NEARLY READY FOR CONSTRUCTION ON THE PORT HOPE AREA INITIATIVE

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ABSTRACT

The Port Hope Area Initiative is a federally-sponsored project to cleanup the historic low-level radioactive waste arising from the operations of Eldorado Nuclear, a former federal crown corporation, and its private sector predecessors. The waste is mostly in the form of contaminated soil and was generated between 1932 and 1988 when Eldorado was dissolved. This paper provides a summary of the origin of the waste, the initial attempt to address the waste issue, and the current initiative which began in 2001. More specifically, this paper provides an introduction to the project and the work accomplished in Phase 1, specific details regarding the ongoing Transition Phase 1A and a sneak peak at the plan for Phase 2 when the construction and remediation activities will be performed and the wastes safely emplaced in new engineered containment mounds.

1. INTRODUCTION

In 1975, elevated levels of radon gas and radium-contaminated soils were detected in the basements and yards of some homes in Port Hope, Ontario. This was the genesis of a six-year long investigation and cleanup effort led by the Atomic Energy Control Board that culminated in the removal of 100,000 m^3 of contaminated soils from private residences to comply with the regulatory requirements of the day. This effort also identified that many hundreds of thousands of cubic metres of low-level radioactive waste (LLRW), originating from the radium and uranium refining operations of Eldorado Nuclear, remained in Port Hope and in the neighbouring Township of Hope and Municipality of Clarington, on both municipal and privately held lands, and resolutely confirmed that a long-term waste management solution was needed.

The search for a long-term solution for the remaining wastes began in 1981 and culminated in 2001 when a Legal Agreement[1] was signed by the federal government and the (then) three (3) municipalities in which the Eldorado wastes were located, thereby creating the Port Hope Area

[1] The 2001 Legal Agreement has been amended three times, most recently in 2009. References in this paper to the Legal Agreement are intended to relate to the latest revision

Initiative (PHAI). This Agreement was pivotal in that it established the "once and for all" solution to the waste management problem that had challenged stakeholders for more than 20 years and reaffirmed Canada's obligation to address its responsibilities for the waste generated by Eldorado, a former federal crown corporation that was dissolved in 1988.

The Agreement identified that the PHAI would be planned and managed in three (3) major phases: Phase 1 - planning / approvals; Phase 2 - construction and remediation; and Phase 3 - long-term monitoring and maintenance. The Agreement also defined the PHAI as consisting of two (2) distinct yet closely linked projects: the Port Hope Project (PHP) and the Port Granby Project (PGP), both of which would culminate with the creation of a new Long-Term Waste Management Facility (LTWMF), one in each community.

In 2001, at the start of Phase 1, the Low-Level Radioactive Waste Management Office (LLRWMO), a division of Atomic Energy of Canada Limited (AECL), was named as the interim proponent for the PHAI on behalf of the Government of Canada. The LLRWMO had been established in 1982 in Port Hope following the initial cleanup to safely manage the historic LLRW in Port Hope until the long-term solution was in place. The LLRWMO was accordingly well positioned to manage Phase 1 of the PHAI.

For nearly eight (8) years, the LLRWMO led the activities on the PHAI, defining the technical basis for the cleanup and establishing implementation protocols in consultation with the municipalities of Clarington and Port Hope (following the amalgamation of the former Town and Township). The most significant undertaking in Phase 1 was the exhaustive reviews of the potential environmental impacts of the PHP and PGP. The environmental assessment (EA) studies considered the biophysical (natural) and socio-economic effects of the projects and determined which of these effects were potentially significant. For potentially significant effects, mitigation measures were proposed. The EA Study Reports produced by the LLRWMO became the primary inputs for the federal Responsible Authorities that prepared the Screening Reports, pursuant to the Canadian Environmental Assessment Act.[2]

In 2008, following an independent review of the progress that had been made on the PHP and PGP since 2001, a Transition Phase 1A was introduced to the PHAI implementation scheme. Phase 1A was intended to bridge the completion of Phase 1 and the start of Phase 2 and accelerate progress. The remainder of this paper is focused on the achievements and challenges faced in the Transition Phase, which is on schedule to conclude in 2011 September.

