

**Safe Community Co-existence with Long-Term Low-Level Radioactive Historic Waste Contamination in Canada – Port Hope Example - 11314**

Mark J. Gardiner, Robert L. Zelmer, and Michael J. Owen  
Low-Level Radioactive Waste Management Office

**ABSTRACT**

The Low-Level Radioactive Waste Management Office has operated co-existence programs in contaminated communities across Canada as part of its overall national delivery since its earliest operating years in the 1982. These have assisted communities to continue to use and to develop or modify land and structures safely with confidence as remediation planning and implementation occurs. Programs in place today are mature and advanced. They have been crafted over many years based on a succession of lessons learned.

The Low-Level Radioactive Waste Management Office has a long history of operating co-existence programs within the Municipality of Port Hope, Ontario, a community with historic radium industry waste management impacts on public and private lands. The Port Hope, Ontario example is the most developed case and has been the proving ground for programs elsewhere.

Since the early waste consolidation and site remediation activities of the Low-Level Radioactive Waste Management Office, in the late 1980's, an Interim Waste Management Program has become the cornerstone of the co-existence strategy, now including as components a Construction Monitoring Program, a Property Compliance Program and an Environmental Monitoring Program.

Currently the Low-Level Radioactive Waste Management Office is engaged in continued operation of these programs in Port Hope while a focused large-scale initiative, now led by the Port Hope Area Initiative Management Office, advances to complete the development of new local long-term low-level radioactive waste management facilities and implement final consolidation of Port Hope's historic low-level radioactive wastes there.

## **INTRODUCTION**

The Low-Level Radioactive Waste Management Office (LLRWMO) manages the federal government's responsibility for historic low-level radioactive waste management in Canada [1, 2]. As part of this responsibility, the LLRWMO manages characterization and interim waste management activities in the Port Hope, Ontario area while ultimate remediation is planned and implemented in the community.

These programs include oversight of low-level radioactive waste (LLRW) produced during the historic radium/uranium refinery operations through radiation surveying of urban area property development, environmental monitoring and detailed property file management. The LLRWMO and the Municipality of Port Hope continue to work interactively to ensure ongoing interim management of historic LLRW is in place while the local long-term waste management facility (LTWWMF) is developed under the Port Hope Area Initiative.

This fully developed program will change following the completion of the remediation of the contaminated sites in Port Hope by focusing on the long-term monitoring of the LTWWMF.

The LLRWMO has provided a continuing presence in Port Hope in the mid 1980's. Building on a community communications program, the office increased its technical capacity from project management of contractor-led site maintenance and monitoring to the provision of a full-time organization of environmental and radiation specialists. The availability and actions of the LLRWMO grew public and town administrative staff confidence over the years. The continuing monitoring and assessment of contaminated sites in the Port Hope area created a knowledge base within the office that the public now takes for granted. With the understanding of the quality of work performed by the LLRWMO, the community is satisfied with knowing that its interests are protected in the actions of the LLRWMO and the oversight of the regulator, the Canadian Nuclear Safety Commission (CNSC).

## **HISTORIC LOW-LEVEL RADIOACTIVE WASTE CONTAMINATION IN CANADA**

Since 1982, the Low-Level Radioactive Waste Management Office has been Canada's agent, as directed by Natural Resources Canada, implementing the delivery of federal government obligations regarding historic low-level radioactive waste management across Canada. These responsibilities include both planning and implementation activities for communication, characterization, remediation and monitoring at sites for which the federal government has accepted responsibility for the wastes.

Historic LLRW poses unique problems as part of the larger radioactive waste management picture in Canada. Historic LLRW is defined as "LLRW that was managed in the past in a manner no longer considered acceptable but for which the owner cannot reasonably be held responsible and for which the federal government has accepted responsibility for its long-term management". Nuclear reactor and uranium mining facilities have relatively well known

distributions of radioactive contaminants in their local environments. Historic LLRW may be found at locations across Canada owing to the wide use of radium and other naturally occurring radioactive materials in commercial operations from the 1930s to the 1960s.

