases of radionuclides in airborne effluents from CRL for 2004 and the past five years.

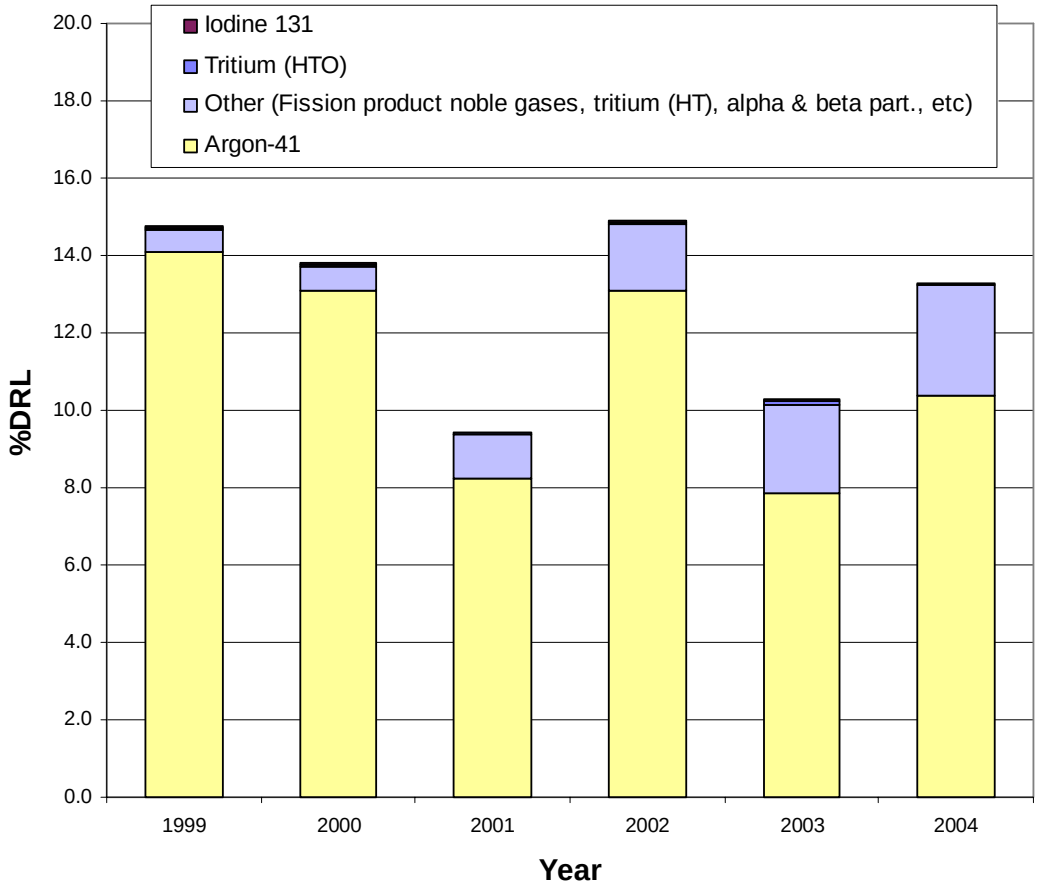
Emissions of argon-41[4] from the NRU/DIF stack continued to be the most significant radioactive releases from the CRL site, averaging 10.4% of the DRL compared to an average for the previous five years of 11.3% of the DRL.

Argon-41 is produced by irradiation of air within the reactor structure. The 2003-2005

[4] Argon-41 is a relatively short-lived (half life 1.8 h) noble gas produced by irradiation of natural argon in air within the NRU reactor structure, for example, in the graphite thermal column, experimental beam holes and J-rod annulus.

Environmental Plan target to complete an ALARA study of Ar-41 emissions was completed in 2004 and introduced several options to reduce argon-41 emissions; the options identified all involve significant design modifications and cost. The study also demonstrated that some of the current systems to maintain argon-41 emissions to a minimum (e.g. the CO2 system that is used to exclude air from the J-rod annulus immediately surrounding the reactor core, which was upgraded in the 1990s) are operating effectively. The options identified in the ALARA study will be further reviewed during NRU life extension evaluations.

Releases of mixed fission product noble gases from the molybdenum-99 medical isotope production process increased by a small amount, averaging 2.64% of the DRL; in 2003 the value was 2.30% of the DRL. The small increase is likely attributed to a variety of factors including quantity and timing of isotope requirements over certain periods of the year. The requirement to solidify (cement) high-level radioactive wastes from the process, since the Fissile Solution Storage Tank, which normally receives these wastes was near its approved maximum capacity, continued throughout 2004. Releases of other monitored nuclides or parameters remained comparable with the past four to five years' levels.



NOTE: The DRL for cesium-137 has been used for calculation of gross beta particulate releases as of 2000. Data for past years have been adjusted.

Figure 1: Radionuclides in CRL Airborne Effluents (1999-2004)

The Whiteshell Laboratories routine Effluent and Environmental Monitoring programs were maintained in 2004. Total radioactive airborne emissions from the WL site during 2004 averaged 0.00072 % of the applicable Derived Release Limits (DRLs). This is below the previous 5-year average value of 0.0015%. The highest release of individual nuclides was tritium from the reactor building (B100), averaging 0.00002% of the DRL. There were no individual releases of significance.

3.1.1.3 Liquid Emissions

Table 2 summarizes radioactive emissions in liquid effluents from the CRL, WL, NPD and Douglas Point (DP) sites during 2004, along with values for the five previous years for comparison. The releases are given as the sum of emissions from all sources and all radionuclides for each site, and are expressed as a percentage of the DRLs in effect during 2004. Radioactive emissions from other AECL sites were negligible in 2004. These releases are also

illustrated in Figure 2. The target for the CRL and WL sites described in the EnvPI, for the 'emissions to water' under normal operating conditions, was 0.20% of the DRL and 0.025% of the DRL, respectively.

Table 2: Radioactive Liquid Emissions From AECL Sites 1999 to 2004

SITE	Total Liquid Site Emissions as % DRL						
	1999	**2000**	**2001**	**2002**	**2003**	**5-year average**	**2004**
CRL*	0.45	0.16	0.22	0.21	0.19	0.25	0.26
WL**	0.018	0.022	0.012	0.012	0.013	0.015	0.016
NPD***	0.050	0.01	0.06	0.024	0.020	0.033	0.002
DP****	0	0	0.01	0.015	0.015	0.008	0.0012

Notes: * The DRLs used for CRL are those in effect as of 2000 November 01. Data do not include releases of groundwater from CRL Controlled Area 2.
** The DRLs used for WL are those in effect as of 2002 January 01.
*** The DRLs currently in use for NPD are based on the old public dose limit of 5 mSv/a. New DRLs were approved by the CNSC in 2003 and implemented in 2004.
**** DRL values used for Douglas Pt are old DRLs in effect while the reactor was operating, and based on the old public dose limit of 5 mSv/a. New DRLs were approved in 2004 September.

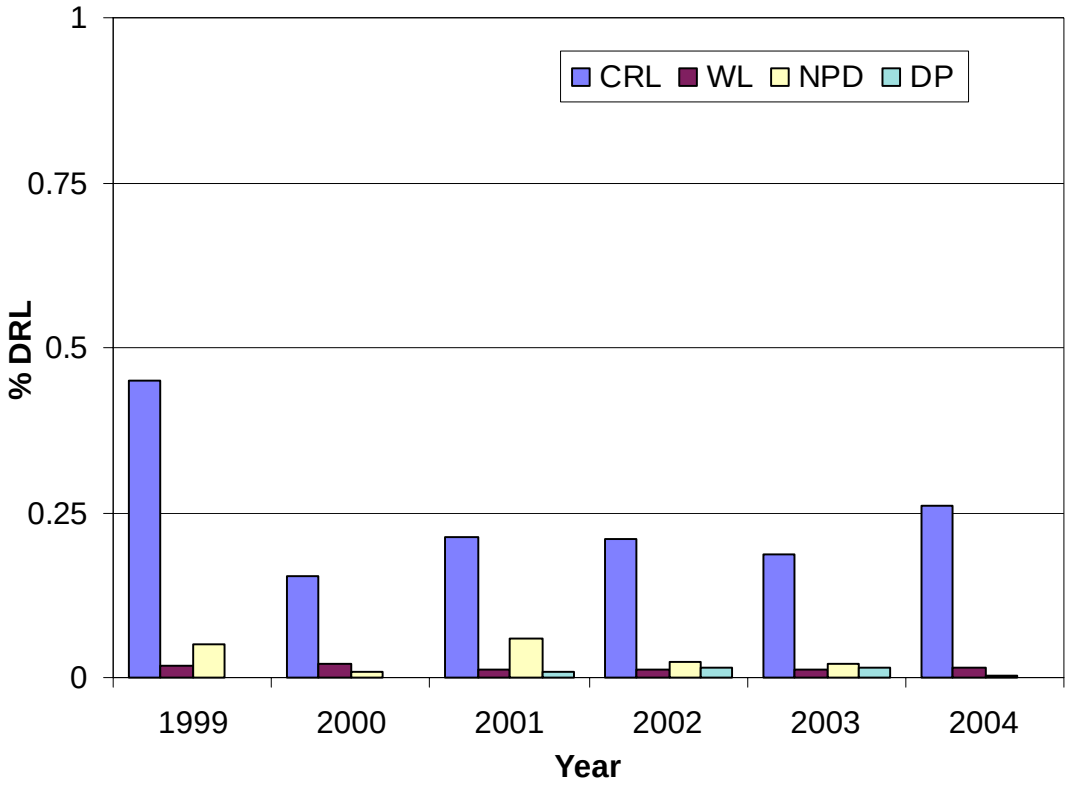


Figure 2: Radioactive Liquid Releases From AECL Sites (1999 - 2004)

In 2004, the CRL site continued to account for the majority of liquid radioactive effluents from AECL sites. A more detailed breakdown of CRL liquid effluent emissions for the current and past five years is illustrated in Figure 3.

All radioactive liquid effluent emissions from CRL in 2004 were small fractions of the respective DRLs for each parameter monitored. Average monthly releases totalled 0.26% of the DRL, a value slightly higher than in 2003, 0.19% of the DRL, but comparable to the past five years' average, 0.25% of the DRL. The CRL Process Sewer that discharges decontaminated wastewater from the Waste Treatment Centre and some process cooling and sump waters to the Ottawa River was the major source. The releases averaged 0.22% of the DRL. In earlier years, cesium-137 has been the most significant nuclide in the Process Sewer, but in 2004, phosphorus-32 was the most significant nuclide, averaging 0.11% of the DRL, with cesium-137 averaging 0.08% of the DRL. Phosphorus-32 and other short-lived activation products, including arsenic-76 and sodium-24 were detected during the period between June and September and are attributed to once-through cooling of defueled NRU experimental loop test sections with Ottawa River water resulting in activation of the cooling water during passage through the in-reactor segment of the loop. In 2004, releases of arsenic-76 and sodium-24 averaged 0.001% and 0.006% of the DRL, respectively. Tritium releases from the Process Sewer averaged 0.003% of

the DRL, a decrease compared to 2003 and comparable to the average for the previous five years.

Releases from CRL liquid effluent streams discharging directly to Ottawa River, other than the Process Sewer, averaged 0.01% of the DRL, a value consistent with that in previous years.

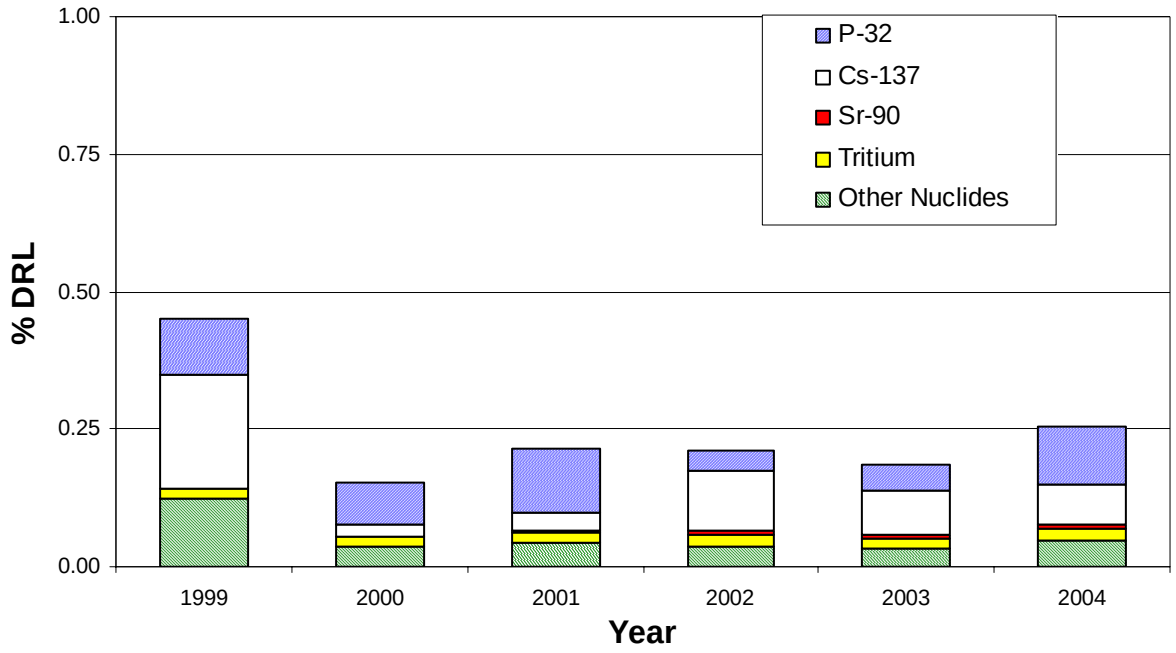


Figure 3: Summary of Radionuclides in CRL Liquid Effluents (1999 – 2004)

Monitoring of potential liquid effluent exposure pathways confirmed small but measurable contributions from WL operations of some radionuclides (cesium-137 and strontium-90) to downstream concentrations of radionuclides in Winnipeg River water, fish and sediments. This is consistent with effluent monitoring results. Radioactive contaminants in Winnipeg River water remained very small fractions of allowable levels defined in the Canadian Drinking Water Standard. The 2004 environmental monitoring results were generally comparable with the results for 2003 and earlier years. These results and effluent monitoring results at the release points supported the dispersion pathway models on which the Derived Release Limits (DRL) are based. The sum of the average monthly releases of all monitored parameters was about 0.016% of the DRL. Cesium-137 was the most abundant isotope emitted from the outfall, averaging 0.012% of the DRL, whereas strontium-90 was the most abundant isotope in the sewage lagoon discharge waters, averaging 0.00009% of the DRL.