2. TRANSITION PHASE 1A

The Transition Phase 1A was officially launched in 2008 April with the approval of a revision to the 2001 federal authorization to implement the PHAI. The main objectives of the Transition Phase were to establish a robust project management and governance framework for Phase 2 and to complete the detailed designs for the new LTWMFs. Other transition goals included securing the remaining regulatory approvals, defining and implementing the follow-up environmental monitoring and mitigation program identified in the Screening Reports, and providing the ongoing delivery of the community programs set out in the Legal Agreement.

[2] [2] Under the Canadian Environmental Assessment Act, Responsible Authorities are federal authorities whose actions or powers trigger the environmental assessment of a particular project. The responsible authority must ensure that an environmental assessment of the project is conducted as early as possible in the planning stages of the project and before irrevocable decisions are made.

2.1 Project Management and Governance Framework

One of the foundational elements required for the Transition Phase was the establishment of a new project management and governance framework. This requirement recognized:

- The strong demand for a best practices project management approach to effectively plan and manage the magnitude and complexity of the PHP and PGP;
- The requirement for a fully dedicated project organization, led by a Project Director whose sole focus would be the PHAI;
- The policy directive to employ federal procurement processes for all major contracting activities; and,
- The benefits that a Steering Committee could offer in terms of strategic and policy direction and oversight of the execution of the Transition Phase in accordance with defined performance measures.

Accordingly, in the spring of 2008, trilateral discussions were initiated by Natural Resources Canada (NRCan), the federal sponsor for the PHAI, with AECL and with the Ontario Regional Office of Public Works & Government Services Canada (PWGSC). Over a six-month long series of meetings, the past, current status and future direction of the project was explored as well as the respective experiences and capabilities that each organization could offer to make the Transition Phase successful. These discussions further served to build relationships amongst those that would become key players in the project and awareness of the challenges they could face working together based on their differing business cultures and standard operating procedures. Consequently, the three organizations were able to reach consensus, and by 2008 November, endorse a Project Charter that provided a common understanding of the Transition Phase authorities and objectives and of the principles to guide their work together on the PHAI.

The Project Charter also defined the broad division of responsibilities among each of the three (3) federal organizations involved in the PHAI. The primary assignments among the project delivery partners were:

NRCan: Project Sponsor, responsible for securing funding, land acquisitions and leases, and strategic management of relationships with the Legal Agreement's municipal signatories;

AECL: Project Manager & Proponent, responsible for overall planning and execution of the PHP and PGP and for leading and managing EA and licensing approvals; and,

PWGSC: Major Contracting Authority, responsible for planning and administering all major design and construction contracts.

Coincident with the signing of the Project Charter, the Terms of Reference (TOR) for an oversight Steering Committee were also approved. The TOR defines the mandate of the Committee, which is centered upon providing strategic direction and overall guidance via the Project Director and ensuring that performance expectations are formally defined and met and issues quickly and effectively resolved. The TOR also addresses the Steering Committee's composition, meeting format and frequency, and the processes for reaching agreement and making decisions. Senior management representatives from the three (3) federal agencies that

had been participating in the discussions that created the Charter were nominated to sit on the Steering Committee and the first meeting was held in 2009 March.

The Project Charter and Steering Committee TOR set the groundwork for the third and final piece of the governance documentation, namely the Tripartite Memorandum of Understanding (MOU) that formally created the PHAI Management Office (see Figure 1).