Historic LLRW for which the Canadian federal government accepts responsibility, normally on a case-by-case basis, includes:

- spilled ore at locations on the Northern Transportation Route between the now-closed radium/uranium mine site at Port Radium in Canada's Northwest Territories and the rail head in Fort McMurray, Alberta;
- radium/uranium refinery process wastes (including decommissioned refinery building materials) in the Port Hope, Ontario area;
- radioluminous dials or sites incidental to their use, preparation or maintenance; or,
- other historic artifacts of a radioactive nature.

## **CONTAMINATION IN THE PORT HOPE URBAN AREA<sup>1</sup>**

The town of Port Hope, Ontario lies on the north shore of Lake Ontario, approximately 100 km to the east of Toronto. The Port Hope, Ontario area contains approximately a million and a half cubic metres of Canada's historic LLRW. This is the single largest component of the national inventory of historic LLRW. The presence of historic LLRW in Port Hope dates back to the early 1930s when a refinery was established for the extraction of radium from pitchblende ores at a refinery in the municipality. Medical and industrial applications of radium made it extremely valuable and well worth the transportation from its source in the Northwest Territories. In 1975, radioactive contamination resulting from practices in the early years of radium and uranium production was discovered in parts of the town.

A Federal/Provincial Task Force on Radioactivity (FPTFR), headed by the Atomic Energy Control Board (AECB), was established to develop cleanup criteria and to carry out remedial work at properties exceeding these criteria in Canada, specifically in Port Hope and in the uranium mining communities of Elliot Lake, Ontario and Uranium City, Saskatchewan.

In the late 1970s, a remediation of the most contaminated areas of Port Hope was completed as part of a dose reduction program in the area. Some 120,000 m<sup>3</sup> of contaminated soils was excavated and disposed of at AECL's Chalk River Laboratories in Deep River, Ontario. While the work of the late 1970s focused on reducing the dose from radioactive materials, associated non-radioactive and residual radioactive materials remain.

The LLRWMO's involvement in the Port Hope area came about through its inception as the agent to manage Canada's responsibility for its national historic low-level radioactive waste issues. Following historic LLRW management oversight by the FPTFR, in 1982, the LLRWMO became its successor and the managing agent for these wastes. The LLRWMO is operated by

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<sup>1</sup> **The Corporation of the Town of Port Hope amalgamated with their neighbour, Hope Township in 2001. The result was the formation of the Municipality of Port Hope, which includes the town of Port Hope.**

Atomic Energy of Canada Limited (AECL) under a federal mandate provided by Natural Resources of Canada.

To date the LLRWMO has advanced the consolidation of the LLRW, established coexistence programs and facilities, enabled continued interim safe use of land with residual contamination and partnered with others in advancing the ultimate remediation of the area. These management and planning activities continue today. The current focus of the LLRWMO in Port Hope is the continuation of the long-established Interim Waste Management (IWM) Program and support to the recently established Port Hope Area Initiative Management Office (PHAI MO), which is advancing the remediation and transfer the local historic LLRW to new long-term waste management facilities.

Consolidated LLRW is stored in several licensed and unlicensed interim storage locations in the area, pending long-term management solution currently under development. Currently, in addition to the licensed sites operated by the LLRWMO, historic LLRW contaminated soils are located at hundreds of small scattered sites and at thirteen major sites in the urban area. The waste management practices of the early years of the local radium/uranium refinery resulted in the distribution of significant volumes of process residues and refinery wastes within the local community. The subsequent demolition of the refinery buildings also resulted in the release of its building materials which have found their way into building construction in Port Hope.

The large LLRWMO managed sites include four Canadian Nuclear Safety Commission (CNSC) licensed interim storage sites, three small unlicensed consolidation sites and ten major unlicensed sites. The solution for these sites and the remaining historic LLRW in the Port Hope area will come from the local long-term waste management facility and municipal remediation activities under the management of the Port Hope Area Initiative Management Office.