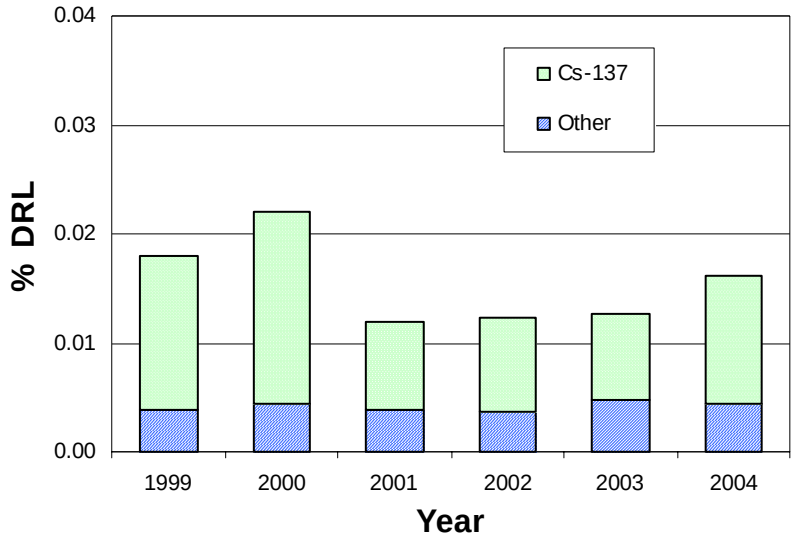


Figure 4: Summary of Radionuclides in WL Liquid Effluents (1999 – 2004)

3.1.1.4 Monitoring of Radioactivity in the Environment

In addition to monitoring of effluents released from the sites, AECL continued to maintain extensive programs to monitor radioactivity in the environment at and around the major licensed sites, CRL and WL, to verify effluent monitoring results. Monitoring included, for example, measurement of ambient gamma radiation, as well as sampling and analysis of drinking water, air, milk, fish, garden produce, and beach/river sediments. The results of the environmental monitoring continued to confirm that radiation doses resulting from AECL operations were below the regulatory dose limit for members of the public, 1 mSv per year, and below the typical background dose from natural radiation in Canada (see Table 3).

At CRL, the highest dose to the public (0.070 mSv) continued to be due to external exposure to radioactive noble gases (mainly argon-41) from the NRU reactor operations, and the second highest from consumption of meat of game animals that have had access to water and vegetation in swamps and streams adjacent to the CRL Waste Management Areas (WMAs) (0.041 mSv). In 2004, the calculated maximum dose from game animal meat ingestion increased rather significantly, mainly because of tritium contamination in three animals found close to the WMAs. Also, elevated levels of strontium were found in bone of one older animal; however, bone is not usually used for human consumption. All of these contributions stem from historical factors rather than the current practices, i.e. old reactor design and past waste management practices at the WMAs. Steps continued to be taken to reduce the production of argon-41 to the extent possible in spite of the reactor design (NRU ALARA study). In addition, those areas of the swamps and streams that can give raise to concentrations of man-made radionuclides in game animals have now been fenced thus preventing further access by large animals (e.g. deer and moose).

Table 3: Total Estimated Doses to Critical Groups at CRL and WL Based on Environmental Monitoring – 1999 - 2004

Site	CRL		WL*	
Effluent Pathways	Airborne	Liquid	Airborne*	Liquid
Critical Group	Infant living at Upriver Boundary	Adult living Downstream	Infant living at Boundary	Adult living Downstream
2004 Total Effective Dose (mSv/a):	0.075	0.045	0.000007	0.00037
– as % of annual public dose limit, 1 mSv	7.5	4.5	0.00072	0.037
– as % of typical average background radiation dose in Canada	2.4	1.4	0.00022	0.012
2003 Total Effective Dose (mSv/a)	0.098	0.021	0.000009	0.00078
2002 Total Effective Dose (mSv/a)	0.100	0.033	0.000008	0.00061
2001 Total Effective Dose (mSv/a)	0.073	0.100	0.000020	0.00096
2000 Total Effective Dose (mSv/a)	0.101	0.054	0.000008	0.00083
1999 Total Effective Dose (mSv/a)	0.138	0.048	0.000009	0.00038

- DRLs for the WL site were revised in March 2001 and approved for use in 2002 January. The revised document (RC-2303) states that the critical group for airborne DRLs consists of adults and infants at the boundary and, as such, data in this table have been revised to reflect the new values. (The DRLs used for CRL are those in effect as of 2000 November 01).
- *Data corrected for error in release factor (See Section 3.1.1.2).

3.1.2 Emissions of Non-Radioactive Substances

3.1.2.1 Airborne Emissions

3.1.2.1.1 Acid Gas Emissions

The main non-radioactive airborne emissions from stationary sources at AECL sites are combustion products that result from the burning of fuel oil to produce steam and hot water for heating and process uses at CRL and WL. Additionally, some emissions of nitrogen (NOx) are emitted from the use of propane for heating at CRL in some of the remote locations on the CRL site. Total estimated emissions of NO_x and sulphur oxides (SO_x) for these research sites are given in Table 4 and compared to previous years' emissions. The estimated emissions for the past five years are also illustrated in Figure 5.

The NO_x emissions for CRL for 2000 through 2004 shown in Table 4 are based on emission factors determined through direct measurements of stack emissions following installation of new boilers in the CRL Power House. The NO_x emissions for WL and for previous years at CRL were estimated using the US-EPA [5] emission factors for the particular type of fuel and boiler design.

[5] US Environmental Protection Agency, *Compilation of Air Pollutant Emission Factors, Vol 1: Stationary Point and Area Sources,* AP-42, 5th Edition (1996).

The SO_x emission estimates in Table 4 for both CRL and WL are calculated using the US-EPA emission factors based on the sulphur content of the fuel.

Table 4: Acid Gas Emissions from CRL and WL Site Heating Boilers

Site	Emission	Total Annual Emissions (tonnes)						
		1999	2000	2001	2002	2003	5-year average	2004
CRL	NO_x*	56	57	51	56	56	55	59
	SO_x**	408	389	348	250	246	328	260
	CO	-	-	-	6.15	6.33	-	6.61
	TPM	-	-	-	18.48	18.32	-	19.60
	PM_{10}	-	-	-	15.96	15.83	-	16.93
	$PM_{2.5}$	-	-	-	10.37	10.26	-	11.00
	VOC	-	-	-	0.37	0.40[1]	-	0.40
	HDD	4405	4745	4313	4601	4890	4591	4864
WL	NO_x[2]	9.9	11.1	10.0	10.6	10.4	10.4	10.6
	SO_x***	2.9	3.3	2.9	3.1	3.1	3.1	3.1
	CO	2.1	2.3	2.1	2.2	2.2	2.2	2.2
	TPM	-	-	-	0.88	0.87	-	0.88
	PM_{10}	-	-	-	0.44	0.43	-	0.44
	$PM_{2.5}$	-	-	-	0.11	0.11	-	0.11
	VOC	-	-	-	0.09	0.09	-	0.09
	HDD	5118.2	5611.6	5311.5	5750.0	5369.6	5432.2	6215.9

Note: * With the installation of the new boilers, starting in CY 2000, emissions of NO_x for CRL are based on emission factors calculated from stack measurements on each boiler. All other releases are estimated using the US-EPA emission factors given in AP-42.

** SO_x estimates based on sulphur content specification of <2%. In 2002, the actual content of sulphur in the fuel was measured to be 1.34%; in 2003, it was 1.32%; and in 2004 it was 1.30%. The 2002, 2003 and 2004 estimates are based on the measured sulphur content.

*** Estimates of SO_x emissions are based on the specified maximum sulphur content in the #2 fuel of 0.05% by wt.

[1] Value corrected from 2003 report

[2] NOx values for WL were recalculated in 2004 using a new emission factor for #2 Fuel Oil (changed from 20 to 24 lb/1000 US gal)

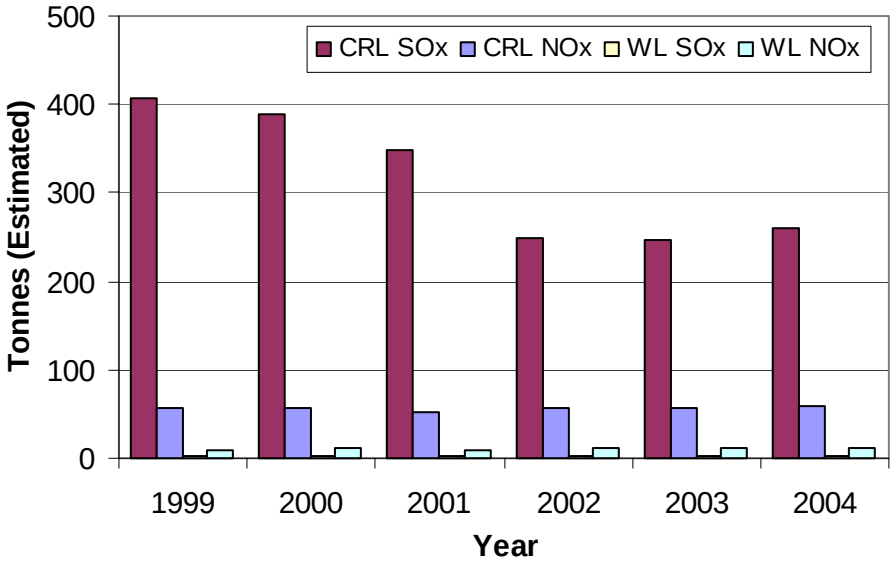


Figure 5: Acid Gas Emissions for CRL and WL (1999 – 2004)

The use of the US EPA emission factors for estimating emissions commenced with the 2001 Annual Environmental Performance Report. As a result, the estimates for previous years in Table 4 were revised at that time using the same method for consistency. The target for CRL and WL sites specified in the 2004 EnvPI, for the emissions of NOx and SOx under normal operating conditions, was 425 tonnes and 11.5 tonnes, respectively. The emissions of NOx and SOx for CRL and WL sites were 319 tonnes and 13.7 tonnes, respectively, namely less than the past 5-year average, with the CRL site below the 2004 target.

Commencing in 2002, under the National Pollutants Release Inventory (NPRI) program, Criteria Air Contaminants (CACs) arising from the burning of fuels are to be reported to Environment Canada, provided the emissions exceed specific threshold limits. CACs consist of Carbon Monoxide (CO), oxides of sulphur and nitrogen (SO_x and NO_x), Total Particulate Matter (TPM), Particulate Matter below 10 microns (PM_{10}), Particulate Matter below 2.5 microns ($PM_{2.5}$), and Volatile Organic Compounds (VOCs). The amounts are calculated from fuel consumption data using recommended emission factors. Data for CAC emissions are included in Table 4.

3.1.2.1.2 Greenhouse Gas Emissions

Operation of the industrial heating boilers at CRL and WL also represents the major source of CO_2 emissions from AECL sites. Estimates of CO_2 emissions from these boilers in 2004 and the five previous years are shown in Table 5, and are illustrated in Figure 6. For both sites, emissions were estimated using the US-EPA emission factors (see previous section). The target for CO_2 emissions specified in the 2004 EnvPI for the CRL and WL sites was 31,000 tonnes and 9,600 tonnes, respectively. The CO_2 emissions for the CRL and WL sites were 32,790 tonnes and 9,840 tonnes, respectively. The actual emissions were only slightly above the 5-year

averages and 2004 targets due to colder winters in 2003 and 2004.