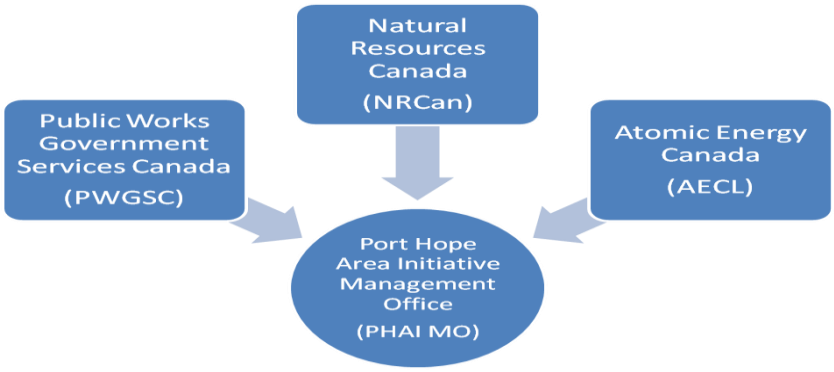

Figure 1: Port Hope Area Initiative Management Office construct

The MOU further elaborated on the roles of each federal organization and the relationships among these participants for the purpose of project delivery. Among the details addressed were the purpose and mandate of the Management Office; the accountabilities and authorities of the Project Director role (established administratively within AECL); and clear expectations that each participant organization would consult with its project partners on all matters that could impact another's responsibilities or the project success as a whole. A dispute resolution mechanism was established in the MOU as was the requirement to develop seven (7) formal PHAI management processes to integrate the similar yet differing practices within the partner organizations and to reflect industry best practices. These processes addressed the management of core project parameters, including scope, schedule, cost, risk and changes as well as administrative requirements for planning and reporting, and invoicing.

More than two years later, these foundational governance documents have effectively served their purpose. No significant challenges have arisen nor have any amendments been necessary. This is a testimony to the balance that was struck in adequately defining the operating parameters for the three (3) partners, while providing sufficient room to manoeuvre within the uncertainty parameters that all novel projects encounter. It also underscores the importance of investing the time and effort needed to build the knowledge and comfort levels among those that would be responsible for working together to make the Transition Phase successful. This bodes well for the forthcoming trilateral dialogues to update the Project Charter, MOU and Steering Committee TOR that will be required to address the Phase 2 requirements and challenges.

Another critical success factor in the Transition Phase has been the creation of a physical work space in which core project team members can comfortably work together and which can accommodate visiting project staff from the "home offices" of each partner organization. In late 2009, an opportunity emerged to lease a building in Port Hope that was being completely redeveloped. The new office, shown in Figure 2, was designed to not only provide the features and information technology essential for a modern project office but was intentionally laid out to promote dialogue, teamwork and cooperation among the respective project functions, particularly the AECL technical experts who brought the local and in-depth knowledge of the

waste challenges and the EA requirements and the PWGSC contract management specialists who were responsible for managing the primary consulting contracts that would produce the detailed design solutions.

Figure 2: New headquarters of the PHAI Management Office, Port Hope Ontario

2.2 Detailed Design

The primary design consultant service contracts for the engineering of the major LLRW remediation sites and the design of the new LTWMFs were awarded early in 2010. A joint venture of the MMM Group and Conestoga Rovers & Associates was engaged for the PHP while AECOM was awarded the contract for the PGP.

Over a period of 13 months, the two (2) consultant teams completed increasingly more detailed presentations of the plans and designs. At each contract milestone, the plans and designs were subject to review by PWGSC for conformity with contract terms and technical standards, by AECL for compliance with environmental and licensing requirements, and by the respective municipal peer review teams for consistency with conceptual designs, municipal by-laws and the Legal Agreement scope.

To ensure the reviews of the design outputs were completed within the PWGSC 15-day contract schedule allowances, a protocol was established between the AECL and the municipalities. This protocol set out a 10-day period for the distribution of documents, their review and the compilation of comments. As such, a further 5-day period was reserved for PWGSC to consolidate and transmit all stakeholder comments. Overall, the deadlines for completing design reviews were met due to the review protocol and the efforts made to provide regular updates on the planned release date of various design documents. The use of a FTP server site[3], employed to provide reviewers with direct access to the large file documents, was another critical success factor.