The LLRWMO provides regular inspection and ongoing monitoring of its licensed and unlicensed sites, and any sites that are discovered during routine Interim Waste Management Program activities. The Interim Waste Management Program provides assurance that known inventories of historic LLRW in the Port Hope area is properly maintained, and also provides monitoring of property development to ensure that any previously unknown historic LLRW is identified and appropriately managed.

The Interim Waste Management Program has operated over the past 20 years through its three component sub-programs:

- the Construction Monitoring Program (CMP),
- the Property Compliance Program (PCP), and
- the Environmental Monitoring Program (EMP).

The CMP is a joint program with the Municipality of Port Hope to ensure that development activities that may result in the movement of soils (e.g. in the excavation for a new home foundation) or the capture of soils (e.g. the addition to a dwelling) are monitored to ensure further spread of contaminated soils and building materials does not occur. The LLRWMO operates the CMP in cooperation with the Town of Port Hope under an agreement established in

1989. The agreement identifies the roles and responsibilities of the parties in the administration of the agreement, as well as the joint operation of the historic LLRW temporary storage site used for the receipt of the contaminated soils and building materials.

The LLRWMO also operates the PCP, which responds to owner inquiries regarding the radiological status of their properties and provides this information to property owners, their real estate agents, or their lawyers. This information may be used to facilitate the sale or purchase of the property or to simply provide radiological information to the property owner. Occasionally, where the property file information is limited or incomplete, property or building surveys are conducted within the PCP, and remediation or recovery of artefacts is undertaken if criteria exceedances are identified. Inquiries on conditions at public and private properties from the public-at-large are also responded to by the LLRWMO outside of the PCP.

The LLRWMO regularly monitors the environment in the vicinity of its licensed and unlicensed historic LLRW sites in Port Hope through the EMP. The EMP includes visual inspections, gamma radiation surveying, water sampling and radon in air monitoring. The monitoring results at LLRWMO-operated licensed sites are reported to the CNSC on an annual basis.

The three Interim Waste Management Program components, CMP, PCP and EMP, respond in different ways to the various needs of the Municipality of Port Hope and the Canadian Nuclear Safety Commission (CNSC). The CMP meets the Municipality's desire to maintain ongoing development in its community. It also meets the CNSC's requirements for the oversight of historic LRLW contamination in the Port Hope area. The PCP meets the needs of the public by ensuring the information gathered by the LLRWMO on properties in the Port Hope area is available for their use, or that of real estate and financial institutions which may require an understanding of the conditions on the property for its sale or mortgaging. This program also assures the CNSC that properties found with the potential to result in a member of the public exceeding the public dose limit (1 mSv per year) are remediated to ensure this does not happen. The EMP meets the regulatory requirements of the CNSC, and serves to assure the public that the sites in their community under LLRWMO management are operated safely.

To meet the Interim Waste Management Program requirements in Port Hope, as well as to meet the needs of other LLRWMO projects across Canada, the LLRWMO operates a sample preparation and analysis laboratory in Port Hope, Ontario. Facilities and core capabilities are maintained to conduct radiation surveys (including equipment maintenance and calibration), remediation, waste packaging and transport, and interim waste management.

## **INTERVENTIONS AND EARLY REMEDIATION IN PORT HOPE**

Following the earliest remedial activities undertaken in Port Hope in the late 1970's and early 1980's, the LLRWMO advanced a program of environmental monitoring and consolidation of contaminated soils beginning in the late 1980's. Early in the active management of contaminated sites, it became clear that owners and occupants of land needed assurance that the development of their property would not be restricted. This was also found true of owners of clean properties that also needed assurance that their continued enjoyment would be confirmed by those responsible for the contaminants in their community. The former confirmed the need for the construct of the CMP, and the latter the PCP.