Table 5: Estimated Greenhouse Gas Emissions* from CRL and WL Site Heating Boilers

Site	Emission	Total Annual Emissions (tonnes)						
		1999	2000	2001	2002	2003	5-year average	2004
CRL	CO_2	32,600	31,100	27,800	30,300	31,200	31,700	32,790
WL[1]	CO_2	9,200	10,270	9,310	9,850	9,680	9,660	9,840

Note: * Emissions were estimated using the US-EPA AP-42 emission factor of 70.3 kg/GJ for #6 fuel oil, 35.2 kg/GJ for propane, and 69.1 kg/GJ for #2 fuel oil.
[1] Value corrected from 2003 report

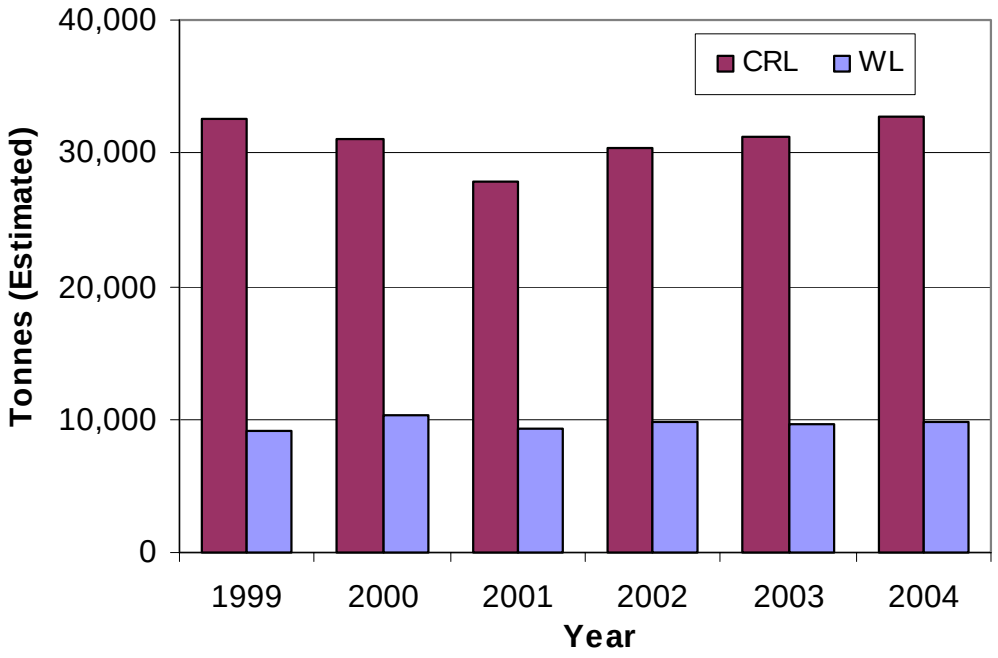


Figure 6: Greenhouse Gas Emissions (1999 - 2004)

Emissions of halocarbons due to losses from various systems at AECL sites are given in Table 6. The relative global warming potentials and ozone depleting potentials of these substances and the calculated CO_2 equivalents are also shown in Table 6. Data for CRL from the previous five years, as well as the current year, are included in Table 6.

There have been no emissions of Halons in the past five years; however, Halons are still being used in some fire suppression systems on site due to a lack of available alternatives. The CFC emission reported in 2004 was due to a small leak in an aging piece of equipment that has now been converted to an HCFC refrigerant (R-22). HFC (R-134a) emissions are heavily influenced

by the refilling requirements of the thermohydraulics loop, which has an inventory that can vary between 4,500 and 6,000 kg depending on the piping configuration. The loop is typically refilled in approximately 800 kg increments, and due to the requirement to refill twice in 1999, 2002, and 2004; emissions of R-134a appear to be much higher in those years. It should be noted that R-134a has no Ozone Depleting Potential and a relatively low Global Warming Potential when compared to other halocarbons used on site.

Table 6: Emissions of Halocarbons from AECL Sites (kg)

Type	Global Warming Potential*	Ozone Depleting Potential**	CRL						Other Sites
			1999	2000	2001	2002	2003	2004	2004
Halons (1301)	5600	10	-	0	0	0	0	0	0
CFC (R-11, R-12)	(R 11: 4000) (R 12: 8500)	1	7	0	0	0	0	18.14 (R-12)	0
HCFC (R-22)	1700	0.055	196	236	49	115.5	114.3	258.31	42.9
HFC (R-134a)	1300	0	1,800	475	75	1,500	200	1652.6	0.23
CO_2 e (tonnes)			2,733	1,019	181	2,146	454	2,742	73

Notes: * Global warming potential (GWP) per unit mass relative to CO_2 = 1
** Ozone depleting potential (ODP) per unit mass relative to CFC-11 = 1

3.1.2.2 Liquid Effluents

Liquid effluents from AECL sites are monitored for non-radioactive contaminants in order to measure conformance with AECL's internal guidelines for chemical substances in liquid effluents, or with directly applicable limits or guidelines established by regulatory authorities. The AECL guidelines are comparable with Environment Canada effluent guidelines for federal facilities and various other federal and provincial effluent guidelines.

The non-radiological effluent-monitoring program originally set up voluntarily by AECL, based on the Ontario Ministry of the Environment's Municipal Industrial Strategy for Abatement (MISA) program, became a CNSC regulatory requirement as of 2000. This program continues to supply valuable information on the non-radiological environmental impacts of CRL's operations to the Ottawa River and the local environment. The two effluent streams, the Power House Drain and the Sanitary Sewer, are the main contributors to estimated loadings. The target in the 2004 EnvPI for the number of exceedances of the guidelines for the CRL and WL sites was 20 and 36, respectively. The total number of exceedances at CRL and WL, for all monitored criteria and streams, compared to the applicable annual target for the current year, is summarized in Table 7.

Table 7: Exceedances of Monthly Guidelines for Non-Radiological Liquid Effluents

Site		Exceedances of Monthly Guidelines					
		1999	**2000**	**2001**	**2002**	**2003**	**2004**
CRL	Number (annual target)	45 (--)	40 (--)	44 (--)	42 (--)	23* (42)	21 (20)
WL	Number (annual target)	207 (--)	134 (180)	107 (144)	70 (108)	44 (72)	26 (36)

*Value for 2003 for the CRL site revised.

3.1.2.2.1 CRL site

The Sanitary Sewer or Sewage Treatment Plant (STP) at CRL collects domestic wastewater from over 80 buildings on site. It also receives small amounts of low-toxic, soluble and biodegradable chemicals from a number of laboratories. The STP effluent is the stream with the most comprehensive monitoring schedule of all the streams monitored on site. Emissions periodically exceed AECL internal guidelines for some parameters. In 2004, the STP effluents exceeded the monthly guideline five times for total suspended solids (TSS). Although there has been deterioration in performance for TSS at the STP in 2004, the overall results remain below the 5-year average. Data for TSS at CRL are found in Figure 7.

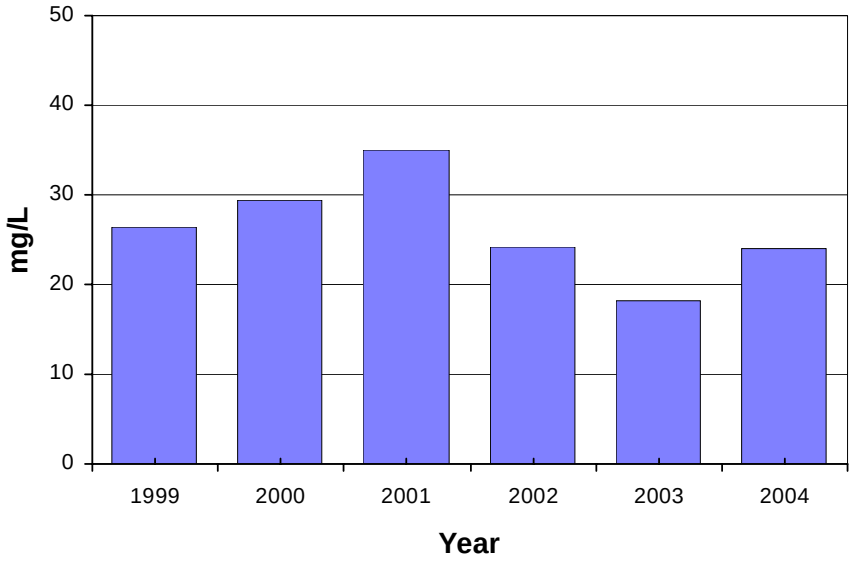


Figure 7: Yearly Average Concentration of Suspended Solids in CRL Sanitary Sewer

Waste Treatment Centre (WTC) effluents periodically exceeded AECL daily guidelines for mercury in 2004 and the guideline for pH was exceeded every month. Although mercury exceeded the AECL guideline at the WTC in 2004 occasionally, the concentrations and overall mercury loading decreased in 2004 compared to the previous four years. Additionally, steps are being taken to further reduce levels to consistently meet guidelines and studies are underway to better characterize the background levels of all metals in the Ottawa River.

The WTC has also evaluated the overall impact that on-line pH adjustment would have on the current treatment system processes and has found it to be unacceptable. Examination of historical data from both the WTC and the Process Sewer support that no impact on overall effluent pH is currently occurring as a result of pH exceedances at the WTC. However the WTC has secured funding for a new pH adjustment system to be installed in 2005-2006.

An Ecological Effects Review (EER) of the CRL site considering all streams was completed in 2004 and the report was finalized in 2005 January (see Section 2.3.5.3). Based on the EER's results, review of the significant parameters is being made to ensure effective monitoring of potential stress-causing non-radiological elements. Accordingly, this will allow the comparison of releases to benchmark levels and allow for an improved indication of the effectiveness of AECL's environmental program.

In 2004, a set of Control Levels (comparable to those used in the Radiological Monitoring Program) was developed based on historical data and accounting for data provided by the EER to further improve our ability to provide overview surveillance. Improved surveillance will then lead to formal investigation of cause(s) and result in Corrective Actions, if required. Plans for implementation of the new levels are being made in 2005.

3.1.2.2.2 WL Site

Measurements of non-radiological parameters in WL effluents were also conducted. The Lagoon and Outfall are the only significant sources of effluent that discharge to surface waters. Two site drainage ditches only contribute during heavy rainfall events. All emission guidelines were met by the Outfall. For the Lagoon, a single Biochemical Oxygen Demand measurement in spring was above the AECL guideline, but met Provincial requirements. Iron and Total Suspended Solids were above monthly guidelines for the fall discharge. The drainage ditch flowing west towards the Winnipeg River was also above monthly guidelines for iron during July, August and September.

Overall, 97.4% of the non-radiological measurements site-wide met the monthly guidelines. Inside the site boundaries, for liquids leaving the Active Liquid Waste Treatment Center to join the process sewer, 95.7% of monthly guidelines were met. This proportion has increased steadily from previous years.

Loadings of non-radiological parameters to the Winnipeg River were calculated for assessment, and trends were identified by comparing the year 2004 to the previous five. Overall, typical performance was noted, with some parameters (Total Suspended Solids, Mercury) lower, and

others (Biochemical Oxygen Demand, Phosphorus) higher than usual. Using analytical data for WL intake water, it was shown that a significant part of apparent total site loading to the environment comes from the Winnipeg River (and is returned).

The uranium concentrations in the holding-pond water remained below the discharge criteria. The mitigative efforts taken to address the elevated levels of Total Dissolved Solids (TDS) in the holding-pond water appear to be working, as there is a slight downward trend in TDS within the holding-pond water. Remediation plans to address the elevated levels of TDS in holding-pond discharges appear to be working. Overall, holding-pond releases of other non-radioactive parameters proceeded in accordance with the Federal-Provincial Review Committee (FPRC) release criteria. Off-site surface waters did not have enhanced uranium levels, in spite of the elevated levels of uranium in the holding-pond water discharges seen in some previous years. Most of the chemical parameters of the off-site surface waters were below the FPRC holding-pond water release criteria, with the exception of iron. This exception appears to relate to natural phenomena, and not to URL operations. In spite of the elevated levels of TDS in the holding pond, the off-site surface waters remain well below the regulatory limits.

3.1.2.2.3 SP Site

Periodic monitoring results of Sheridan Park sewer effluents by the Region of Peel during 2004 were consistently below the limits for the parameters for wastewater streams.

3.1.2.3 CRL Thermal Emissions

Figure 8 shows the temperature of the discharge of the Process Sewer on the CRL site. The temperature rise is primarily from the cooling of the 125-megawatt thermal NRU Reactor. Also discharging to this Process Sewer are streams from the NRX Reactor, the Heavy Water Upgrading Plant, the Waste Treatment Centre and the cooling water from the Dedicated Isotope Facility (DIF). A project was established in the 2003-2005 Environmental Plan to maintain thermal discharge monitoring. The Environmental Canada Federal Guideline states that limits on allowable discharge temperatures, the areas and temperature rise within mixing zones are decided on a case-by-case basis in consideration of site specific conditions. The Federal Guideline for cooling water discharges is that the temperature at the edge of the agreed-upon zone of influence in the receiving body of water should be no more that 1°C above ambient. The general requirement for cooling water discharge is that the thermal regime of the receiving body of water shall not be altered so as to impair the quality of the natural environment. In particular, the diversity, distribution and abundance of plant and animal life shall not be significantly changed. At CRL, efforts are currently underway to define the extent of the outfall and delineate the mixing zone. Estimates indicate that the zone with temperatures elevated by more than 1°C above ambient will be small. The mean effluent temperature rise between ambient river and Process Sewer discharge at CRL in 2004 is consistent with the 5-year average.