The final designs for the two mounds similarly incorporate multi-layer base liner and cap systems, similar to those employed in hazardous material landfills. The 1.5m thick base liner system comprises natural clay and manmade geomembrane materials and a piping network to collect moisture draining from the wastes (leachate) for treatment. The 2.5 m thick cap system

[3] A File Transfer Protocol (FTP) server site is a method for transferring data (sharing files) over a network or the Internet

will similarly incorporate multiple layers of materials to restrict water transmission into the mound and will additionally include a thick layer of soil to attenuate radiation from the emplaced waste to achieve natural background levels on the surface of each mound.

Artists' conceptions of the completed mounds appears in Figures 3 and 4. The PHP mound will hold 1.2 million m^3 of waste and approximately 0.3 million m^3 of daily clean covering soil material. The PGP mound will be less than half the size of the PHP mound. Each mound can accommodate waste volume increases encountered during the remediation work. Further, each facility will have a dedicated water treatment plant to process leachate from the mound, decontamination operations and intercepted groundwater. Ancillary facilities such as collection ponds, pumping stations, construction offices and change rooms are all part of the design of the LTWMFs. To access each new LTWMF work site, new civil infrastructure is required. In the case of the PHP, a dedicated "Access Road" is being constructed as part of the Transition Phase. For the PGP, the substantial upgrade of an existing road allowance (Elliott Road) will be accomplished early in Phase 2.

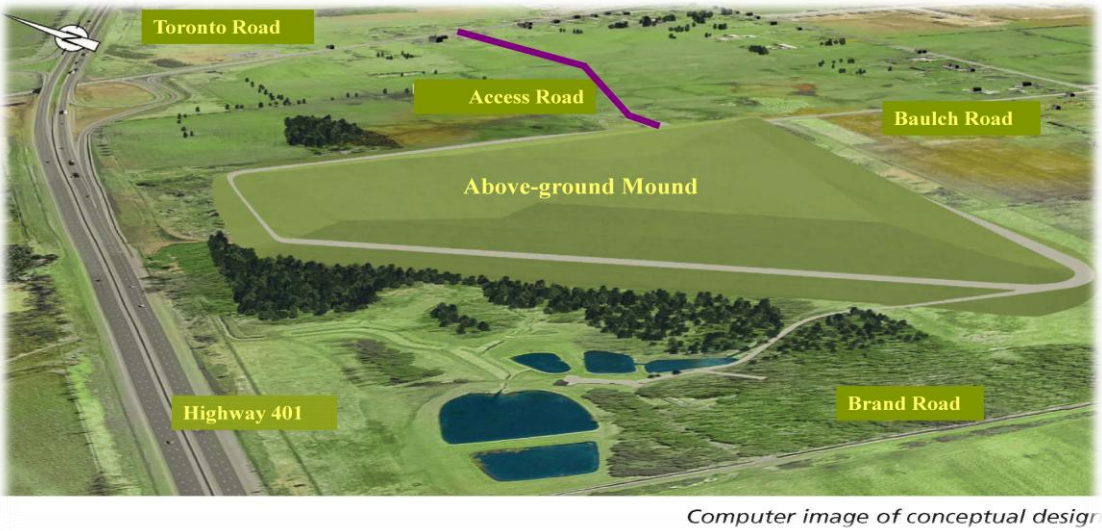

Figure 3: Aerial view of the PHP mound at the LTWMF

Figure 4: The low profile PGP Mound / LTWMF, looking north from Lakeshore Road

2.3 Other Transition Phase Accomplishments

2.3.1 Regulatory Approvals

At the start of the Transition Phase, only one (1) of the four (4) required regulatory approvals was in place. In 2007, the Screening Report for the PHP had been approved by the Responsible Authorities. Thus, a deliberate focus was placed on securing the outstanding approvals, namely the EA decision for the PGP and the licences for both the PHP and PGP.