Recognizing that in the late 1980's a long-term solution for the remaining contaminated materials in the Port Hope area was being sought by the new federal Siting Task Force, the Town of Port Hope and the LLRWMO worked together to create the foundation for the tools that would allow for the ongoing development of the town. While the Siting Task Force sought options across the province for the disposal of Port Hope's contaminated soils, an interim solution was found in the creation of a temporary storage site on AECL land in the town.

The temporary storage site consists of two asphalt pads with engineered drainage systems, perimeter security fences, and anchored woven synthetic fabric covers. The original pad, completely secured by a single cover, no longer receives contaminated materials as it has reached its operational capacity. On the receiving pad, multiple covers are used for the different stockpiles on the pads. The main inventory stockpile is secured beneath a large cover and an active receiving stockpile covered by a smaller, more manageable one.



Fig. 1. Port Hope's Pine Street Extension Temporary Storage Site

A program of remediation and consolidation at both small and large-scale public and private properties began in the late 1980's. The ongoing performance of these activities would eventually become known as the Interim Waste Management Program. On-site storage proved to be important at the larger deposits of contaminated soils. Since the late 1980's, the LLRWMO has consolidated approximately 80,000 m<sup>3</sup> of historic LLRW contaminated soils and building materials in managed sites in the Port Hope area.

## **THE PORT HOPE CONSTRUCTION MONITORING AGREEMENT AND PROGRAM**

In 1988, Town of Port Hope staff presented concerns that the presence of historic LLRW in the community would impede development within the town. As part of planning waste consolidation activities and advancing work in partnership with municipal officials in Port Hope, the concept of a temporary storage site and program to receive discoveries of small quantities of historic LLRW from development activities in Port Hope was first discussed. This was acted upon, resulting in the development of a legal agreement between the Town of Port Hope and the LLRWMO [3], which outlined the responsibilities of the two parties. The resulting CMP met the needs of the Town, in that development would continue unimpeded by the presence of residual historic LLRW in the town, and the needs of the LLRWMO, in recovering and managing the contaminated materials pending final disposal.

Responsibilities under the agreement differentiate between the property owner/developer and the LLRWMO and vary depending on the type of excavation project. Interactions with the town, through its Building and Engineering Departments, cover the administration of the CMP, the development of the town's infrastructure, and the maintenance of the temporary storage site.

Following the example of an owner (or their agent) adding a garage to their property, the owner applies for a building permit at the town's Building Department. The Building Department initiates their administrative paperwork and directs the applicant to the LLRWMO. A simple signed consent form allows the LLRWMO to perform a radiological survey of the property, should the file review not be conclusive in its assessment of radiological conditions in the area of the proposed garage. If the data review/radiation survey confirms there is no potential for historic LLRW in the area, the consent form is signed by an LLRWMO representative and returned to the Building Department allowing the issuance of a building permit. Should the potential for historic LLRW be indicated from the file review or the radiation survey, the LLRWMO will perform more detailed site characterization, initiate site remediation or attend the excavation activity for further assessment and potential remediation should conditions require it.



Fig. 2. LLRWMO Staff Surveying Building Materials Prior to the Structure's Demolition

### **THE CONSTRUCTION MONITORING PROGRAM (CMP) AND INTERIM WASTE MANAGEMENT (IWM)**

The CMP had been operating for many years in Port Hope before the term “interim waste management” took on its current-day meaning. Approximately 12 years passed between the completion of the early site remediation activities by the Federal-Provincial Task Force on Radioactivity and the expression of interest by the Town of Port Hope to begin to move forward with the active consolidation of the larger and more publicly accessible known historic LLRW contaminated sites.

Many phases of investigation had occurred in the search for remote disposal sites, which strategically had held up the advancement of remediation activities. The need for progress called for a site-by-site review of “what can be done now” at each site. As an outcome, a series of intrusion blankets and fencing as well as stepped up collection of more monitoring data occurred at the major sites.