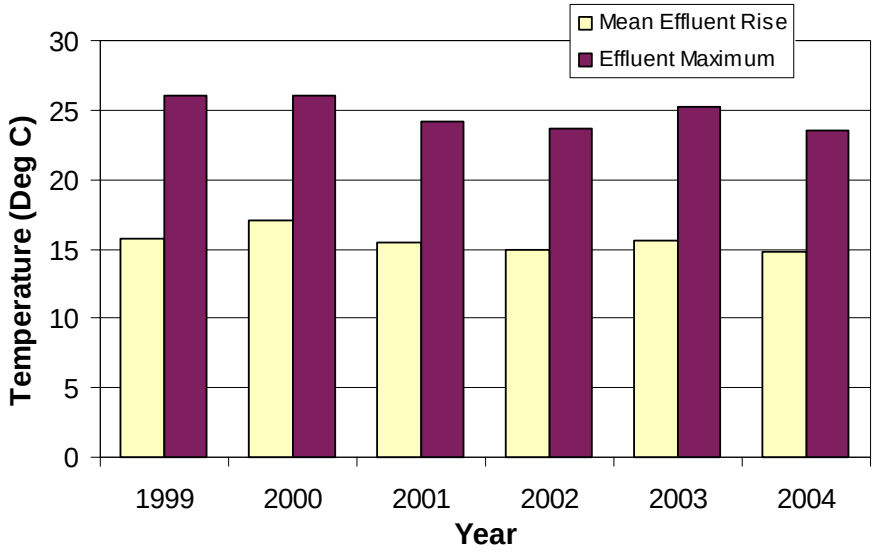


Figure 8: Temperature at the Process Sewer Discharge

3.2 Waste Generation and Management

It is AECL's practice to minimize waste generation, and to manage both radioactive and non-radioactive wastes in a safe and responsible manner, meeting the requirements of applicable environmental regulations and standards.

AECL generates a variety of radioactive and non-radioactive wastes in the course of operating, and in some cases decommissioning, its sites and facilities. In addition, AECL provides a service by accepting and managing radioactive wastes from numerous Canadian universities, medical institutions, and industries, as well as providing interim safe storage for wastes resulting from the remediation of some non-AECL sites historically contaminated with radioactive material. The principal regulatory requirements applicable to the generation and management of radioactive wastes are those of the Canadian Nuclear Safety and Control Act (NSCA) and its associated Regulations, and the regulatory policies of the CNSC. Radioactive waste management facilities on AECL sites are operated in accordance with licences issued by the CNSC.

3.2.1 Solid Radioactive Waste Generation and Management

AECL continued to manage all solid radioactive wastes generated at facilities on AECL sites, as well as wastes received from external generators by emplacing them in monitored storage facilities located on AECL sites. Wastes generated and received at AECL sites in 2004 were stored in the following types of facilities, as appropriate, based on the potential hazard they represent to people and the environment.

3.2.1.1 Radioactive Waste Generation - CRL

As shown in Table 8, activities at the CRL site continued to account for the largest volumes of radioactive waste generated and placed in storage within AECL sites in 2004. The CRL site houses the majority of AECL's waste management facilities and the largest inventory of stored radioactive wastes. In addition, the CRL site serves as the destination for much of the radioactive waste generated at other AECL sites, and the majority of wastes received by AECL from external organizations. Annual volumes of low-level radioactive wastes generated at CRL and stored in the CRL Waste Management Areas (WMAs) during the current and for each of the past five years are shown in Figure 9. This figure has been updated to include the waste placed in the low-level storage buildings (MAGS) beginning in 2002. In 2004, the ~635m^3 of stockpiled material consisted primarily of sand and gravel reused on site in various construction projects.

For comparative purposes, the total low-level solid waste generated through normal operations at AECL sites is included in Table 8. This total includes the waste stored in the Sand Trench, Low-Level Storage Buildings and in Bunkers, but does not include waste designated as Stockpile since this waste is re-used on the CRL site and the volume varies considerably from year to year. Waste diversion programs associated with the operation of the Waste Management Areas at CRL, designed to minimize the quantities of low-level solid waste, operated efficiently in 2004 and have achieved their maximum effectiveness in terms of waste reduction capability. Further reductions in the volume of low-level radioactive waste will likely require changes to processes and procedures on the part of the Generators of the waste at the CRL site.

Table 8: Volume of Solid Radioactive Wastes Produced and Handled by AECL

Waste Generator Site	*Type of Activity*	*Destination of Waste*	*Volumes to Destination Facilities (m^3)*					
			Sand Trench (CRL)	*Low Level Storage Buildings*	*Above Ground Stockpile (Soils, etc.)*	*Low Level Engineered Structures (Bunkers)*	*High Level Engineered Structures (Tile Hole, Canisters)*	*Total Low Level Waste (m3)*
NON-AECL WASTE – 2004								
Commercial	**Operation**	CRL	2.2	278.1	0	36.3	5.8	
Historic Sites	**Remed.**	LLRWMO*		0.014	351.5			
(LLRWMO)	**Remed.**	CRL		6.2		6.4		
AECL GENERATED WASTE – 2004								
AECL CRL	**Operation**	CRL	9.2	987.6	635.0	244.2	32.6	
	Construction	CRL						
	Decomm.	CRL						
AECL WL	**Operation**	WL	0	7.9	0	33.4	0.07	
	Decomm.	WL	0	7.9	0	33.4	0.22	
AECL G1	**Decomm.**	G-1						
AECL Doug Pt	**Decomm.**	DP						
AECL NPD	**Decomm.**	CRL						
AECL SP	**Operation**	CRL						
TOTAL ANNUAL AECL GENERATED WASTE								
Total AECL Waste - 2004**	**Operation**		9.2	995.5	635.0	277.6	32.7	1282
	Construction							
	Decommiss		0	7.9	0	33.4	0.22	
Total AECL Waste - 2003**	**Operation**		46.2	648.6	0	347.4	37.4	1042
	Construction				366			
	Decommiss		0	73.8		65.7	0.39	
Total AECL Waste – 2002**	**Operation**		135.1	73.9	2630.8	566.3	35.52	775
	Construction							
	Decommiss.							
Total AECL Waste – 2001**	**Operation**		237	5.0	993	471.6	22.9	714
	Construction		8.1		139	1.8		
	Decommiss.					28.5	0.5	
Total AECL Waste – 2000**	**Operation**		408.5	199	92.5	489.8	14.8	1097
	Construction							
	Decommiss.		12.9		0.5	43.7	0.39	
Total AECL Waste – 1999**	**Operation**		321	181.5		571.9	17.9	1134
	Construction				3663			
	Decommiss.		14.5			45.6	0.3	

Notes: * The LLRWMO maintains several licensed and unlicensed sites across Canada for interim storage of waste generated through clean up of historically contaminated (non-AECL) sites on behalf of Natural Resources Canada.
[a] The increase in the low level waste from the G1 Facility is due to the addition of material not included on the original waste inventory consisting of material dismantled during the initial decommissioning activity in the 1980's.
** Total, excluding waste received from organizations external to AECL, and historic wastes accepted for management by the LLRWMO.

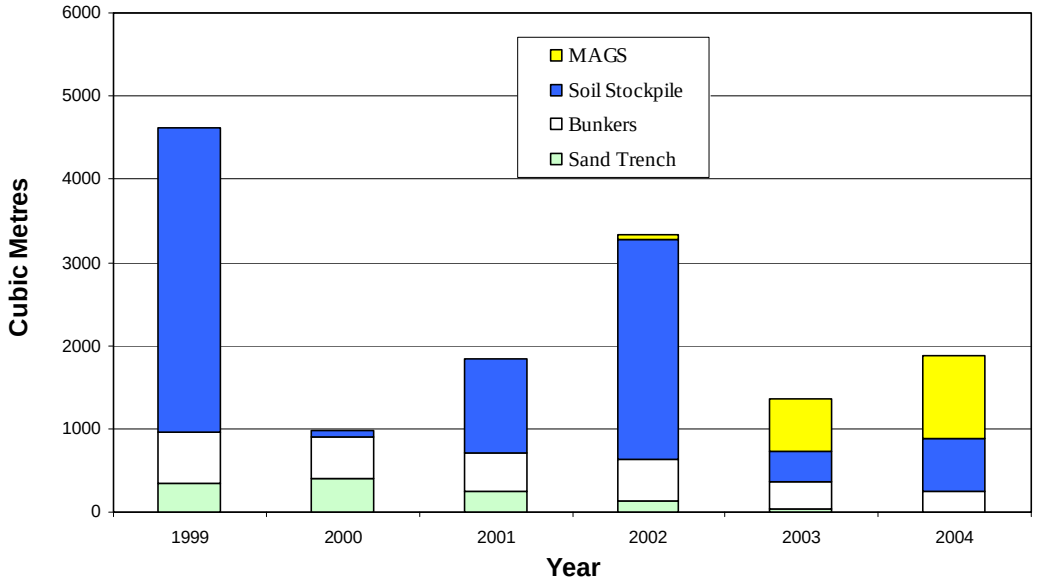


Figure 9: Total CRL Generated Low Level Waste Emplaced in CRL WMAs

3.2.1.2 Radioactive Waste Management - CRL

Very-low-level and low-hazard radioactive wastes were placed in sand trenches (at the CRL site only), in unshielded storage buildings, or in aboveground covered and monitored stockpiles. Biological low-level radioactive waste continued to be emplaced in sand trenches. CRL sewage sludge was no longer emplaced in sand trenches as of 2004 November. Currently, the sludge is de-watered and is stored in containers above ground in Waste Management Area "C".

Low-level radioactive wastes representing moderate hazard were stored in engineered containment structures, either above or below ground, typically having some limited radiation shielding. High-level, high-hazard wastes were stored in heavily radiation-shielded engineered containment structures either above or in-ground. In 2004 radiological surveys were conducted and conditions were found to be unchanged from previous field program surveys.

The construction of two Modular Above Ground Storage (MAGS) facilities, with the associated supercompacting facility, was completed allowing CRL to meet the 2003-2005 Environmental Plan project target dates. These facilities are used for storage of low-level solid radioactive wastes in aboveground buildings or structures, and will allow for a significant reduction in the amount of waste placed in the in-ground sand trenches currently in use at CRL for these types of wastes. The first storage building continued to receive waste and was filled in 2004. The second storage building began receiving waste in 2004 September. As is shown in Table 8 the volume of waste placed in sand trench storage at CRL decreased significantly in 2004 compared to the previous five years, and the operations of the new facilities will allow all new emplacements of low-level solid wastes in AECL waste storage facilities appropriately packaged and stored in

secure and weatherproof engineered structures.

A project identified in the 2003-2005 Environmental Plan called for undertaking stabilization of a select group of tile holes to enable future fuel retrieval for storage in stable, dry containment in designated waste storage areas. The Tile Hole Remediation Program, initiated in 1996 to identify and address issues related to the continued storage of this type of waste, continued to work towards developing a plan to achieve this target.

CRL Waste Management Operations staff continued to work with CRL facilities to improve the characterization, segregation and minimization of wastes being generated. Operation of a proactive waste-segregation program at CRL continued throughout 2004. The program employs segregation at source and thorough monitoring to divert wastes, which might otherwise be stored as "suspect" radioactive waste, to non-radioactive waste facilities or recycling. The waste-diversion program resulted in the diversion of about 3,166 m^3 of waste from radioactive waste storage (see Table 9), a significant increase over the previous year.

Table 9: Waste Diverted from Radioactive Waste Storage/Disposal at CRL (m^3)

Year	Waste Diverted to Landfill		Waste Diverted to Reuse or Recycle	
	On-Site	Off-Site (Municipal)	On-Site	Off-Site
2004	3,166	243	0	290
2003	2,006.5	0	0	180.2
2002	2,267	0	1	190.5
2001	2,701	0	8	227
2000	4,589	26.0	13.6	567.9
1999	-	-	-	-

3.2.2 Solid Radioactive Waste Generation and Management – WL

All solid radioactive wastes generated at WL during 2004 were stored at the Whiteshell Waste Management Area (WMA) facilities. Annual volumes of low-level radioactive waste stored during 2004 and for each of the past five years are shown in Figure 10. Increases in waste volumes sent to bunker storage during 1999 and 2000 resulted from the clean-ups associated with getting the WL facilities into a safe state for decommissioning. The increase observed in 2004 compared with the previous year was a result of work associated with cleanout of WL Hot cells #6-12, and transfer of the Amine Liquid Waste from the WMA to the Shielded Facilities.