Central to this focus was the definition of specific action plans to accelerate the progress that had been made through 2008 March. At that juncture, the PGP EA Study Report was substantially finished; all that remained was the completion of an Addendum to address feedback on the Study Report that had been subjected to extensive public and regulatory review in 2007. By contrast, the activities to secure the PHP licence had recently been launched (the PHP EA decision was an essential pre-requisite) and no work had been initiated on the PGP licence.

One of the first steps taken was to confirm the requirements to achieve the outstanding PGP Screening Report decision and the licences for both projects and then to determine a means to heighten focus on these goals. The idea to use protocols to raise priority was advanced by the Canadian Nuclear Safety Commission (CNSC) as part of its mission to broaden its application of risk-based regulation and bring closure to long-standing applications for projects that were likely to result in positive benefits to human health and safety and the environment.

The protocols for the PHP and PGP were signed in 2008 December between AECL, the proponent; NRCan, the lead Responsible Authority; and the CNSC, the nuclear regulator. They established the administrative framework as well as the target timelines and service standards for the remaining activities of the federal regulatory process. The defined timelines and service standards were:

- Document submission date (AECL) – various specified dates over a 3 month period
- Conformity review service standard (CNSC or NRCan) – 3 days
- Detailed review service standard (CNSC or NRCan) – 20 days
- Review /acknowledgement of comments service standard (AECL) – 3 days
- Revised document submission date (AECL) – 20 days
- Detailed review of revised document (CNSC or NRCan) – 5 days

The protocols encouraged dialogue before and after document submittals to clarify intentions and facilitate common understandings, with the aim of achieving the target timelines. The protocols also included an issues resolution process that supported the timely escalation of issues that could not be resolved at the working level through defined committees of the signatories.

The results from the application of the protocols were powerful: a positive PGP EA decision was achieved in 2009 August and the PHP licence was issued in 2009 October (and took effect in 2010 March). Second editions of the protocols are now being employed to track the conclusion of conditions placed on the PHP licence and the milestones for the PGP licence which were amended following the issuance of the PHP licence. The hearing to secure the PGP licence, the final regulatory approval required for the Transition Phase, is planned for September, 2011.

2.3.2 EA Follow-up Program

Pursuant to the Screening Report decisions noted in Section 2.3.1 above, AECL prepared EA Follow-up Program Plans for both the PHP and PGP to provide the overall framework for the development and implementation of project-specific monitoring activities and, as required, mitigation measures. These Program Plans were each supplemented with monitoring plans for the predicted socio-economic and biophysical impacts of the PHP and PGP.

One of the most important early requirements of the follow-up program is the re-establishment of the environmental baseline; i.e. a comprehensive assessment of the pre-project conditions, one year in advance of the start of Phase 2 construction and remediation activities. The baseline is re-established to update (refresh) the data collected in the 2003-2005 period that underpinned the preparation of the EA Study Reports so that a benchmark is available from which true project effects can be objectively and accurately measured.

Thus, beginning 2010 April, AECL began the redeployment of scientific equipment to assess the levels of radon and dust in the air, the normal ambient background noise in the community, and the quality of surface water and groundwater. The resurrection of the program has required significant preparation work to secure permission to access properties, install hydro poles, and drill supplementary wells. Examples of the monitoring equipment and the sampling work are shown in Figure 4. Additionally, AECL is reviewing the terrrestrial environment via tree surveys, species at risk reviews and wildlife observations.

Figure 4: Equipment to measure air quality, noise levels and groundwater contaminants

On the socio-economic side of the EA follow-up program, the focus has been on measuring the impacts to people and the community life generally. Among the many parameters tracked are changes to:

- Traffic;
- Real estate values;
- Traditional land uses by First Nations; and,
- Local business and tourism.

In Port Hope, annual surveys have also been completed to measure residents' satisfaction with living in the community, the levels of awareness of the PHP and confidence in the solution being advanced to manage the LLRW; and the degree to which the PHP weighs on their minds. In Port

Granby, similar questions are asked, though on a less frequent basis due to the lower profile of the project within the rural community and the smaller population in the local area of the PGP.