Unfortunately, the Siting Task Force process came to an end without identifying a willing host community. As a result, the interest in participating in final solution planning rose in the three Port Hope area municipalities eventually leading to the community proposal to volunteer as host communities. The key result of this process is a signed legal agreement between the local municipalities and the federal government. This forms the basis of the Port Hope Area Initiative, in which two local long-term low-level radioactive waste management facilities are being created to receive the local historic LLRW.

## **CMP OVERSIGHT AND STORAGE CAPACITY MANAGEMENT**

The CMP is maintained through continuous dialog between the two parties, including regular meetings of the CMP Coordination Group, which includes Port Hope administrative staff, Building and Engineering Department representatives, and LLRWMO staff. These meetings serve to ensure both parties to the agreement are kept current on their respective activities and potential issues requiring more detailed research or discussion.

The Municipality of Port Hope retains the administrative responsibility for approvals on the volume of deliveries from individual properties to the temporary storage site. This ensures that Port Hope's development process is not impeded by the inability to move contaminated materials to secure storage. However, the CMP does allow for deliveries from private properties in volumes of up to 100 m<sup>3</sup> per property. Beyond this volume, a decision from Municipal staff is required. Large-scale remediation activities driven by CMP triggers are infrequent. The most significant of which resulted in the development of a project-specific temporary storage site for the receipt of some 20,000 m<sup>3</sup> of historic LLRW identified during the development and construction of a new water treatment facility in the town of Port Hope. In most cases, only a few truck loads (few 10's of cubic metres) are delivered to the temporary storage site on a given project.

The LLRWMO summarizes all activities performed under the CMP in an annual report to the Municipality of Port Hope [4]. This report presents tracking information on the Municipality of Port Hope Capital Works Projects, Utility Applications, Public Works Applications and Regular (private property owner) Applications, as well as the operating statistics for the temporary storage site that receives the historic LLRW from construction and site remediation activities.

The Town of Port Hope provided its Works Department staff to perform the maintenance of the temporary storage site, including road access, stockpile reshaping, and containment tarp handling during receipt of materials. The LLRWMO manages the temporary storage site under licence from the Canadian Nuclear Safety Commission (CNSC). Annual reporting to the CNSC presents the results of another Interim Waste Management Program activity, the Environmental Monitoring Program (EMP). The EMP includes site inspections, drainage system water monitoring, radon monitoring and gamma radiation survey measurements.

The current temporary storage site capacity and radionuclide inventory is defined by the CNSC licence as 12,000 m<sup>3</sup> of historic LLRW contaminated materials with an activity limit of 20 GBq of associated uranium series radionuclides. This is twice the original capacity of 6,000 m<sup>3</sup> and

10 GBq. The need to expand the temporary storage site resulted in a doubling of its capacity in 2001 due to the successful recovery of contaminated materials over the previous 12 years.

Over the 21-year history of the CMP, the LLRWMO has received approximately 9,000 m<sup>3</sup> of historic LLRW contaminated materials at the temporary storage site in Port Hope. The construction of a separate licensed consolidation site for historic LLRW adjacent to the one used by the CMP allowed for the transfer of approximately 1,700 m<sup>3</sup> of soils from the temporary storage site to increase its operating capacity [5]. The development activities in Port Hope have continued without significant impacts from the CMP, as the temporary storage site is usually closer to the excavation site than other potential disposal sites for soils excavated during site development.

The average annual rate of receipt of contaminated materials, usually in the form of radium/uranium refining process wastes mixed in soils, is approximately 300 m<sup>3</sup> per year, excluding two years when large municipal projects had no option but to send contaminated soils to the LLRWMO's temporary storage site. At this rate, the current facility should be able to receive contaminated soils from development in Port Hope through to the local LTWMF's ability to receive the material directly. Should any large-scale developments identify significant volumes of materials that cannot be managed on site in the interim, discussions on potential options would be initiated by the LLRWMO with the CNSC and the Municipality of Port Hope.