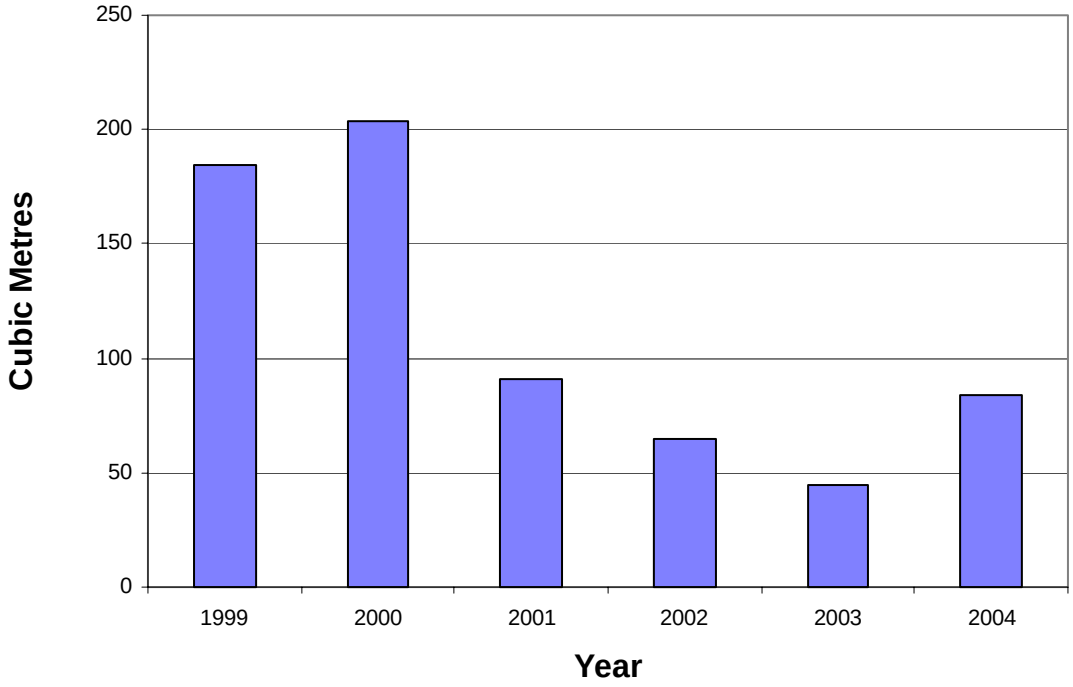


Figure 10: Low Level Solid Radioactive Waste Emplaced In WL WMA

3.2.3 Solid Radioactive Waste Generation and Management – Other Sites

The Low Level Radioactive Waste Management Office (LLRWMO) continued to manage radioactive wastes as a result of remediation of various historically contaminated (non-AECL) sites within Canada. In August 2004, the LLRWMO conducted an overpacking operation within the two LLRWMO storage warehouses at Chalk River. A drum handling, inspection and overpacking procedure was prepared and approved. In all, 90 deteriorated drums were repackaged into 15 six-barrel overpacks. The area was left in a clean and safer condition.

In 2004, there were no additional solid radioactive wastes generated at, transferred to, nor transferred from the NPD site. Approximately 160 m^3 of low-level construction and office waste material was identified in the Reactor Building at the Gentilly-1 site during the year. Sixteen drums of low-level contaminated soil from the cleanup of contaminated areas at the Douglas Point site were placed into the Service Building in 2004.

3.2.4 Liquid Radioactive Waste Generation and Management

3.2.4.1 Liquid Radioactive Waste Generation

Liquid radioactive wastes generated at AECL sites, other than those wastes solidified at source, are managed by one of the following means:

- Collection and treatment of low-level radioactive wastewater to remove and solidify contaminants (at CRL this is collected by the Active Drain System and treated by the Waste Treatment Centre on site) prior to controlled discharge of the treated waste-water to local surface waters via the process sewer;
- Monitored discharge of very low-level radioactive wastewater to local surface waters via the process sewer system;
- Interim storage of low-level liquid wastes in tanks or drums;
- Interim storage of high-level liquid wastes in engineered tanks pending transfer to or development of appropriate treatment or processing facilities; and
- Interim storage of high & low-level radioactive hazardous chemical liquid wastes.

The volumes of low-level liquid radioactive waste produced, treated and stored in 2004 by AECL are shown in Table 10. Results of monitoring of the radioactive content of discharged wastewater are included in the data in Section 3.1.1 above. The total volume of low-level liquid waste generated in 2004 was approximately 53% of the total for 1997 (16,854 m^3). At CRL, all low-level liquid wastes are treated prior to discharge.

Table 10: Volume of Low-Level Liquid Radioactive Wastes Produced and Handled

Waste Producer	Volumes (m^3)			
	Treated and Monitored Prior to Discharge to Surface Water	Monitored Discharge* to Surface Water	Monitored Ground Dispersal	Total Low Level Liquid Wastes
CRL	3,916	3,010	0	
WL	0	1,433	0	
SP				
NPD		25		
Douglas Pt.				
Gentilly-1		46		
Total 2004	3,916	4,514	0	8,900
Total 2003	4,386	4,257	0	8,643
Total 2002	3,235	5,278	0	8,513
Total 2001	3,751	4,961	0	8,712
Total 2000	6,193	6,268	169	12,630
Total 1999	2,298	4,999	6,574	13,871

Notes: * Treatment not required. Excludes cooling water. These are discharges to the Process Sewer from the B205 Tanks 46-E/F/G).

3.2.4.1.1 CRL site

The Liquid Waste Transfer and Storage (LWTS) Project, initiated in 2003 to deal with approximately 280 m^3 of high-level and intermediate-level liquid radioactive waste stored in 21 tanks on the CRL site, continued in 2004. The technical specification for the Waste Storage System (WSS) was 75% completed during the year. The LWTS project is presently requesting bids from qualified contractors for the design, construction and commissioning of the new waste storage system with construction to begin in about one year. A specification for the retrieval, transfer and tank access portions of the work is being prepared. The in-house design for the retrieval and transfer of the Mo-99 waste is approximately 30% complete. The Environmental Assessment for this project was 80% completed in 2004.

Management of low-level liquid wastewaters generated at CRL during 2004 is summarized in Figure 11, which shows the quantities of CRL wastewater discharged to the Ottawa River during the current and past five years. There were no discharges of wastewater to engineered in-ground dispersal pits in the CRL Liquid Dispersal Area during 2004, and none are expected to be made in the future. These data are represented in Figure 12.

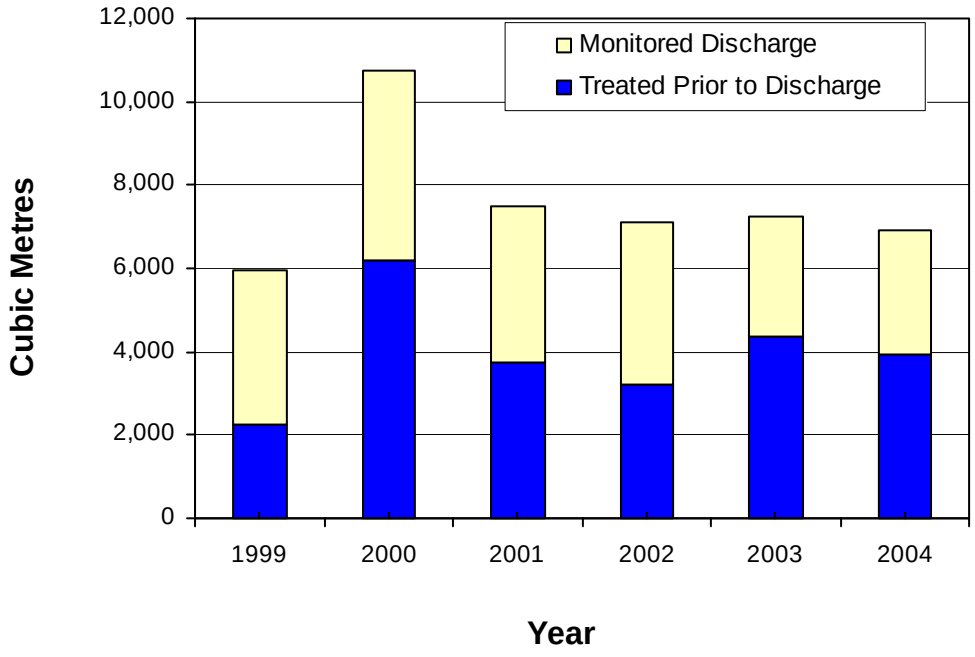


Figure 11: Discharges of Low Level Radioactive Wastewater at CRL

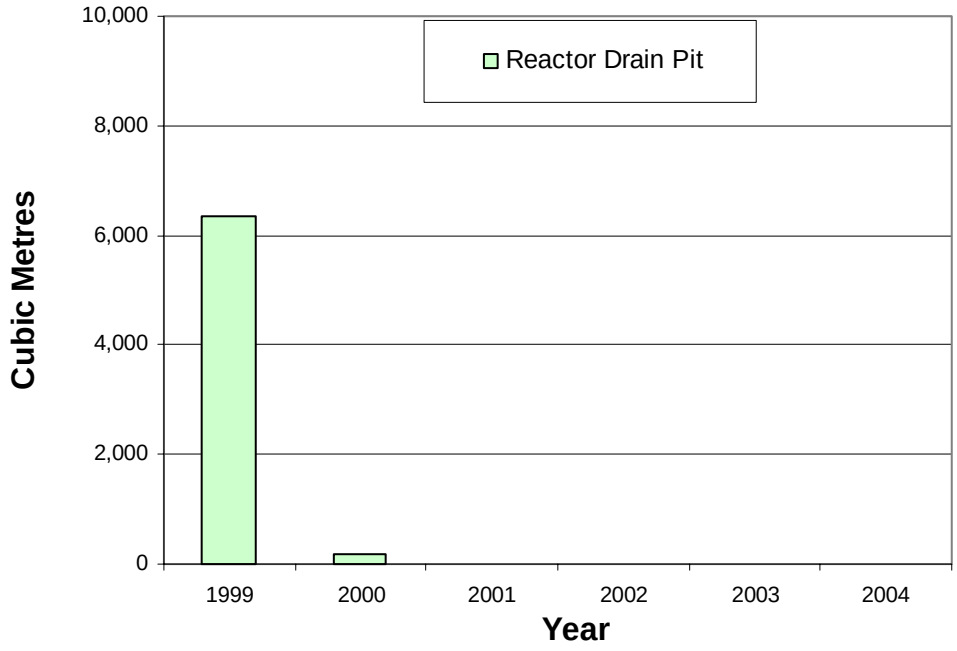


Figure 12: Discharges of Low Level Wastewater to Ground Dispersal at CR

In 2004 the WTC processed 100% of the low level radioactive wastewater fed to the facility. Work on upgrading Waste Treatment Centre systems continued. The Liquid Waste Volume Reduction System continued to be overhauled as a maintenance activity to ensure the continued availability as this system as a back up for the Liquid Waste Evaporator. The reliability of the Liquid Waste Immobilization System was improved by procuring additional Thin Film Evaporators and associated equipment. These upgrades increased the capacity of the WTC, and improved the overall efficiency for removal of radioactive contaminants. The improvements have resulted in no discharges to the Reactor Drain Pit since 2000.

3.2.4.1.2 WL site

Efforts, including feasibility studies, towards achieving an a system to provide treatment for all low-level liquid wastes prior to discharge for WL are underway; however, work to select and possibly to install an improved low-level liquid waste treatment system for WL has been placed on hold. Key decisions are needed about which nuclear facilities must be decommissioned first to achieve goals at minimum cost. One possibility would rebuild current laundry, decontamination, and waste treatment facilities in Shielded Facilities space. In that case, the present wastewater treatment system would probably be replaced by a more elaborate one. If instead the Shielded Facilities are decommissioned first, then in situ modifications to the current wastewater treatment system will be needed. Until the issues are resolved, the best use is being

made of existing capabilities, as well as detective work to try to trace the source of each excursion back to its source.

At Whiteshell the annual volumes of low-level radioactive wastewater collected at the WL Active Liquid Waste Treatment Centre, and monitored prior to controlled discharge to the Winnipeg River, is shown in Figure 13. As can be seen, the volume has remained relatively constant over the past six years. Approximately 80% of the total comes from washing contaminated rubbers and other protective clothing, which is required equally for operations or decommissioning activities.

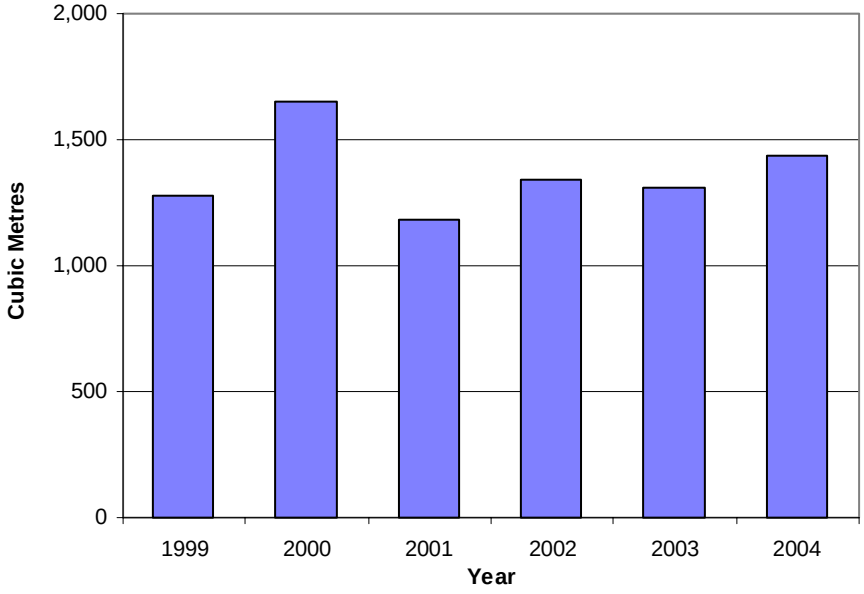


Figure 13: WL Discharges of Low Level Wastewater to the Winnipeg River

3.2.4.2 Radioactive Liquid Waste Management

AECL continued in 2004 to maintain inventories of stored high-level & low-level radioactive liquid wastes that have accumulated at the CRL and WL sites awaiting the development of appropriate treatment processes. The year-end inventory for each of the current and past five years is shown in Table 11 and Figure 14. In 2004, fifty-six 68-L drums of aqueous solution were received from Nordion and added to storage at CRL's WMA C. These drums are in overpacks awaiting further treatment. Contaminated waste oils from CRL and CAMECO continued to be stored safety in WMA D.