The mitigation component of the EA follow-up program is as varied as the scope of monitoring. For some project effects, the mitigation action is pre-emptive by design; i.e. it is in place to preclude or off-set predicted significant environmental effects. The Property Value Protection (PVP) program, which compensates property owners for losses realized upon sale that can be directly linked to a project effect, is one example. The PHAI community outreach program that aims to provide citizens, service clubs, and community groups with the information they need about the project is another example. During Phase 2, contractors will be required to take mitigative measures to contain the generation of dust and noise to the levels cited in specifications. Further, a two-tier complaints resolution process will be implemented to provide a flexible framework that supports the timely resolution of simple or routine issues in a non-bureaucratic fashion and treats more complicated or non-routine complaints within a framework that has defined boundaries and supports consistent and reasonable resolutions.

One of the final tasks to complete in the Transition Phase is the design of the reports that will communicate EA monitoring data and mitigation results to the concerned regulatory agencies and to the public. Valuable insight has been gained from the Sydney Tar Ponds Project[4] and the lessons learned from its ongoing urban cleanup are being incorporated into the PHAI plan.

2.3.3 Ongoing Program Commitments

The Legal Agreement that created the PHAI anticipated that the planning and implementation of the PHP and PGP would impact the communities and therefore incorporated provisions to offset the impacts. For the municipalities hosting the LTWMFs, assurances were provided that they could meaningfully participate in the project and be compensated for the additional costs they incur doing so. Thus, in addition to one-time, lump sum hosting fees, a Municipal Administrative Cost Recovery program was authorized. During the Transition Phase, the guidelines for how the program would be administered were substantially updated to increase the level of predictability in these costs.

Another significant program committed in the Legal Agreement is the aforementioned PVP program, which aims to address losses on sales of real estate, difficulties renewing mortgages and losses of income from a rental property, as a direct result of the effects of the project activities. All property owners within a defined 92 km^2 zone are eligible to participate in the PVP program. The municipalities of Port Hope and Clarington are eligible to use the PVP program and to claim for limited tax revenue losses resulting from property devaluation that is shown to be caused by the PHAI and verified by the Ontario Municipal Property Appraisal Corporation[5]. During the Transition Phase, approximately 25 PVP claims related to loss on sale have been filed, and more than $1 million has been paid to claimants.

The Communication program delivered by the PHAI represents another important Legal Agreement obligation. This multi-faceted program encompassess public affairs, community outreach, and media relations and incorporates traditional and modern methods. In 2010, as part of the plan for the new PHAI Management Office headquarters, the Project Information Exchange was significantly expanded to support a higher number of visitors and tour

[4] www.tarpondscleanup.ca
[5] www.mpac.ca

delegations, to address the growing demand for personal (one-on-one) briefings from project staff, and to provide a backdrop for official events and media interviews. A standalone PHAI website (www.phai.ca) was launched in 2009 and it was updated with many new features in 2010, receiving ~ 500,000 visits in its first seven (7) months of operation. In addition to conventional PHP and PGP newsletters mailed out semi-annually to every home in the communities, project updates are frequently provided via the webpage and (in the near term) using social media. Participation in local fairs and exhibits has been a hallmark of the outreach element of the Communications program since its beginnings in 2001 and this, along with presentations to community groups, municipal council committees, and other stakeholders continued throughout the Transition Phase and will remain a component of Phase 2 communications strategy. Figure 5 illustrates some of the communication channels noted above.

Figure 5: PHAI webpage, Project Information Exchange, exhibit at local fair

3. OUTLOOK FOR PHASE 2 IMPLEMENTATION

Phase 2 will commence when the necessary federal policy and funding authorizations are in place, currently projected for 2011 Fall. The construction and remediation work for both the PHP and PGP would commence shortly thereafter. Early activities include site preparation as well as improvements to municipal infrastructure to access the sites and construction of upgraded water treatment plants. With the enabling infrastructure in place, taking an estimated two-three (2-3) years to complete, the cleanup and consolidation of the radioactive waste could commence.