## **HISTORY OF USE AND RESPONSE TO THE IWM PROGRAMS**

Over the 21 years since its inception, the CMP has now responded to more than 3,500 applications for construction monitoring services, of which more than 1,000 were from the Municipal Public Works Department or local utility companies. CMP Activity since its inception is shown in Figure 3 and Table I. The importance of the CMP in the local community is reflected in the sustained activity from year to year. During 2009, staff from the LLRWMO responded to over 200 requests for CMP services, primarily related to proposed new construction activities, landscaping or utility excavations. Approximately 250 m<sup>3</sup> of contaminated soil was excavated from remediated properties and transported to the licensed Pine Street Extension Temporary Storage Site (PSE TSS) in the Municipality of Port Hope. The accumulated volume stored at the PSE TSS is now approximately 7,300 m<sup>3</sup>, about 60 percent of the licensed capacity of 12,000 m<sup>3</sup>.

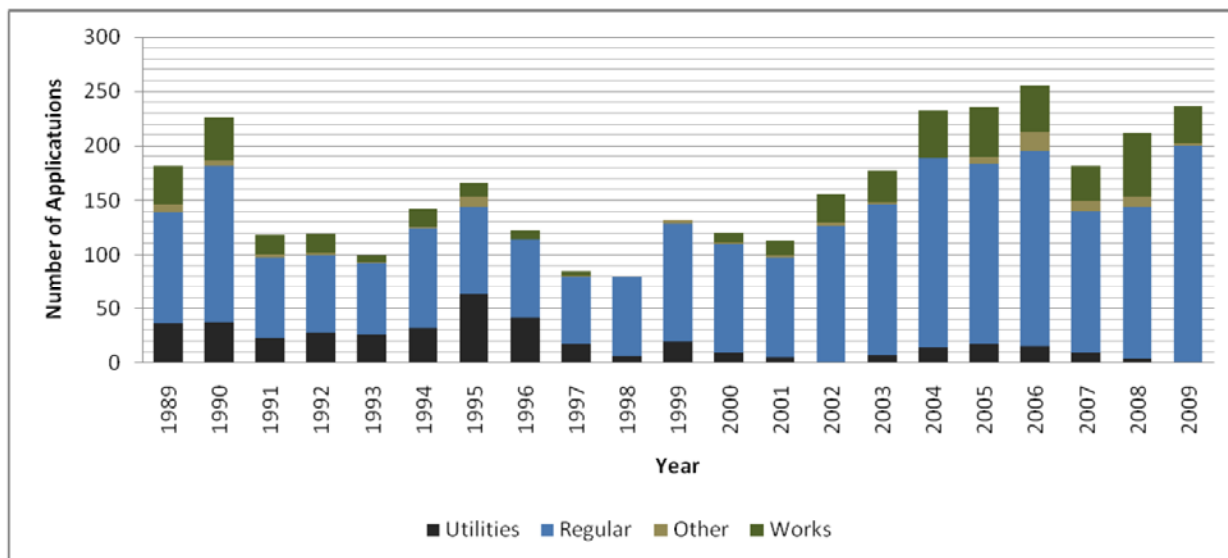


Fig. 3. Construction Monitoring Program Applications as of 2009 December 31

Under the PCP, the LLRWMO issued a total of 533 radiological status letters for individual properties during the 2009. Although the vast majority were in Port Hope, 123 of these letters dealt with properties outside of Port Hope, mostly in the Greater Toronto Area and other areas in southern Ontario. The LLRWMO also conducted 90 property surveys, including interior and exterior gamma surveys and interior radon surveys. These surveys provide information that helps facilitate both private and commercial development applications and the sale of individual properties in the municipality.