In 2004, 29 drums of CAMECO oil contaminated with uranium were discovered among the mixed-liquid drums, resulting in an increase in the interim drum storage inventory compared with that for the previous year. Scintillation counter solutions produced on-site continued to be

stored temporarily in the Waste Reception Centre and shipped off-site for disposal annually. The status of the 68 drums containing low-level radioactive or suspect PCB-contaminated waste oils received from CAMECO remains unchanged and they continue to be stored in two marine containers.

As shown in the data in Table 11, medium and high level liquid wastes stored in tanks at CRL continue to be processed and treated with added volumes remaining relatively low. The overall volumes have remained relatively constant over the past five years.

Table 11: Inventory of Radioactive Liquid Wastes in Interim Storage at AECL Sites in 2004

	Interim Tank Storage* (Medium and high level liquids) (m^3)			**Interim Drum Storage (Organic & Misc.) (m^3)**		
	Added	Removed/ Processed	Year-End Inventory	Added	Processed/ Treated	Year-End Inventory
CRL	2.5	2.7	310.7	37.4	5.9	240.7
WL	4.3	1.1	11.2	3.2	3.6	2.0
Total 2004	6.8	3.8	321.9	40.6	9.5	242.7
Total 2003	12.1	13.1	318.9	7.1	5.0	199.8
Total 2002	5.3	13.2	320.6	6.0	98.4	197.7
Total 2001	1.4	0.1	326	1.2	9.7	287.0
Total 2000	6.4	3.7	331	3.1	70.0	295.5
Total 1999	11.7	0.2	328	9.6	5.9	357.3

Notes: * Does not include wastewater stored in tanks within waste treatment facilities waiting processing.

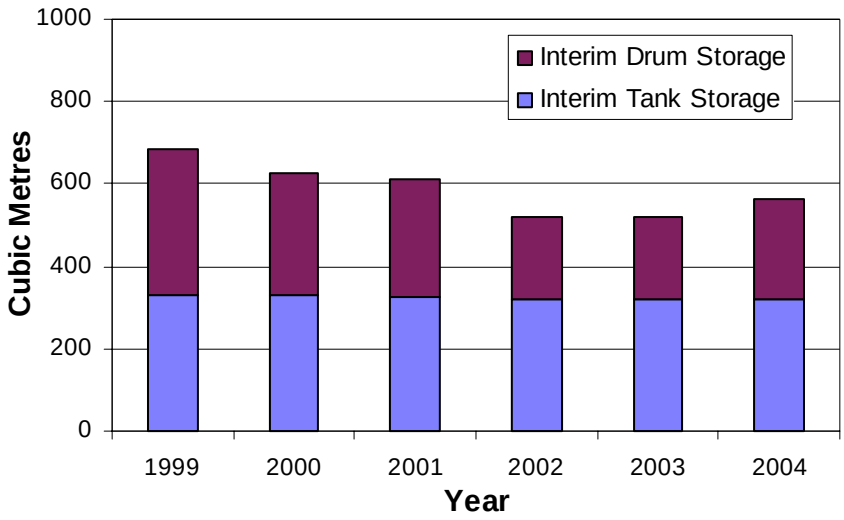


Figure 14: Year End Inventory of Stored Radioactive Liquid Waste in Tanks and Drums at AECL

3.2.5 Non-Radioactive Waste Management

AECL also generates a variety of non-radioactive wastes in the course of operating and decommissioning its sites and facilities. To minimize the quantities of non-radioactive waste requiring disposal, AECL sites continued to operate recycling programs. Residual wastes were either managed on-site or were shipped off-site to appropriately licensed waste management facilities. The total weight of batteries recycled at CRL is now tracked and reported in the table below, rather than the total number of individual items. Table 12 summarizes the quantities and destinations of non-radioactive wastes generated at AECL sites, including quantities of wastes recycled. AECL is working towards achieving a benchmark value of recycling 35% of its annual non-radioactive waste generated by 2015.

Table 12: Non-Radioactive Waste Management at AECL Sites in 2004

	Non-Hazardous Solid Waste			*Hazardous & Liquid Industrial Waste*		
Site Generating Waste	***To On-Site Landfill***	***To Municipal Landfill***	***Recycled Off-Site***	***Off-Site Disposal***	***Recycled Off-Site***	***Incinerated On-Site (WL only)***
CRL*	4,887 m^3	47 m^3	1,204m^3	1,007 kg & 3,321 L (Solvents & Oils)	2,273 kg (batteries) & 36,625 L (solvents & oils)	-
CRL (Decommiss)	57 m^3	243 m^3	29 m^3	-	-	-
WL (& URL)	880 m^3	323 m^3	411 m^3	1,042 kg & 2,305 L (liquids)	0	3,600 L
SP	0	187.7 tonnes	0	900 kg & 6,472 L (solvents + oils)	0	-
Other Sites LaPrade, Glace Bay, NPD	< 1 m^3	1 m^3	1 2 m^3	None	None	-

Note: * Waste totals for CRL include wastes from the Waste Diversion Project (see Table 8).

AECL continued to operate landfill sites for non-hazardous solid waste at the WL and CRL sites in conformance with the applicable Ministry of the Environment guidelines and in compliance with Federal regulations. Some wastes from each site are also sent to local municipal landfill sites where appropriate.

Non-radioactive hazardous and liquid industrial wastes generated at AECL sites continued to be collected for off-site disposal or for recycling. All off-site disposal or recycling was carried out in conformance with applicable Provincial regulations. Non-radioactive waste volumes generated from other AECL sites not included above were negligible in 2004.

3.2.6 Recycling

AECL continued in 2004 to strive to conserve resources through application of the "3 R's" - reduce, reuse and recycle. AECL sites continued to operate recycling programs in 2004 in order to reduce the quantities of waste requiring disposal. Table 13 summarizes the types and quantities of materials recycled from major AECL sites during the year.

Table 13: Recycling at AECL Sites in 2004

Description	CRL	WL	URL	SP*
Paper	101 m^3	6.64 m^3	3.24 m^3	160.4 tonnes
Cardboard	70 m^3	6.76m^3	4.83 m^3	9.23 tonnes
Glass & Aluminium Cans	30 m^3	51 kg	0.5 m^3	112.6 tonnes
Scrap Metal	969 m^3 plus 29 m^3 from decommissioning projects	17,932 kg	Included in the WL amount	0
Plastics	7.8 m^3	0 m^3	0 m^3	Now included in the glass/cans
Wood & Building Materials	27 m^3	72 m^3	0	56.24 tonnes
Other	0	0	0	Computers & monitors
Batteries**	-	-	-	-

Note: *Computers and monitors are recycled but not tracked.
**Total weight of batteries rather than the total number is now tracked (see Table 12).

3.3 Nuclear Liability Management

3.3.1 Chalk River Laboratories Site

Since the inclusion of game animal monitoring in the CRL radiological environmental monitoring program in 1998, elevated concentrations of nuclides (e.g. tritium and cesium-137 in meat and strontium-90 in the bone have been detected in game animals living in the vicinity of the contaminated swamps and streams adjacent to the CRL WMAs. A project to fence these areas to prevent further access by large mammals, e.g. deer and moose, to water and vegetation in these areas, was completed in 2004. In addition, inclusion of game breaks to permit large mammal passage through high fences elsewhere on the site were considered locations for game breaks were identified, and installation will commence in 2005.

Management of Legacy Waste Areas

The Legacy Waste Areas Branch manages more than 40 sites located within the boundaries of the CRL. All Legacy Waste Areas fall outside the boundaries of the WMAs and require cleanup from activities related to past operations. These initiatives included a series of firebreaks and access roads that have been established to assist with prevention and control of fires in the outer areas.

In 2004 a project to clean up the Perch Lake Canopy Tower Site was completed removing AECL research apparatus from a plot of land belonging to CFB Petawawa. A coordinated effort between DND and AECL removed more than 350 test wells and a number of other artifacts from the site including a 23-meter tower.

Another area known as Blimkies Meadow, where old equipment had been stored, was also cleaned up so it could be returned to the landlord for reuse.

Groundwater Treatment

Two automated treatment systems and one passive system continued to remove radioactivity, primarily Sr-90, from intercepted groundwater in three plumes. Approximately 3.18 million litres of groundwater from a plume discharging to the east of WMA B (referred to as the Spring B Groundwater Treatment Plant) were treated to remove greater than 99% of the Sr-90. A total of 7.89 GBq of Sr-90 was removed and solidified with cement in ten 205-L drums for storage. Approximately 4.57 million litres of groundwater from a plume from the now-closed Chemical Pit, situated northeast of WMA A, was treated to remove 3.95 GBq of activity. This liquid was captured as secondary waste in three 205-L drums.

A study is now underway for a fourth treatment facility which will treat water from the south swamp.

The passive wall and curtain remediation system continued to channel groundwater flows containing Sr-90 from the shut down Ammonium Nitrate Decomposition Plant, capturing 99% of the Sr-90 present in the groundwater plume. In 2004 more than ten million litres passed through the curtain avoiding the discharge of 1.0E+09 Bq of activity into the nearby swamp.

Decommissioning Planning and Operation

Facility decommissioning at CRL encompasses facilities that have been shut down and formally turned over to Decommissioning, including both those in a passive Storage-With-Surveillance (SWS) state and those in which projects are being conducted. In 2004 CRL Decommissioning managed twenty-five buildings, six of which are nuclear facilities listed on the CRL Site License.

Although planned progress in a number of areas was significantly restricted by delays in CNSC approval, other targeted work that was achieved included:

- Health, safety and environment issues were identified, submitted and approved by the CNSC. Work is continuing to address these activities.
- All decommissioning facilities were maintained in a safe state compliant with regulatory requirements. Maintenance and surveillance activities were undertaken in twenty-five buildings, six of which were nuclear facilities listed on the Site Licence.
- Updating of drawings to “as-found” condition continued.
- Facility evaluations were completed and clean up is continuing to improve the storage with surveillance state. Systems are being shut down where possible and configuration management has been implemented.
- Shut down of the exhaust system and removal of B107 fume hoods was completed.

- Fire fuel load in the facilities was removed where possible.
- Removal of redundant systems and equipment in various buildings commenced to address HSE issues.

A number of decommissioning planning documents, required as part of the CNSC decommissioning process, were prepared/revised and submitted during the past fiscal year. In several cases, implementation of the plans needed to be postponed while awaiting CNSC approval. Including documents submitted previously, returns from CNSC of approval or formal comments on several are still outstanding. The contents include the schedule and estimated costs to decommission facilities, as well as the basic strategy involved in their decommissioning.

In addition to the decommissioning documents above, structural and mechanical assessment reports that document the required actions for maintaining a building in a storage with surveillance state, were prepared for more than eight buildings on the CRL site that are either currently under decommissioning care or will be very shortly.

Progress with various other decommissioning projects has also been impeded by delays in CNSC approval of submitted plans. Securing CNSC approval and completing the environmental assessment process for the planning and work to drain, decontaminate and stabilize the NRX Reactor Building 204 fuel storage bays is now not expected until mid-year 2005. However, some project preparatory work was approved and some progress was made during 2004:

- Significant volumes of stored redundant equipment and materials were characterized and sent to waste storage facilities.
- Water purification/filtration systems continued to operate.
- Work commenced on the B204 Isolation/X Rod bays cleanup.

In summary, documented Decommissioning Plans are in place for all facilities as required by the CNSC. By the end of 2004 three facilities were in Phase 1, sixteen facilities were in Phase 2 and none was in Phase 3. End state status, wherein the facility was turned over for alternate use, had been achieved for a total of six facilities by the end of 2004.

3.3.2 Whiteshell Laboratories Site

No new permanent facilities were constructed during the year. One-year leases were signed for four WL Building 402 tenants (Pine Pro Automotive, Spectrum Scientific, EcoMatters, and Channel Systems), and a three-year lease for another (ACSION Industries). Continuing land leases were also signed for four farm properties in the exclusion zone across the river from the WL site.

No new contaminated sites were identified in 2004, but additional information was gathered about the extent and condition of some known sites. Sampling and assessment work was completed around the WL Sewage Lagoon to establish its integrity. Drilling was carried out in

and around the Waste Management Area to confirm that it is properly situated in a water discharge zone, and the fitness-for-service of storage bunkers located there was tested.

More scrap (tanks, cable reels, etc.) was recovered from the WL site's affected lands, contributing to nearly 9.0 tonnes of metal scrap, sent for recycling, as well as wastes. Packers were upgraded for some high-pressure underground boreholes at the URL, in order to assure their long-term effectiveness, and some electrical and mechanical services were removed from the 420-meter level. More will be completed in 2005. No other significant remediation was undertaken for WL or URL during the year. Remediation work is being planned as part of each site's decommissioning activities. For example, a remediation plan was prepared for the Cesium Experimental Pond.

There were no major excavation or construction activities undertaken at the URL during 2004.

3.3.3 Other Sites

At the Gentilly-1 site Hydro Québec's non-radioactive turbine equipment was removed during the year and transfer of Turbine Building room T301 to Hydro Québec was approved by the CNSC.

In 2004 a Radiological Zoning Plan for the NPD site was submitted to and accepted by the CNSC. An inventory of stored waste was prepared and 19 drums that were found to be deteriorating were transferred into overpack drums.

In 2004 at Douglas Point, 16 drums of low level contaminated soil from the cleanup of contaminated areas were placed into the Service Building.