The sequencing of the remediation for the PHP is dependent on a number of factors, due to its complexity. Fundamentally, the siting of the new LTWMF on the same parcel of land currently occupied by a large LLRW deposit (the Welcome Waste Management Facility) necessitates a sequential cell development and site remediation strategy for the approximate 450,000 m^3 of contaminated soils currently located on the site.For some areas of the site it requires temporary stockpiling of on-site wastes while the base liner systems (including leachate collection) for the individual cells of the new mound are installed. The set aside waste can then placed within the cells. When most of this on-site waste transfer is completed, nearly 700,000 m^3 of LLRW from offsite locations will be received at the LTWMF over a five-six (5-6) year period.

The waste from the 13 major LLRW sites[6] within urban Port Hope (Ward 1) will be delivered using the north, central and south regional transportation routes, as shown in Figure 6. These routes were identified during the EA Study to avoid sensitive sites and to minimize the impact of

[6] Industrial waste toalling 51,250 m^3 from up to 5 sites designated by the Municipality of Port Hope will also be emplaced within the LTWMF.

the total estimated 85,000 waste truck trips on the community. Coincidentally, Cameco will delivery to the LTWMF approximately 150,000 m^3 of Eldorado decommissioning waste situated at its harbourfront operation as part of its Vision 2010 Project[7]. As the LLRW is consolidated within each of the cells that comprise the mound, the capping system will be installed that will permit the diversion of non-impacted precipitation to a storm water management pond, guard against intrusion and attenuate the radiation from the encapsulated waste.