The LLRWMO conducted environmental monitoring at licensed and unlicensed sites in Port Hope throughout the year. Parameters measured included radon in air, gamma radiation, radium/uranium/arsenic in ground and surface water, and groundwater levels. Monitoring is carried out at licensed sites to satisfy the conditions of the CNSC licenses, and at unlicensed sites to ensure environmental diligence as well as to monitor for trends and to provide baseline information in Port Hope. An annual inspection of the LLRWMO licensed sites was also performed by the CNSC to confirm that they are being safely operated in compliance with their license.

Table I. Annual Construction Monitoring Program Summary, 1989-2009

Year	Number of Applications					PSE TSS Deliveries (m <sup>3</sup> )						
	Utilities	Regular	Works	Other	Total	CMP Regular	CMP Works	CMP Major	Other Cleanups	Annual Total	Cumulative Total	TSS Volume <sup>B</sup>
1989	36	103	36	7	182	849	151	618	63	1,681	1,681	0
1990	37	145	39	5	226	358	135	0	106	599	2,280	599
1991	23	74	17	4	118	75	3	611	188	877	3,157	1,476
1992	28	72	17	2	119	110	0	220	0	330	3,487	1,806
1993	26	66	7	1	100	0	5	0	0	5	3,492	1,811
1994	32	92	16	2	142	674	19	1,718	69	2,480	5,707 <sup>A</sup>	4,026
1995	63	81	12	10	166	22	0	15	130	167	5,874	4,193
1996	41	73	8	0	122	18	0	0	36	54	5,928	4,247
1997	17	63	4	1	85	25	0	0	1	26	5,954	4,273
1998	6	74	0	0	80	184	0	0	4	188	6,142	4,461
1999	20	109	0	3	132	30	0	72	0	102	6,244	4,563
2000	9	101	9	1	120	210	0	60	0	270	6,514	4,833
2001	5	92	13	3	113	0	14	328	28	370	6,884	5,203
2002	1	126	26	3	156	54	22	5	5	86	6,970	5,289
2003	7	139	30	2	178	281	91	0	1	372	7,342	5,661
2004	14	175	44	0	233	63	14	260	3	340	7,681	6,000
2005	17	167	46	6	236	90	30	76	0	196	7,877	6,196
2006	15	180	42	18	255	313	21	0	5	338	8,215	6,534
2007	7	131	33	9	180	268	0	2	12	282	8,497	6,816
2008	4	140	58	10	212	88	8	5	0	101	8,598	6,917
2009	9	134	55	4	202	200.5	34.1	0	1.9	236.5	8,835	7,154
<b>Total</b>	<b>417</b>	<b>2,337</b>	<b>512</b>	<b>91</b>	<b>3,357</b>	<b>3,913</b>	<b>547</b>	<b>3,990</b>	<b>653</b>	<b>9,101</b>		

<sup>A</sup> Cumulative total reflects 1994 volume correction of 265 m<sup>3</sup>.

<sup>B</sup> TSS volume total reflects 1989 pad clearing of 1,681 m<sup>3</sup> and 1994 volume correction of 265 m<sup>3</sup>.

## INTERIM WASTE MANAGEMENT PROGRAM CHANGE OVER THE YEARS

There have been a few changes in the IWM over the years as a result of operating experience and program needs.

Under the CMP, the LLRWMO has taken on responsibility for all site maintenance to aid in the reactive nature of the temporary storage site's operations. The federal government has accepted the responsibility for covering property owner costs in the excavation and transportation of contaminated materials to the temporary storage site; previously, the owner would have covered the costs associated with the excavation and transportation while the LLRWMO provided the

temporary storage site for the materials being transported off-site. Administratively there has been little change.

Under the PCP, the most significant change is the increase in public access to the property files that contain all radiation survey data gathered by the federal government. Up until mid 2010, the LLRWMO treated the property files as owner-protected and provided access to them only to the property owner. The federal Access to Information policies now allows access to these files by anyone. AECL ensures that any information that should be protected regarding the Privacy Act be redacted from the files. This new access to property file information has developed significant interest by potential property buyers, special interest groups, and even curious former owners of the properties.