In 2004 the CNSC inspected the Waterways storage mound in Fort McMurray, which is managed and monitored by the LLRWMO. Monitoring has shown no environmental impact resulting from the stored waste in the cell. During the year minor improvements were made to the fencing and signage around the site.

In 2004 August, the LLRWMO conducted an overpacking operation within the two LLRWMO storage warehouses at the CRL site. A drum handling, inspection and overpacking procedure was prepared and approved. LLRWMO staff supervised the overpacking operations and the fieldwork conducted by CRL staff experienced in Waste Management Area operations. A total of 90 deteriorated drums were repackaged into 15 six-barrel overpacks.

NRCan continued to fund LLRWMO's major project, the Port Hope Area Initiative (PHAI). The PHAI is composed of two distinct projects, the Port Hope and Port Granby Low-Level Long-Term Radioactive Waste Management Projects, established to clean up various sites contaminated with historic low-level radioactive waste and to construct and operate facilities for the long-term management of the wastes. In its role as Proponent for the PHAI, the LLRWMO continued its technical work in support of the preparation of an environmental screening, conducted at the comprehensive study level, pursuant to the Canadian Environmental

Assessment Act (CEAA). During 2004, a baseline characterization was completed, alternative means for the projects were evaluated, detailed effects assessments were performed, and Environmental Assessment Study Reports (EASRs) were prepared.

3.4 Incidents

Action was taken to investigate, correct, and prevent recurrence of the incidents, which occurred in 2004. None of the incidents represented a significant hazard to human health or the environment. As required, the appropriate regulatory authorities were notified, and appropriate corrective actions were taken to prevent recurrence of similar incidents.

In 2004, there were 30 environmental incidents logged for CRL and 1 for SP, and none for WL, areas under surveillance of and monitored by the LLRWMO, or as a result of operations at the Gentilly-1 Waste Management Facility, the Nuclear Power Demonstration Waste Management Facility, and the Douglas Point Waste Management Facility. A total of 21 incidents were reportable to external regulators, twenty with an environmental significance rating of negligible and one with a rating of moderate.

Of the 21 reportable incidents, nineteen were leaks from cooling/air conditioning systems that resulted in halocarbon emissions, all of which were rated negligible. In an effort to reduce the occurrence of these leaks, a set of recommendations were documented to ensure the site inventory of halocarbon-containing equipment is comprehensive and that preventive maintenance and repair is occurring according to the requirements of the Federal Halocarbon Regulations (FHR), under the Canadian Environmental Protection Act. Implementation of the recommendations is in progress in 2005. All losses were reported to Environment Canada as required, and assigned an environmental significance rating of negligible.

In 2004 May, an estimated 8,000 to 9,000 L of untreated sanitary wastewater was leaked into the Ottawa River, due to a failure of back-up systems and a fault in the computerized control system of the Sewage Treatment Plant at CRL, which led to an automated system shutdown. The procedure for testing the effectiveness of the back-up overflow alarm mechanism was reviewed and revised. The event was reported to the Ministry of Environment Spills Line and assigned an environmental significance of moderate.

There was one environmental incident as a result of operations at the SP site that required reporting to an external regulator. In September 2004, a leak in an air conditioning unit caused a release of 20.4 kg of R-22. The leak was repaired and the loss was reported to Environment Canada as required and assigned an environmental significance rating of negligible.

3.5 Land Management (Stewardship)

3.5.1 Road Salt

As a safety measure salt was used as a de-icing agent on roadways within the various AECL sites

during the winter season. A summary of the road salt usage at the AECL sites is given in Table 14.

As a result of the addition of road salt to Schedule 1 of the Canadian Environmental Protection Act (CEPA), the Department of the Environment issued a preliminary *Code of Practice for the Environmental Management of Road Salts* in 2004 April. The access road to the CRL site is not considered public therefore CRL is not obliged to prepare and implement a salt management plan. However, CRL has reviewed its salt storage practices and is planning to prepare a salt management plan and construct a new salt storage shed on the CRL property. In addition, individuals responsible for the application of road salt on site will be attending best practice training.

Table 14: Summary of Road Salt Usage

Site	Approximate Distance (Roads, sidewalks etc.) (km)	Amount (tonnes)					
		1999	2000	2001	2002	2003	2004
CRL*	54	785	729	339	418	424	597
WL + URL	10	9	6	43.5**	2.26	9.9	7.43
SP**	2	35	30	30	120	120	225
LaPrade	1	-	-	-	-	-	
NPD	2	0.2	-	0	0	0	0

Notes: * CRL includes 2 hectares of parking lots
**Sand/salt mixture.

At CRL, salt was applied directly to the main plant road, a distance of about 7 km, and a mixture of sand and salt was used on a total of about 47 km of other roads within the property. At other AECL sites, sand/salt is applied to the roads, sidewalks and parking lots.

3.6 Energy and Resources

3.6.1 Heat, Light and Processes

Energy consumption at AECL sites during 2004 is summarized in Table 15 along with totals for the five previous years for comparison. Using the appropriate conversion factors for the fuel oil, propane and electricity, the total consumption for the sites was calculated and is given in terajoules (TJ).

At CRL, recovery of some of the waste heat from the NRU Reactor provided about 59.5 terajoules of energy for building heating purposes in 2004, reducing fuel oil consumption by an estimated 1,389,000 L, equivalent to about 13% of the total CRL fuel oil consumption. The level of heat recovery has remained consistent over the past five years. Of this total, the NRU U2 Loops supplied 42.9 million pounds of steam to the distribution system in 2004 resulting in a

savings of 1,258,000 L. The amount of waste heat recovery was up significantly from the 39.5 terajoules recovered in 2003.

The propane consumption at CRL is a result of the heating requirements for the Biological Research Facility. Rather than using steam heat from the oil-fired boilers in the CRL Power House, this propane use minimizes oil consumption and energy losses due to distance from the Power House to the facility.

The target set in the 2003-2005 Environmental Plan and in the EnvPI was for a 10% reduction in total equivalent energy from 2003 to 2004, and a 30% reduction from 2003 to 2015. Building Energy End-Use-Intensity at AECL owned and operated sites in Canada is presented in Table 16. Even though the 2004 target has not been met, the 2003-2005 Environmental Plan energy management initiative target to procure an external consultant to complete an assessment of potential energy savings options at CRL, the site with the greatest energy consumption, is well underway and implementation of ensuing recommendations is a target captured in the 2005-2006 Environmental Plan.

Table 15: Energy Consumption at AECL Sites for Heating, Lighting & Processing in 2004

Energy (Heat, light & Processes)	WL	URL	CRL	SP	Other Sites**	2004 Total	Annual Total Equivalent Energy in terajoules (TJ/y)					
							2004	2003	2002	2001	2000	1999
Electricity (kW.h)	14,555,585	3,235,700	70,321,976	10,862,482	1,250,000	100,225,7439	361	374	389	351	394	387
Heating Oil (L)	3,663,398	0	10,648,624	0	0	14,312,022	598	565	566	531	592	606
Natural Gas (m^3)	0	0	0	781,399	0	781,399	27	32	22	24	21	21
Propane (L)	22,166	93,199	565,062	0	0	680,427	18	19	19	16	17	28
Total Equiv. Energy (TJ)	195	14	725	66	4.5	1,005	1,005	990	996	925	1,023	1,042
Heated Floor Area -approx. total (m^2)	44,600	3,900	152,600	40,600	24,000	265,700					-	-
NRU Waste Heat Recovered (TJ)	-	-	59.5	-	-	59.5	59.5	39.5	41	51	60	36

Notes: * 1 TJ = 1 terajoule = 1 x 10^{12} joules (1 watt = 1 joule/second)
** Other sites include LaPrade, Glace Bay, NPD, Douglas Pt, and G-1.

Table 16: Energy End-Use-Intensity at AECL Sites

Energy (Heat, light & Processes)	2004	5-year average	2003	2002	2001	2000	1999
Total Equiv. Energy (TJ)	1,005	995.2	990	996	925	1,023	1,042
Heated Floor Area -approx. total (m^2)	265,700		270,000	270,000	267,300	267,300	267,300
Energy End-Use-Intensity $MJ/m^2/a$	3,780.7	3,708.3	3,666.7	3,688.9	3,460.5	3,827.2	3,898.2

In accordance with Schedule II of the Registration of Storage Tank Systems for Petroleum Products and Allied Petroleum Products on Federal Lands Regulations, AECL is required to submit a Compliance Summary Report to Environment Canada annually. The target in the 2003-2005 Environmental Plan with respect to underground and aboveground petroleum storage tanks and pipe systems is for AECL to resolve deficiencies in compliance to Federal Technical Guidelines for petroleum storage tanks and start mitigation. While some aboveground tanks still do not comply with Federal guidelines, all underground storage tanks are compliant with Federal Technical Guidelines. Work is continuing in this area. AECL continues to meet its obligations to provide summary reports on an annual basis.

3.6.2 Vehicle Fuel Use

Consumption of fuels by AECL's vehicle fleet at AECL sites during 2004 is summarized in Table 17 along with totals for the five previous years.

Table 17: Vehicle Fuel Consumption at AECL Sites in 2004

Fuel Type	Units	WL	URL	CRL	SP	2004 Total	2003 Total#	2002 Total*	2001 Total#	2000 Total	1999 Total
Gasoline	L	39,140	15,663	152,038	6,000	212,841	268,151	162,234	184,816	198,756	191,846
Propane	L	0	0	5,400	0	5,400	5,400	4,543	5,717	32,921	51,700
Diesel	L	8,408	5,009	145,052	0	158,469	229,071	114,250	139,499	156,596	147,030

Notes: *Total includes data for other sites (LaPrade, Glace Bay, NPD, Douglas Pt, and G-1).
Corrected data for 2001 and 2003.

AECL continued to operate and maintain fleets of vehicles at the CRL and WL site and a small number of vehicles at some other sites for operational, maintenance and transportation purposes. At the end of 2004 AECL's fleet of owned or leased vehicles consisted of 122 automobiles, vans, light and medium duty trucks. Of these, 93 were fuelled with gasoline, and 28 were fuelled with diesel. The single propane fuelled vehicle was operated at CRL.

Of the four new vehicles acquired in 2004 (3 at CRL and 1 at WL; purchased or leased), none was equipped to operate on alternative fuels as the assessment determined that it was not cost effective or operationally feasible to do so. The target included in the Environmental Plan, which was for AECL to be compliant with the Alternative Fuels Act, was met.

3.7 Management of Designated Toxic Substances

3.7.1 Ozone Depleting Substances

The new Federal Halocarbon Regulations came into force on 2003 August 13. The regulations reflect new initiatives under Canada's Ozone Layer Protection Program and modify certain administrative issues. The regulations are intended to introduce a "phase-out" period for the use of halocarbons in such products as refrigeration units and fire extinguishing systems. AECL staff reviewed the changes to the regulations before they came into force and concluded that the impacts should be limited to addressing the changes to the phase out dates for the CFC and Halon halocarbons. In accordance with the Montreal Protocol, Federal and AECL policies, AECL continued to phase-out and consider alternatives to the use of substances such as CFC's, HCFC's and Halons.

Approximate inventories of ozone-depleting substances (ODS's) in equipment and in storage at AECL sites as of the end of 2004 are summarized in Table 18. Also included in the table is a comparison with previous years' inventories. There are several targets in the EnvPI related to ODS's all of which are directed at eliminating all ODS's at AECL by 2020. While inventories have remained relatively constant over the past several years, work is continuing at all sites towards achieving these targets.

Table 18: Inventories of Ozone Depleting Substances And Related Halocarbons at AECL Sites, 1999 - 2004

Substance Type *[Ozone Depleting Potential (ODP)]*	Use/Application	2004				2003	2002	2001	2000	1999
		CRL (kg)	WL (kg)	SP (kg)	Total (kg)	Total (kg)	Total (kg)	Total (kg)	Total (kg)	Total (kg
Halons *[ODP ~ 3 - 10]*	Fire Suppression Systems	586	889	0	1,475	1,475	1,239	1,239	1,291	1,291
CFC's & Blends (e.g. R-11, R-12, R-113, R-503) *[ODP ~ 0.5 - 1.0]*	Refrig. & Air Cond. Systems	100	1,822	4.24	1,926	2,169	1,723	1,732	1,760	2,484
	Storage (includes solvents)	85	380	0	465	480	1,204	1,207	1,214	1,226
	Thermalhydraulics Research*	0	0	0	0	0	0	0	0	0
HCFC's (e.g. R-22, R-123) *[ODP ~ 0.02-0.06]*	Refrig. & Air Cond. Systems	1,839	341	503	2,683	2,597	2,761	2,840	1,840	2,358
	Storage (includes solvents)	283	180	0	463	931	493	788	595	478
	Thermalhydraulics Research*	0	0	0	0	0	0	0	0	0
HFC's (e.g. R-134a) *[ODP = zero]*	Refrig. & Air Cond. Systems	104	8	634	746	764	679	677	1	1
	Storage (includes solvents)	55	22	0	77	56	28	30	13	14
	Thermalhydraulics Research	6,294	0	0	6,294	5,500	4,900	4,900	5,400	6,810

Existing Halon fire-extinguishing systems in some critical areas, the NRU Reactor control room and RFFL facility, remain in place for safety reasons. Replacement systems offering equivalent levels of effectiveness and personnel safety are will be investigated during 2005. As such, the number of Halon fire-extinguishing systems remains unchanged from the previous year.