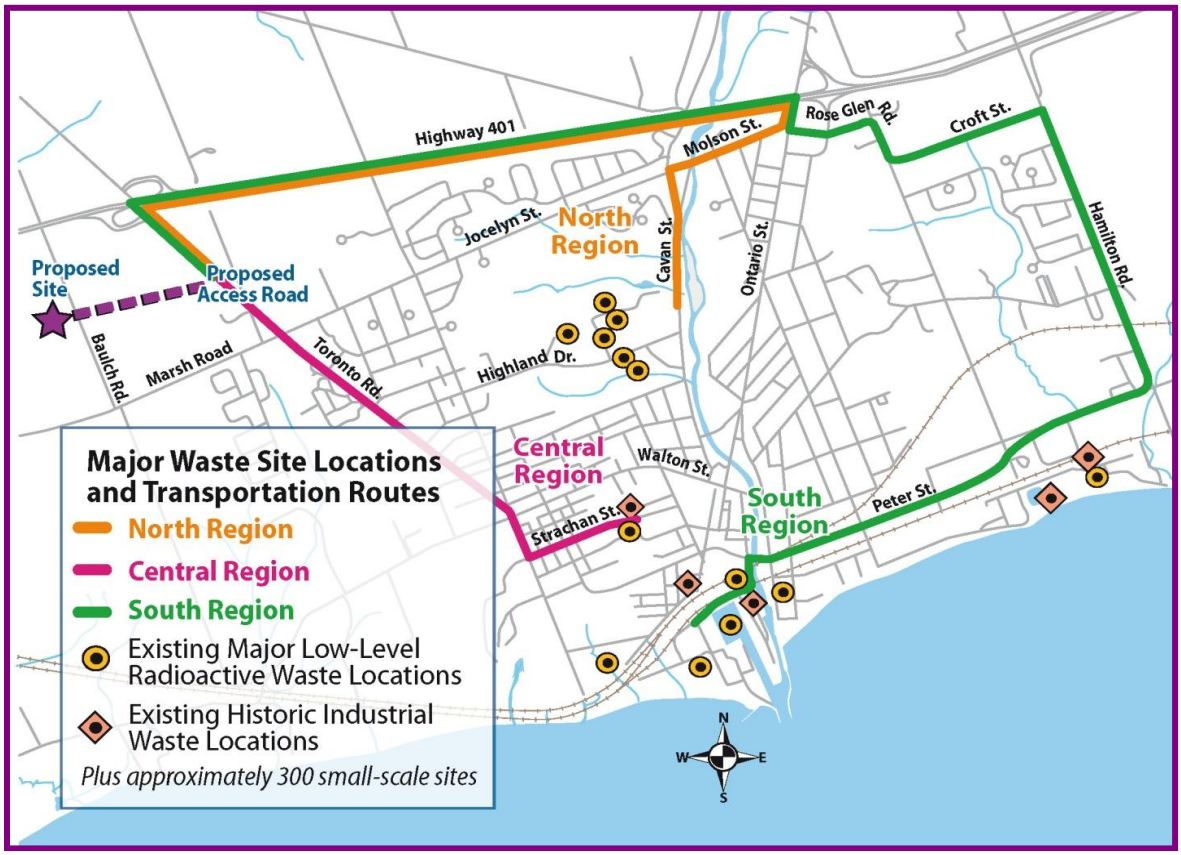

Figure 6: Primary transportation routes for LLRW within Port Hope

The sequencing for the PGP, which involves the remediation of only one site (the Port Granby Waste Management Facility) is fundamentally different than for the PHP. The LTWMF location on a greenfield site approximately 800m north of the remediation site, as shown in Figure 7, allows the base liner system to be installed without competing physical constraints. In parallel, the underpass structure beneath Lakeshore Road can be installed. Then, employing a 14-stage plan, the LLRW will be systematically excavated and trucked to the LTWMF via the dedicated haul route that passes beneath Lakeshore Road. The primary challenge of the remediation component is the site's topography, particularly maintaining geotechnical stability and avoiding the recontamination of land at lower elevations that must be remediated first. The placement of the nearly 450,000 m^3 of LLRW and daily clean cover soils within the mounds' cells and the installation of the capping system will take an estimated four-five (4-5) years to accomplish.

[7] www.cameco.com/fuel_services

Figure 7: Port Granby site layout

Once the operational and environmental performance monitoring systems for the closed mounds have been established, each will be aesthetically finished to incorporate the end uses that the host municipalities have developed. The Municipality of Port Hope has chosen to use the mound for passive recreation in the form of walking trails while the Municipality of Clarington prefers to have the mound finished to resemble a drumlin and surround it with vegetation and trees to blend in with the natural topography. It is anticipated that neither mound will require fencing as the waste will be securely encapsulated within the engineered mound structure and radiation levels on the mound surface at natural background levels. Only the water treatment infrastructure is anticipated to remain under restricted access control.

In conjunction with the final elements of the field work, projected to take two (2) years to accomplish, the Phase 2 project infrastructure will be demobilized and the much smaller capability required to manage the final, long-term monitoring and maintenance Phase 3 of the project will be established.

4. CONCLUSION

The PHAI is a major remediation project, the largest of its kind ever undertaken in Canada. Decades in the making, the initiative has finally reached the point where the actual cleanup is ready to be safely undertaken. The landmark decision to build LTWMFs within the communities that currently store the LLRW was agreed in 2001 and over the past ten (10) years, the work to develop environmentally-sound solutions, secure regulatory approvals, complete the detailed designs and define the project execution framework is very nearly completed. The federal funding and policy approvals required to proceed with Phase 2 – remediation and construction - are anticipated in 2011.

It has been a long road for the communities who, for several generations, have desired and eagerly anticipated a solution for the Eldorado Nuclear waste legacy. The Legal Agreement provides many avenues for the ongoing involvement of municipalities as the PHP and PGP are completed and together with the provisions of the EA Screening Reports offer several kinds of mitigation and compensation for significant project-based impacts on the communities and individuals living there.

The PHAI Management Office has been established by the federal government to manage the engineering projects and the delivery of program commitments. Over an approximate ten (10) year period, and in cooperation with host municipalities, regulators, contractors and citizens, the Management Office looks forward to finally retiring Canada's largest historic LLRW liability and to leaving an honourable legacy for future generations.