The EMP is the least likely program to change, as the environmental monitoring requirements of the LLRWMO's licensed sites are defined by CNSC licence. While not required from a regulatory perspective, the LLRWMO also operates similar monitoring at unlicensed sites of interest. This usually covers major sites that have not required licensing as a result of exemption from licensing by the CNSC pending the upcoming remedial work to be performed during the Port Hope Area Initiative.

## **MALVERN COMPARISON**

The LLRWMO conducted the remediation of contaminated soils from a radium recovery site in the Malvern area of the city of Toronto Ontario in 1995-96 [6]. Most of the properties in the area were public housing land owned by the province of Ontario. Following the excavation of contaminated soils on private properties, including the area from the property line to the street curbing, it was recognized that a small potential remained for contaminated soil to exist beneath the roadways. To ensure that any potential roadway or utility corridor excavations were managed with this in mind, the LLRWMO created a separate Construction Monitoring Program.

This program is not used as much as its counterpart in Port Hope, owing mostly to the fully developed nature of the infrastructure in the Malvern area. When the private or Public Utilities require sub-surface maintenance or improvements, the LLRWMO is contacted to provide the required radiation surveying and radiation protection oversight. Since its inception in 1996, the LLRWMO has performed approximately 20 surveys. No contaminated soils were identified during any of these surveys.

The Malvern Remedial Project included the sorting of radium-contaminated soils into two separate streams, licensable and non-licensable categories. The licensable material was transferred to AECL's Chalk River Laboratories Waste Management Area D for storage pending the development of a final disposal facility for Canada's historic LLRW. The non-licensable materials were placed into a stockpile on Ontario Realty Corporation, a provincial government land management organization, property. The LLRWMO monitors this site similar to those in Port Hope, with annual operations reporting to the property owner and several community stakeholders, including the public library.

## **THE LOOK AHEAD**

The agreement created in 1989 is in need of review. The upcoming creation of a local long-term low-level radioactive waste management facility and the remediation activities to capture the residual historic LLRW in the Port Hope area will resolve the need for the Construction Monitoring and Property Compliance Programs as they exist today. As the Interim Waste Management Program components transition toward this longer-term facility surveillance and monitoring activity, there is a need to recognize the various new waste management practices in current and near-future use.

The examples of the Construction Monitoring Programs in the areas of Port Hope and Malvern, Ontario, could also be used in other areas of Canada where the development of long-term waste management solutions will require interim action by the federal government. This will allow continuing development and enjoyment of properties potentially affected by historic LLRW, or perhaps it could even be applied to areas impacted by contaminants of a completely different nature.

## **CONCLUSIONS**

Open and frequent interaction with local municipal representatives is a key to the success of the LLRWMO's programs in Port Hope and other communities across Canada. Empowering all parties throughout the process allows for the development of long-term relationships that will ensure the future success of the Interim Waste Management sub-programs. The continued success of the co-existing federal-municipal programs is evident in the ongoing urban development in the community and the willingness of people to continue living in, moving to, or simply visiting, the area. Public safety and property values are assured in spite of the continues presence of some contamination.

It is important to get all stakeholders represented at the discussion table. Identifying known and potential issues, and where responsibilities lie, makes it much easier to operate a co-existing program in a state of inclusion. Decisions made independently of other stakeholders can fail to achieve buy-in from all parties, as they have the potential to be made without complete or current knowledge of impacts on the activities of the other stakeholders.

The resolution of historic LLRW contamination issues in the Port Hope area will come in the development of a local long-term low-level radioactive waste management facility to receive materials from site remediation work in the community. Completion of the remedial work that started in the mid-1970s over the next ten years will be satisfying to everyone the community, and a release of the concern that has formed through the Port Hope area association with radioactive waste.

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