3.7.2 Poly-Chlorinated Biphenyls (PCBs)

AECL continued to maintain storage facilities for PCB waste at several of its sites, in compliance with Federal Regulations. A summary of PCB waste inventory remaining in storage at these sites along with PCBs still in service at AECL sites as of the end of 2004 is given in Table 19. Efforts directed at eliminating PCBs in storage continued throughout the year.

Table 19: 2004 Year-End Inventory of PCBs at AECL Sites

Site	Storage					In Service		
	Misc Solids & Debris (kg)	Liquids (L)	Light Ballasts (Items)	Capacitors or Misc. Equip (Items)	Transformer (Items)	Transformer (Items)	Light Ballasts (Estimated) (Items)	Capacitors (Items)
CRL	0	205	986 kg	0	0	-	-	-
CRL (Suspect Radioactive)	200	20,090	10					
WL	0	0	0	0	0	1	~8,775	26
SP	0	0	0	0	0	1 (trace)	0	0

3.7.3 Chlorine

Chlorine was used for water treatment purposes at both the CRL and WL sites in 2004. Process and firewater systems were shock-chlorinated on a regular basis to prevent fouling of piping systems and heat exchangers by algal growth. Water for domestic use was continuously chlorinated for health purposes. At CRL, the effluent from the sewage treatment plant was continuously chlorinated for disinfection.

Total consumption of chlorine for these purposes in 2004 at CRL was 4,494 kg, consistent with the value for 2003 and considerably down from the 10,200 kg in 2000 and the 6,700 kg in 2001. A reduction in the amount of chlorine used for treatment of wastewater (from 524 kg in 2002 down to 299 kg in 2004, and consistent with the value in 2003) was due to improvements made to the chlorination process at the CRL sanitary wastewater treatment facility. At WL chlorine use to disinfect the domestic potable water supply was 3,264 kg, consistent with previous years.

4. PUBLIC COMMUNICATIONS

Efforts continued in 2004-2005 to ensure that the local communities and stakeholders were kept apprised of AECL's operations. In this regard, the following activities took place:

Interactions with Federal, Provincial and Municipal Elected Officials

Three community liaison committee briefings were held with elected officials, two with representatives from Deep River, Laurentian Hills and Head, Clara and Maria in July 2004 and February 2005 and one with representatives from Pembroke, Petawawa and the Pontiac in April 2004. A follow up letter of thanks from the Deep River and District Waste Management Board was received in September 2004 in appreciation for AECL's cooperation and assistance in the management of the Baggs Road site.

Elected officials and stakeholders were informed that AECL would be appearing in September 2004 before the CNSC to discuss the Financial Guarantee and the Preliminary

Decommissioning Plan. The meeting was adjourned and more information requested. A follow-up meeting was scheduled for May 2005.

Communications continued with the Algonquins of Pikwàkanagàn throughout the reporting period and a positive letter of support was received for the Fuel Packaging and Storage Project. AECL was pleased to receive a copy of First Nation's new protocol for archaeological management of burial sites. This document was provided to relevant environmental and site management staff for consideration and information. A tour of the known First Nations' burial sites at Chalk River is planned for the Summer of 2005.

In the Whiteshell area, Public Liaison Committee meetings continued with local communities and the Sagkeeng First Nation.

Positive Support from Communities for ACR™ and Continued Funding for AECL

AECL was pleased to receive copies of letters sent to the Prime Minister, the Premier of Ontario, the Provincial Minister of Energy and other government departments indicating community support for increased funding to AECL for ACR™ development and for the continued operation of AECL's Chalk River Laboratories' site. The letters were sent by the Mayor of Mississauga, the Warden of Renfrew County and the Towns of Deep River and Laurentian Hills.

Participation in Community Events

AECL either supported and/or participated in more than 70 community events over the reporting period. This included a number of well-attended local fairs and festivals in Petawawa (Options 2004 skilled trades fair in April/Showcase 2004 in May), Summerfest in Deep River in August, Shawville in September and Chalk River in February 2005. Participation at these events provided opportunities for members of the public to ask questions regarding the environmental and operational performance of AECL.

In addition AECL continued its participation in the preparation of a nomination document that will see the Ottawa River named as a Canadian Heritage River System and supported the Chalk River management also supported the Annual Upper Ottawa Valley Ducks Unlimited Charity Auction and Dinner.

Public Consultation Activities

The Environmental Assessment Study Report for Liquid Wastes Transfer and Storage Project was submitted to the CNSC for comment in September. It included the details of all employee and public-based comments associated with various consultation activities held earlier in the year as well as an update on the project in July.

Public consultation activities associated with the Fuel Packaging and Storage Project were launched in August for employees and in September for the public with letters to elected officials, the Concerned Citizens of Renfrew County and the Algonquins of Pikwakanagan offering briefings on the project and announcing the public open houses. Four public open

houses were advertised in the local papers for Deep River, Petawawa, Pembroke and Chapeau, Quebec. Information was also posted on AECL's external website.

In January 2004, CRL announced its intention to seek ISO 14001 Environmental Management System certification for the Chalk River site. Communities were advised of the successful certification in June 2004.

A series of meetings with employees and representatives from environmentally-focussed organizations was held to review the results of the "Ecological Effects Review of Chalk River Laboratories" and to seek input on Valued Ecosystem Components. The meetings were well attended by individuals associated with the Algonquins of Pikwàkanagàn, the Ministry of Natural Resources, the Petawawa Research Forest, Ducks Unlimited, the Concerned Citizens of Renfrew County, the Deep River/Petawawa/Pembroke Horticultural Societies, The Four Seasons Recreation Trail, the Deep River Birdwatchers' Association and the Pembroke and Area Naturalist Club. Comments are being compiled from these sessions and will be provided to the CNSC, to all participants and made available on the external website.

Disclosure Interactions

During this period, various documentation was provided to the Sierra Club. The documentation included copies of the Annual Environmental Report and the CRL Preliminary Decommissioning Plan. The Concerned Citizens of Renfrew County were also provided with the Annual Environmental Report, the CRL Preliminary Decommissioning Plan and the Environmental Effects Review.

Copies of AECL's Annual Environmental Report (Volumes 1-3) for 2003 and the Corporate Annual Report for 2003/04 were provided to all community stakeholders, both at Chalk River and Whiteshell.

Media Coverage

AECL's activities were tracked in the local papers and included:

- Positive coverage in the Daily Observer in April noting AECL's Earth Day contribution of trees and shrubs to the new Renfrew-County Miramichi Lodge Long-Term Health Care Facility. The announcement was also carried on local radio.

- Regional, national and international media continued around the environmental benefits of nuclear with respect to meeting the province's projected energy demand and Bruce Power's decision to study the feasibility of new build.

- The major story for this period was related to the sewage sludge practice at Chalk River. Even though this story was negatively carried in the Ottawa Citizen, AECL received good local support from elected officials and the local media.

All contacts and any comments (positive or negative) were recorded in a "Stakeholder comment

database" and used, where appropriate, by LLRWMO staff as input to the "Environmental" and "Ways & Means" assessment processes.

Bi-monthly summaries of the LLRWMO public communications activities were provided to NRCan.

5. ACRONYMS AND TERMINOLOGY

ALARA	The principle of maintaining emissions and radiation doses as low as reasonably achievable, social and economic factors being taken into account.
ALWTC	The Active Liquid Waste Treatment Centre at the Whiteshell Laboratories, which concentrates and solidifies medium level radioactive wastewater, and collects low level wastewater for controlled discharge.
ANL	An Action Level is a quantity or rate of radioactive emissions that, if reached, may represent a significant loss of control of a facility's environmental protection program or emission control systems, and triggers a requirement for specific actions to be taken.
CANDU	**CAN**ada **D**euterium **U**ranium nuclear power reactor system; registered trademark.
CEAA	Canadian Environmental Assessment Act
CFCs	Chlorofluorocarbons, used primarily as the working fluid in refrigeration and air conditioning systems, and harmful to the earth's ozone layer.
CNSC	Canadian Nuclear Safety Commission, the federal body responsible for regulating the Canadian nuclear industry in accordance with the Nuclear Safety & Control Act and associated regulations. This was formerly the Atomic Energy Control Board (AECB).
CPFS	Commercial Products and Field Services laboratory, located in Sheridan Park. This facility was formerly known as SPEL, Sheridan Park Engineering Laboratory.
CRL	AECL's Chalk River Laboratories research site, located beside the Ottawa River at Chalk River, Ontario.
DP	AECL's partially decommissioned Douglas Point nuclear generating station, located near Tiverton, Ontario.
DRL	Derived Release Limit for normal emissions of radioactive material in airborne or liquid effluents from nuclear facilities derived from the regulatory radiation dose limits for members of the public considering all significant environmental exposure pathways.
EER	Ecological Effects Review conducted at the CRL site of all waste streams based upon available risk assessment guidelines.
EMS	Environmental Management System

EnvPCI	A measure related to the strategic objective to demonstrate regulatory compliance. The measure is based upon feedback form the regulators, effectiveness in responding to regulator driven actions and any identified gaps with regulations or regulatory expectations.
Env PI	A measure of environmental performance related to the strategic objective to prevent environmental degradation (i.e. pollution prevention). The measure is based upon setting 2015 targets for each of the environmental aspect groups identified for CRL.
EnvPMI	A measure related to the strategic objective to provide an effective environmental management system. The measure is based upon the ISO-14001 environmental management standard.
EnvPSTI	A measure related to the strategic objective to provide continual improvement of systems and technology that help ensure AECL controls its environmental aspects and the prevention of pollution.
FNO	Facilities and Nuclear Operations
FOC	Fisheries and Oceans Canada
G-1	AECL's partially decommissioned Gentilly-1 nuclear generating station, located at Bécancour, Québec.
GWP	Global warming potential: a relative measure per unit mass of the potential for substances released into the atmosphere to contribute to global warming, based on carbon dioxide having a GWP = 1.0.
Halons	Brominated chlorofluorocarbons, used primarily as fire suppressants, and which are relatively more harmful to the earth's ozone layer than CFCs.
HCFCs	Hydrochlorofluorocarbons, used primarily as a working fluid for refrigeration and air conditioning systems, but which are less harmful to the earth's ozone layer than CFCs.
IFTF	Immobilized Fuel Test Facility, a laboratory complex containing instruments in shielded concrete canisters and warm cells for conducting used fuel storage experiments. The complex is part of the Shielded Facilities at WL.
LLRWMO	AECL's Low-Level Radioactive Waste Management Office, responsible for site remediation and waste management, on behalf of Natural Resources Canada (NRCan), at designated sites in Canada historically contaminated with radioactivity.
MAGS	Modular Above Ground Storage facility for low-level radioactive waste.
MAPLE	Multipurpose Applied Physics Lattice Experimental research reactor designed and marketed by AECL.
MMIR	MDS Nordion Medical Isotopes Reactor Project tasked with the construction and commissioning of the Dedicated Isotope Facilities at AECL.

MOX	Mixed Oxide Fuel
NLBU	Nuclear Laboratories Business Unit
NPD	AECL's partially decommissioned Nuclear Power Demonstration nuclear generating station, located at Rolphton, Ontario.
NRCan	Natural Resources Canada
NRU	The 125-megawatt, heavy water cooled and moderated National Research Universal nuclear research reactor located at the CRL site. NRU is currently used for both nuclear research and development, and for production of medical radioisotopes.
NRX	Heavy water moderated, 40 megawatt National Research Experimental reactor, cooled by once-through flow of river water. It is located on the CRL site, and is now shutdown awaiting decommissioning.
ODP	Ozone depleting potential: a relative measure of the potential for ODS's to cause damage to the earth's ozone layer, based on CFC-11 having an ODP = 1.0.
ODS	Ozone depleting substance: refers to halogenated hydrocarbons (CFCs, HCFCs, Halons, etc.) that are harmful to the earth's ozone when released to the atmosphere. In response to international agreements, federal and provincial policies and regulations call for control and phase-out of designated ODS's from manufacture and use.
PCBs	Poly-chlorinated biphenyls, used primarily as insulating fluids in electrical equipment. PCBs are environmentally persistent and bioaccumulative substances considered to be environmentally harmful.
SED	Safety and Environment Division
SF	Shielded Facilities, a complex of hot cells for radioactive handling located at WL.
SP	AECL's Sheridan Park site consisting of engineering offices and a laboratory, located in Mississauga, Ontario.
SRC	AECL Safety Review Committee, responsible for independent review to assure the AECL President that proposed and existing AECL facilities and activities are acceptable with respect to health, safety and protection of the environment, as defined in AECL Policy 40101.
STP	Sewage Treatment Plant
URL	AECL's Underground Research Laboratory, located near WL, which conducts research in support of the concept of deep geological disposal of high level nuclear wastes.
WL	AECL's Whiteshell Laboratories research site, located beside the Winnipeg River near Pinawa, Manitoba.

WMA	Waste Management Area containing facilities for storage of radioactive wastes. Licenced WMAs are maintained at both the CRL and WL sites.
WTC	The Waste Treatment Centre, located at the CRL site, which uses a large evaporator to remove contaminants from low-level radioactive wastewater for solidification.
WR-1	The Whiteshell Reactor -1 research reactor, which used organic liquids as the primary fuel coolant. It is located on the WL site, and is now maintained in a partially decommissioned state.

Notice:

This report is not to be listed in abstract journals.
If it is cited as a reference,
the source from which copies may be obtained should be given as:

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